NEW YORK POWER AUTHORITY

ANNUAL ENVIRONMENTAL OPERATING REPORT
PART B: RADIOLOGICAL REPORT

JANUARY 1, 1987 - DECEMBER 31, 1987

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

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I-A INTRODUCTION

The New York Power Authority (NYPA) is the owner and licensee of the James A. FitzPatrick Nuclear Power Plant (JAFNPP). The FitzPatrick Plant which is located on the eastern portion of the Nine Mile Point promontory approximately one-half mile due east of the Niagara Mohawk Power Corporation (NMPC) Nine Mile Point Nuclear Power Stations (NMPNPS). The NMPNPS Unit #1 is located on the western portion of the site and is a boiling water reactor with a design capacity of 620 MWe. The NMPNPS has been in commercial operation since the fall of 1969. Located between the JAFNPP and NMPNPS, Nine Mile Point Unit #2 previously under construction was completed in mid-1987. NMPNPS Unit #2 will have generation capacity of 1,100 MWe and commenced start-up testing in late 1987. The JAFNPP is a boiling water reactor with a power output of 810 MWe (net). Initial fuel loading of the reactor core was completed in November of 1974. Initial criticality was achieved in late November, 1974 and commercial operation began in July of 1975.

The site is located on the southern shore of Lake Ontario in Oswego County, New York, approximately seven miles northeast of the city of Oswego, New York. Syracuse, New York is the largest metropolitan center in the area and is located 40 miles to the south of the site. The area consists of partially wooded land and shoreline. The land adjacent to the site is used mainly for recreational and residential purposes. For many miles to the west, east and south the country is characterized by rolling terrain rising gently up from the lake, composed mainly of glacial deposits. Approximately 34 percent of the land area in Oswego County is devoted to farming.

The Radiological Environmental Monitoring Program for the FitzPatrick Plant is a site program with responsibility for the program shared by the Power Authority and Niagara Mohawk. Similar Technical Specifications for radiological monitoring of the environment allows for majority of the sampling and analysis to be a joint undertaking. Data generated by the program is shared by the two facilities with review and publication of the data undertaken through each organization.

This report is submitted in accordance with Section 7.3.d of the Radiological Effluent Technical Specifications (RETS) to DPR-59, Docket 50-333.

I-B PROGRAM OBJECTIVES

The objectives of the Radiological Environmental Monitoring Program are as follows:

1. To determine and evaluate the effects of plant operation on the environs and to verify the effectiveness of the controls on radioactive material sources.
2. To monitor and evaluate natural radiation levels in the environs of the JAFNPP site.
3. To meet the requirements of applicable state and federal regulatory guides and limits.
4. To provide information by which the general public can evaluate the environmental aspects of nuclear power using data which is factual and unbiased.

II PROGRAM IMPLEMENTATION AND DESIGN

To achieve the objectives listed in Section I-B, sampling and analysis are performed as outlined in Table I.

The sample collections for the radiological program are accomplished by a dedicated site environmental staff from both the James A. FitzPatrick Plant and the Nine Mile Point Station. The site staff is assisted by a contracted environmental engineering company, EA Science and Technology, Inc. (EA).

1. SAMPLE COLLECTION METHODOLOGY

A. Surface Water

Surface water samples are taken from the respective inlet canals of JAFNPP and Niagara Mohawk's Oswego Steam Station (OSS). The JAFNPP removes water from Lake Ontario on a continuous basis and generally represents a "down-current" sampling point from the Nine Mile Point Unit 1 facility. The OSS inlet canal removes water from Lake Ontario at a point approximately 7.6 miles west of the site. This "up-current" location is considered a control location because of the distance from the site as well as lake current patterns and current patterns from the Oswego River located nearby.

Samples from the JAFNPP are composited from automatic sampling equipment which discharges into a large compositing tank. Samples are obtained from the tank monthly and analyzed for gamma emitters. Samples from the OSS are also composited from automatic sampling equipment and discharged to a compositing tank. Samples from this location are obtained weekly and composited to form monthly composite samples. Monthly samples are analyzed for gamma emitters.

A portion of the monthly samples from each of the locations is saved and composited to form quarterly composite samples for calendar quarter. Quarterly composite samples are analyzed for Tritium.

In addition to the FitzPatrick and Oswego Steam Station facilities, data are presented for the nine Mile point Unit 1 and Unit 2 facility inlet canals and city water from the City of Oswego. The latter three locations are not required by the Technical Specifications, but are optional samples. Monthly composite samples from these three locations are analyzed for gamma emitters and quarterly composite samples are analyzed for Tritium.

Surface water sample locations are shown in Section VII on Figure 1A.

B. Air Particulate/Iodine

The air sampling stations required by the RETS are located in the general area of the site boundary (within 0.7 miles) in sectors of highest calculated meteorological deposition factors (D/Q) based on historical meteorological data. These stations (R-1, R-2, and R-3) are located in the east, east-southeast, and southeast sectors as measured from the center of the Nine Mile Point Nuclear Station Unit 2 reactor building. The RETS also require that a fourth air sampling station be located in the vicinity of a year round community having the highest calculated dispersion factor (D/Q) based on historical meteorological data. This station is located in the southeast sector (R-4). A fifth station required by the RETS is located at a site 16.4 miles from the site in a least prevalent wind direction of east-northeast (R-5). This location is considered a control location.

In addition to the RETS required locations, there are six other sampling stations located within the site boundary (D1, G, H, I, J, and K). These locations generally surround the area occupied by the three generating facilities, but are well within the site boundary. One other air sampling station is located off-site in the southwest sector and is in the vicinity of the City of Oswego (G off). Three remaining air sampling stations (D2, E, F) are located in the ESE, SSE, and S sectors and range in distance from 7.2 to 9.0 miles.

At each station, airborne particulates are collected by glass fiber filters and radioiodine by charcoal cartridges. Air particulate glass fiber filters are approximately two inches (47 millimeters) in diameter and are placed in sample holders in the intake line of a vacuum sampler. Directly down stream from the particulate filter is a 2 x 1 inch charcoal cartridge used to adsorb airborne radioiodine. The samplers run continuously and the charcoal cartridges and particulate filters are changed on a weekly basis, or as required by dust loading. Gross beta analysis is performed for the individual particulate filters on a weekly basis. Charcoal cartridges are analyzed weekly for radioiodine by GeLi detector.

The particulate filters are composited for gamma analyses on a monthly basis by location after all weekly particulate filters have been counted for gross beta activity.

Air sampling stations are shown in Figures 1A, 1B, and 2.

C. Milk

Milk samples are collected in polyethylene bottles from the bulk storage tank at each sampled farm. Before the sample is drawn, the tank contents are agitated from three to five minutes to assure a homogenous mixture of milk and butterfat. Two gallons are collected during the first half and second half of each month from each of the selected locations within ten miles of the site and from a control location. The samples are chilled and shipped to the analytical laboratory within thirty-six hours of collection in insulated shipping containers.

Milk sample location selection is based on maximum deposition factors (D/Q). Deposition factors are generated from average historical meteorological data based on all licensed reactors. The Technical Specifications require three sample locations within 5.0 miles of the site with the highest calculated deposition factors. During 1987, there were no milk sample locations within 5.0 miles that could be sampled. However, there were several optional locations beyond five miles that were sampled.

A fourth sample location required by the Technical Specifications is located in a least prevalent wind direction from the site. This location is in the southwest sector and serves as a control location. Milk samples are collected twice per month (April - December) and analyzed for gamma emitters and I-131. Samples are collected and analyzed in January - March in the event I-131 is detected in November and December of the preceding year.

The milk sampling locations are found in Section VII on Figure 4.

D. Food Products

One kilogram samples of three different kinds of broad leaf vegetation (edible or inedible) are collected during the late summer harvest season. Sample collections are performed at the site boundary in two different direction sectors having the height calculated D/Q values. The broad leaf vegetation is chilled prior to shipping and shipped fresh in insulated containers. Attempts are made to collect control samples located 9-20 miles distant for each type of sample. Food products sampling as required by Table 6.1-1 (Section A & B under Food Products) are not performed. This form of food products sampling is only required when milk sampling is not being performed. The food products sampling locations are shown in Section VII on Figure 3.

E. Fish Samples

Available fish species are removed from the Nine Mile Point Aquatic Ecology Study monitoring collections during the spring and fall collection periods. Samples are collected from a combination of the four onsite sample transects and one offsite sample transect (see Section VII, Figure 1A). Available species are selected under the following guidelines:

1) 0.5 to 1 kilogram of edible portion only of a maximum of three species per location.

2) Samples composed of more than 1 kilogram of single species from the same location are divided into samples of 1 kilogram each prior to shipping. A maximum of three samples per species per location are used. Weight of samples are the edible portions only.

Selected fish samples are frozen immediately after collection and segregated by species and location. Samples are shipped frozen in insulated containers for analysis.

F. Shoreline Sediments

One kilogram of shoreline sediment is collected at one area of existing or potential recreational value and from one area beyond the influence of the site. The samples are placed in plastic bags, sealed and shipped for analysis in insulated containers.

Shoreline sediment locations are shown in Section VII on Figure 1A.

G. TLD (direct radiation)

Thermoluminescent dosimeters (TLD's) are used to measure direct radiation (gamma dose) in the environment. TLD's are obtained from Teledyne Isotopes on a quarterly basis and are read at Teledyne Isotopes' facility in Westwood, New Jersey. Shipment control TLD's (at least two) accompany each shipment to and from the vendor's laboratory. Shipment control TLD's also accompany the TLD's when they are being placed or collected and are shielded by lead when they are not being used. TLD data results are corrected for a transit dose by use of the data from the shipment control TLD's.

Five different types of areas are evaluated by environmental TLD's. These areas include on-site areas (areas within the site boundary not required by the RETS), the site boundary area in each of the sixteen meteorological sectors, and outer ring of TLD's (located four to five miles from the site in eight available land based meteorological sectors), special interest TLD's (located at sites of high population density) and control TLD's located at sites beyond significant influence of the site. Special interest TLD's are located at or near large industrial sites, schools, or proximal towns or communities. Control TLD's are located to the southwest, south and east-northeast of the site at distances of 12.6 to 19.8 miles.

TLD's used during 1987 were composed of rectangular teflon wafers impregnated with 25 percent $CaSO_4$:Dy phosphor. These were placed in a polyethylene package to ensure dosimeter integrity. TLD packages were placed in open webbed plastic holders and were attached to supporting structures, usually trees or utility poles.

Environmental TLD locations are shown in Section VII on Figures 1A, 1B, and 2.

H. Land Use Census

A land use census is conducted during the beginning of the grazing season to determine the utilization of land within the vicinity of the site. The land use census consists of two types of census. A milk animal census is conducted to identify all milk animals within a distance of ten miles from the site. This census is conducted by using road surveys, contacting local agricultural authorities, post cards, and investigating references from other owners.

A second type of census is a residence census. This census is conducted in order to identify the closest residence in each of the 22½ degree meteorological sectors. A residence, for the purpose of this census, is a residence that is occupied on a part time basis (such as a summer camp) or on a full time, year round basis. For the residence census, several of the meteorological sectors are over Lake Ontario because the site is located at the shoreline. No residences are located in these sectors. There are only eight sectors over land where residences are located within five miles.

I. Interlaboratory Comparison Program

An interlaboratory comparison program is conducted with reference samples originating from the Environmental Protection Agency (EPA). As required by the Technical Specifications, participation in this program includes media for which environmental samples are routinely collected and for which intercomparison samples are available.

2. ANALYSIS PERFORMED

The analysis of the environmental samples is performed by Teledyne Isotopes (TI) and the James A. FitzPatrick Environmental Counting Laboratory (JAFECL). The following samples are analyzed at the JAFECL:

- o Air Particulate Filter - gross beta (weekly)
- o Air Particulate Filter Composites - gamma spectral analysis (monthly)
- o Airborne Radioiodine - gamma spectral analysis (weekly)
- o Surface Water Composites - gamma spectral analysis (monthly)
- o Special Samples (soil, etc.) - gamma spectral analysis (as collected)
- o Fish - gamma spectral analysis
- o Shoreline Sediment - gamma spectral analysis
- o Milk - gamma spectral analysis

The remainder of the sample analysis as outlined in Table I is performed by TI.

3. CHANGES TO THE 1987 SAMPLE PROGRAM

A. Program TLD #107 was added to the monitoring program on April 2, 1987. TLD #107 was added to the program as a backup for TLD #106 which is used to evaluate any possible doses to members of the public involved in activities within the site boundary.

B. An additional food product location (J) was added to the monitoring program during 1987. This location was utilized during 1987 for garden fruits and vegetables. Location J was added because of its proximity to the site and represents one location of several program locations that may be utilized for food product samples dependent upon sample availability.

C. The Nine Mile Point Nuclear Station Unit 2 inlet canal was added to the sampling program during 1987. The Unit 2 inlet canal removes cooling water from Lake Ontario. This location was added to the sampling program to be consistent with the sampling program at the other generating facilities and to assess any possible impact from the operation of the generating facilities in the immediate area of Lake Ontario. This sample is not required by the J.A. FitzPatrick Technical Specifications.

D. Three on-site (within the site boundary) air sampling stations were moved to former off-site air sampling locations. The three air sampling stations were D2 on-site (moved 1-14-87), E on-site (moved 1-14-87), and F on-site (moved 1-15-87). These stations were moved to previous air sampling locations--D2 off-site, E off-site, and F off-site which were utilized prior to 1985. None of the on-site or off-site locations are required by the Technical Specifications. The on-site locations were moved because of the importance of locating monitoring stations between the site and populated areas. The D2 off-site location is in line with Mexico, New York; the E off-site location is in line with Phoenix, New York; and the F off-site location is in line with Fulton, New York. The three on-site locations were not considered as critical as the off-site locations when considering the fact that air monitoring stations are already located at the site boundary in critical downwind areas.

4. EXCEPTIONS TO THE 1987 SAMPLE PROGRAM

Exceptions to he 1987 sample program concern those sampling or monitoring requirements which are required by the JAF Technical Specifications.

A. Air radioiodine and air particulate monitoring required by Technical Specifications.

1. Environmental air sample equipment at R-3 off-site air sampling station was inoperable from 4/14/87 (1550 hours) to 4/16/87 (0919 hours). The vacuum pump was found defective and was replaced.

2. Environmental air sample equipment at R-5 off-site air sampling station was inoperable from 6/23/87 (1057 hours) to 6/23/87 (1329 hours). The vacuum pump was found defective and was replaced.

3. Environmental air sample equipment at R-5 off-site air sampling location was inoperable from 6/27/87 (2250 hours) to 6/30/87 (1504 hours). The vacuum pump was blown. The pump was replaced.

4. Environmental air sample equipment at R-2 off-site air sampling location was inoperable from 9/4/87 (0550 hours) to 9/4/87 (0855 hours). The vacuum pump was found defective and was replaced.

5. Environmental air sample equipment at R-4 off-site air monitoring station was inoperable from 9/10/87 (2000 hours) to 9/11/87 (1340 hours). The vacuum pump was found defective and was replaced.

6. Environmental air sample equipment at R-5 off-site air monitoring station was inoperable from 10/31/87 (1530 hours) to 11/3/87 (1056 hours). The vacuum pump was found defective and was replaced.

7. Environmental air sample equipment at R-1 and R-2 off-site air monitoring stations was inoperable from 11/6/87 (2045 hours) to 11/7/87 (0510 hours). The vacuum pumps in both of these monitoring stations were inoperable due to an off-site power loss. All monitoring equipment was operable once off-site power was restored.

Other occurrences of downtime for optional air sampling stations were documented for 1987. These occurrences are not noted in this report because the optional air sampling stations are not required by Technical Specifications. Documentation includes downtime for air sampling equipment as well as environmental radiation monitoring equipment.

B. Deviations from the Interlaboratory Comparison Program

Section 6.3 of the J.A. FitzPatrick N.P.P. Technical Specifications requires the site to conduct an Interlaboratory Comparison Program utilizing QC samples from the Environmental Protection Agency (EPA). This section also requires that deviations from the sample schedules be reported in the Annual Radiological Environmental Operating Report. The sample schedule is set by the EPA and includes media for which environmental samples are routinely collected and for which interlaboratory comparison samples are available from the EPA.

During 1987, sample media offered by the EPA for the Interlaboratory Comparison Program, and for which environmental samples are routinely collected and analyzed, were obtained and analyzed. The amount of samples obtained from the EPA program was based on the maximum amount available per participant or on a ten percent or better level (percent of the ratio of EPA samples to the total required sample volume).

A review of the 1987 results showed that one EPA sample, which was scheduled during October, was not received. This sample was a spiked milk sample. Since the sample was not received, it could not be analyzed. Subsequent investigation of the missing spike sample and written correspondence from EPA showed that the sample was never sent by the EPA to the program participants.

TABLE I

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
AIRBORNE			
Radioiodine and Particulates	Samples from 5 locations: a. 3 samples from offsite locations in different sectors of the highest calculated site average D/Q (based on all licensed site reactors). b. 1 sample from the vicinity of a community having the highest calculated site average D/Q (based on all licensed site reactors). c. 1 sample from a control location 9 to 20 miles distant and in the least prevalent wind direction[d].	Continuous sample operation with sample collection weekly or as required by dust loading, whichever is more frequent.	Radioiodine Canisters: Analyze weekly for I-131. Particulate Samples: Gross beta radioactivity[b] following filter change composite (by location) for gamma isotopic quarterly (as a minimum).
Direct Radiation[e]	32 stations with two or more dosimeters placed as follows: An inner ring of stations in the general area of th site boundary and an outer ring in the 4 to 5 mile range from the site with a station in each of the land based sectors of each ring. There are 16 land based sectors in the inner ring, and 8 land based sectors in the outer ring. The balance of the stations (8) are placed in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	Quarterly	Gamma dose monthly or quarterly.

TABLE I (CONTINUED)

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
WATERBORNE			
Surface[f]	a. 1 sample upstream. b. 1 sample from the site's most downstream cooling water intake[d].	Composite sample over one month period[g].	Gamma isotopic analysis monthly. Composite for Tritium analysis quarterly[c].
Sediment from Shoreline	1 sample from a downstream area with existing or potential recreational value.	Twice per year.	Gamma isotopic analysis semiannually[c].
INGESTION			
Milk	a. Samples from milch animals in 3 locations within 3.5 miles distant having the highest calculated site average D/Q. If there are none, then 1 sample from milch animals in each of 3 areas 3.5 to 5.0 miles distant having the highest calculated site average D/Q (based on all licensed site reactors)[h]. b. 1 sample from milch animals at a control location (9 to 20 miles distant and in a less prevalent wind direction)[d].	Twice per month, April through December (samples will be collected in January through March if I-131 is detected in November and December of the preceding year).	Gamma isotopic and I-131 analysis twice per month when milch animals are on pasture (April through December); monthly (January through March), if required[c].

TABLE I (CONTINUED)

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
Fish	a. 1 sample of each of 2 commercially or recreationally important species in the vicinity of a site discharge point.	Twice per year.	Gamma isotopic[c] analysis of edible portions.
	b. 1 sample of each of 2 species (same as in a. above or of a species with similar feeding habits) from an area at least 5 miles distant from the site[d].		
Food Products	a. Samples of 3 different kinds of broad leaf vegetation (edible or inedible) grown nearest each of two different off-site locations of highest calculated annual average ground level D/Q if milk sampling is not performed (based on all licensed site reactors).	Monthly when available (May through October).	Gamma isotopic[c] analysis. (Isotopic to include I-131.)
	b. 1 sample of each of the similar broad leaf vegetation grown 9-20 miles distant in the least prevalent wind direction in milk sampling is not performed.	Monthly when available (May through October).	Gamma isotopic[c] analysis. (Isotopic to include I-131.)
	c. In lieu of the garden census as specified in 6.2 of the RETS, samples of at least 3 different kinds of broad leaf vegetation (edible or inedible) may be performed at the site boundary in each of 2 different direction sectors with the highest calculated D/Qs. 1 sample each of 3 similar broad leaf varieties of vegetation grown 9-20 miles distant in the least prevalent wind direction sector[d].	Once, during harvest season.	Gamma isotopic[c] analysis. (Isotopic to include I-131.)

NOTES FOR TABLE I

(a) It is recognized that, at times, it may not be possible or practical to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question. Actual locations (distance and directions) from the site shall be provided in the Annual Radiological Environmental Operating Report. Calculated site averaged D/Q values and meteorological parameters are based on historical data (specified in the ODCM) for all licensed site reactors.

(b) Particulate sample filters should be analyzed for gross beta 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air is greater than 10 times a historical yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(c) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the plant.

(d) The purpose of these samples is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites which provide valid background data may be substituted.

(e) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purpose of this table, a thermoluminescent dosimeter may be considered to be one phosphor and two or more phosphors in a pocket may be considered as two or more dosimeters. Film badges shall not be used for measuring direct radiation.

(f) The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream sample" shall be taken in an area beyond, but near, the mixing zone, if practical.

(g) Composite samples should be collected with equipment (or equivalent) which is capable of collecting an aliquoit at time intervals which are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure that a representative sample is obtained.

(h) A milk sampling location, as required in Table 6.1-1 of the RETS, or Table I of this report, is defined as a location having at least 10 milking cows present at a designated milk sample location. It has been found from past experience, and as a result of conferring with local farmers, that a minimum of 10 milking cows is necessary to guarantee an adequate supply of milk twice per month for analytical purposes. Locations with less than 10 milking cows are usually utilized for breeding purposes which eliminates a stable supply of milk for samples as a result of suckling calves and periods when the adult animals are dry. In the event that 3 milk sample locations cannot meet the requirement for 10 milking cows, then a sample location having less than 10 milking cows can be used if an adequate supply of milk can reasonably and reliably be obtained based on communications with the farmer.

III SAMPLE SUMMARIES

All sample data is summarized in table form. The tables are titled "Radiological Monitoring Program Annual Summary" and use the following format:

A. Sample medium.

B. Type and number of analyses performed.

C. LLD (Lower Limits of Detection). This wording indicates that inclusive data is based on 4.66 sigma of background.

D. The mean and range of the positive measured values of the indicator locations.

E. The mean, range, and location of the highest indicator annual mean.

F. The mean and range of the positive measured values of the control locations.

G. The number of nonroutine reports sent to the Nuclear Regulatory Commission.

NOTE: Only positive measured values are used in statistical calculations. The use of LLD's in these calculations would result in means being biased high.

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1987*

Medium (Units)	Type and Number of Analyses	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Shoreline Sediment (pCi/g-dry)	GSA (4)					
	Cs-134	0.15	<LLD	<LLD	<LLD	0
	Cs-137	0.18	<LLD	<LLD	<LLD	0
Fish (pCi/g-wet)	GSA (24)					
	Mn-54	0.13	<LLD	<LLD	<LLD	0
	Fe-59	0.26	<LLD	<LLD	<LLD	0
	C0-58	0.13	<LLD	<LLD	<LLD	0
	Co-60	0.13	<LLD	<LLD	<LLD	0
	Zn-65	0.26	<LLD	<LLD	<LLD	0
	Cs-134	0.13	<LLD	<LLD	<LLD	0
	Cs-137	0.15	0.034 (11/17) 0.024-0.063	NMP 0.035 (7/10) 0.3@315° 0.024-0.063	0.031 (7/7) 0.017-0.040	0
Food Products (pCi/g-wet) Inedible Vegetation	GSA (9)					
	I-131	0.06	<LLD	<LLD	<LLD	0
	Cs-134	0.06	<LLD	<LLD	<LLD	0
	Cs-137	0.08	<LLD	<LLD	<LLD	0

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OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1987*

	Type and Number of Analyses	LLD	Indicator Locations: Mean (a) / Range	Location (b) of Highest Annual Mean: Location &	Mean (a) / Range	Control Location: Mean (a) / Range	Number of Nonroutine Reports
Surface (Lake) Water (pCi/liter)	H-3 (8)	3000	323 (4/4) / 160-410	JAF 0.5@70°	323 (4/4) / 160-410	210 (4/4) / 140-270	0
	GSA (24)						
	Mn-54	15	<LLD		<LLD	<LLD	0
	Fe-59	30	<LLD		<LLD	<LLD	0
	Co-58	15	<LLD		<LLD	<LLD	0
	Co-60	15	<LLD		<LLD	<LLD	0
	Zn-65	[illegible]	<LLD		<LLD	<LLD	0
	Zr-95	15	<LLD		<LLD	<LLD	0
	Nb-95	15	<LLD		<LLD	<LLD	0
	I-131	15(g)	<LLD		<LLD	<LLD	0
	Cs-134	15	<LLD		<LLD	<LLD	0
	Cs-137	18	<LLD		<LLD	<LLD	0
	Ba/La-140	15	<LLD		<LLD	<LLD	0

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OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1987*

Medium (units)	Type and Number of Analyses	LLD	Indicator Locations: Mean (a) / Range	Location (b) of Highest Annual Mean: Location	Location (b) of Highest Annual Mean: Mean (a) / Range	Control Location: Mean (a) / Range	Number of Nonroutine Reports
Air Particulates and Radioiodine (d) (pCi/m^3)	G.B.(260)	0.01	0.021 (208/208) 0.009-0.040	R2 1.1@104°	0.021 (52/52) 0.009-0.037	0.021 (52/52) 0.009-0.037	0
	I-131(260)	0.07	0.014 (2/208) 0.011-0.018	R2 1.1@104°	0.018 (1/52) 0.018	<LLD	0
	GSA(60):						
	Cs-134	0.05	<LLD		<LLD	<LLD	0
	Cs-137	0.06	<LLD		<LLD	<LLD	0
	Ru-103	N/A	<LLD		<LLD	<LLD	0
	Ru-106	N/A	<LLD		<LLD	<LLD	0
	I-131(h)	N/A	<LLD		<LLD	<LLD	0
TLD (mrem per standard month)	Gamma(144) Dose	N/A	5.6 (136/136)(c) 3.5-14.3	#85 0.2@294°	12.9 (4/4)(e) 12.1-14.3	5.2 (8/8) 4.6-5.8	0

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OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1987*

Medium (units)	Type and Number of Analyses	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Location & Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Milk (pCi/liter)	GSA (126)					
	Cs-134	15	(f)	(f)	<LLD	0
	Cs-137	18	6.8 (2/108) 5.5-8.1	#55 3.1 (1/18) 9.0@95° 8.1	<LLD	0
	Ba/La-140	15	(f)	(f)	<LLD	0
	I-131(126)	1	(f)	(f)	<LLD	0

ANNUAL SUMMARY TABLE NOTES

* = Data for the Annual Summary Tables is based on RETS required samples only.

N/A = Not applicable.

(a) = Fraction of detectable measurement to total measurement.

(b) = Location is distance in miles, and direction in compass degrees.

(c) = Indicator TLD locations are: #7, 23, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 8, 15, 18, 56, and 58 Control TLD's are all TLD's located beyond the influence of the site (#14, 49).

(d) = Indicator samples from environmental stations R1 offsite, R2 offsite, R3 offsite, and R4 offsite. Control samples are samples from R5 offsite environmental station.

(e) = This dose is not representative of doses to a member of the public since this area is located near the north shoreline which is in close proximity to the generating facility and is not accessible to members of the public (see Section V.4-TLD's).

(f) = The RETS criteria for indicator milk sample locations includes locations within 5.0 miles of the site. There are no milk sample locations within 5.0 miles of the site. Therefore, the only sample location required by the RETS is the control location.

(g) = The RETS do not specify a particular LLD value for surface water analysis (non-drinking water) for I-131. A value of 15 pCi/liter is used here and represents the most recent guidance from the NRC.

(h) = Data for particulate I-131.

(i) = Cs-137 values are a result of the 1986 Chernobyl Nuclear Plant accident.

IV ANALYTICAL RESULTS

Environmental Sample Data

Environmental sample data is summarized by tables. Tables are provided for select sample media and contain data based on actual values obtained over the year. These values are comprised of both positive values and LLD values where applicable.

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

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

$$LLD = \frac{4.66\ s_b}{E\ .\ V\ .\ 2.22\ .\ Y\ .\ \exp(-\lambda\Delta t)}$$

Where:

LLD is the a priori lower limit of detection, as defined above (in picocurie per unit mass or volume);

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (in counts per minute);

E is the counting efficiency (in counts per transformation);

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

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

Δ is the elapsed time between sample collection (or end of the sample collection period) and time of counting.

Typical values of E, V, Y, and Δt should be used in the calculations.

TABLE 1

CONCENTRATIONS OF GAMMA EMITTERS IN SHORELINE SEDIMENT SAMPLES
Results in Units of pCi/g (dry) ± 2 Sigma

COLLECTION SITE*	COLLECTION DATE	GAMMA EMITTERS K-40	Co-60	Cs-134	Cs-137	Ra-226	OTHERS
Sunset Beach (05)	04/24/87	15.7±1.15	<0.05	<0.04	<0.05	2.16±0.58	AcTh-228 0.93+0.17 All Others <LLD
	10/23/87	15.4±1.02	<0.04	<0.04	<0.04	1.84±0.60	AcTh-228 0.83+0.16 All Others <LLD
Lang's Beach (06, CONTROL)	04/24/87	14.7±1.16	<0.05	<0.04	<0.05	1.11±0.49	AcTh-228 0.67+0.15 All Others <LLD
	10/23/87	8.10±0.59	<0.01	<0.02	<0.02	0.76±0.27	AcTh-228 0.21+0.07 All Others <LLD

*Corresponds to sample locations noted on Figure 1A, Section VII.

TABLE 2

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES
Results in Units of pCi/g (wet) ± 2 sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS
					FITZPATRICK					
06/02/87	Lake Trout #1	3.04±0.42	<0.024	<0.032	<0.076	<0.024	<0.051	<0.023	0.032±0.015	<LLD
06/02/87	Lake Trout #2	3.85±0.40	<0.022	<0.028	<0.076	<0.023	<0.050	<0.022	<0.025	<LLD
06/05/87	Brown Trout	3.67±0.44	<0.021	<0.028	<0.081	<0.021	<0.056	<0.022	0.032±0.014	<LLD
10/14/87	Lake Trout #1	2.48±0.39	<0.020	<0.028	<0.081	<0.026	<0.055	<0.020	0.030±0.013	<LLD
10/14/87	Lake Trout #2	4.14±0.42	<0.021	<0.029	<0.078	<0.018	<0.054	<0.023	0.026±0.012	<LLD
10/20/87	White Sucker	3.03±0.34	<0.017	<0.024	<0.064	<0.020	<0.040	<0.018	<0.019	<LLD
10/07/87	Walleye	6.19±0.58	<0.038	<0.053	<0.114	<0.041	<0.089	<0.043	<0.043	<LLD
					NINE MILE POINT					
06/02/87	Lake Trout #1	1.95±0.28	<0.017	<0.022	<0.063	<0.018	<0.038	<0.016	0.026±0.010	<LLD
06/02/87	Lake Trout #2	3.80±0.42	<0.023	<0.026	<0.082	<0.022	<0.053	<0.022	<0.027	<LLD
07/02/87	Brown Trout	3.69±0.44	<0.019	<0.024	<0.050	<0.020	<0.045	<0.021	0.036±0.016	<LLD
07/02/87	Sm. Mouth Bass	3.18±0.52	<0.018	<0.023	<0.047	<0.021	<0.054	<0.019	0.026±0.014	<LLD
10/14/87	Lake Trout #1	3.08±0.34	<0.018	<0.019	<0.050	<0.022	<0.039	<0.017	0.032±0.013	<LLD
10/14/87	Lake Trout #2	2.90±0.42	<0.023	<0.027	<0.064	<0.023	<0.052	<0.021	0.024±0.012	<LLD
11/04/87	Salmon (Chinook)	4.04±0.60	<0.029	<0.033	<0.079	<0.034	<0.074	<0.031	0.063±0.021	<LLD
10/07/87	Sm. Mouth Bass	4.07±0.45	<0.025	<0.030	<0.093	<0.019	<0.057	<0.022	0.036±0.014	<LLD
10/07/87	Walleye	4.24±0.48	<0.022	<0.032	<0.094	<0.024	<0.058	<0.026	<0.030	<LLD
10/07/87	White Sucker	4.64±0.41	<0.021	<0.028	<0.075	<0.021	<0.047	<0.019	<0.024	<LLD

TABLE 2 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES
Results in Units of pCi/g (wet) ± 2 sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS
					<u>OSWEGO HARBOR</u> (CONTROL)					
06/25/87	Lake Trout #1	3.62±0.44	<0.026	<0.029	<0.066	<0.021	<0.054	<0.025	0.022±0.015	<LLD
06/25/87	Lake Trout #2	3.87±0.42	<0.023	<0.026	<0.057	<0.024	<0.042	<0.020	0.017±0.010	<LLD
06/05/87	Brown Trout	4.02±0.45	<0.024	<0.032	<0.075	<0.026	<0.065	<0.024	0.039±0.015	<LLD
10/06/87	Lake Trout #1	4.28±0.47	<0.025	<0.036	<0.100	<0.025	<0.062	<0.025	0.040±0.019	<LLD
10/06/87	Lake Trout #2	4.05±0.38	<0.019	<0.030	<0.065	<0.018	<0.048	<0.020	0.034±0.011	<LLD
11/05/87	Salmon (Chinook)	4.13±0.36	<0.018	<0.021	<0.043	<0.021	<0.041	<0.017	0.037±0.011	<LLD
10/20/87	Walleye	3.19±0.45	<0.023	<0.025	<0.074	<0.028	<0.054	<0.020	0.030±0.014	<LLD

TABLE 3

CONCENTRATIONS OF TRITIUM IN SURFACE WATER
(QUARTERLY COMPOSITE SAMPLES)
Results in Units of pCi/l ± 2 sigma

STATION CODE	PERIOD	DATE	TRITIUM
FITZPATRICK* (03, INLET)	First Quarter	01/02/87 to 03/31/87	160±80
	Second Quarter	03/31/87 to 07/01/87	350±100
	Third Quarter	07/01/87 to 09/30/87	410±80
	Fourth Quarter	09/30/87 to 12/30/87	370±60
OSWEGO STEAM* STATION (08, CONTROL)	First Quarter	12/31/86 to 03/31/87	170±90
	Second Quarter	03/31/87 to 06/30/87	260±90
	Third Quarter	06/30/87 to 09/30/87	270±90
	Fourth Quarter	09/30/87 to 01/04/88	140±90

* Samples required by the Technical Specifications.

TABLE 3 (Continued)

CONCENTRATIONS OF TRITIUM IN SURFACE WATER
(QUARTERLY COMPOSITE SAMPLES)
Results in Units of pCi/l ± 2 sigma

STATION CODE	PERIOD	DATE	TRITIUM
NINE MILE POINT UNIT 1** (09, INLET)	First Quarter	12/31/86 to 03/31/87	<170
	Second Quarter	03/31/87 to 06/30/87	210±70
	Third Quarter	06/30/87 to 09/30/87	390±100
	Fourth Quarter	09/30/87 to 01/04/88	250±100
NINE MILE POINT UNIT 2** (11, INLET)	First Quarter	12/31/86 to 03/31/87	300±110
	Second Quarter	03/31/87 to 06/30/87	310±70
	Third Quarter	06/30/87 to 09/30/87	300±70
	Fourth Quarter	09/30/87 to 01/04/88	260±80
OSWEGO CITY** WATER (10)	First Quarter	12/31/86 to 03/31/87	210±70
	Second Quarter	03/31/87 to 06/30/87	310±100
	Third Quarter	06/30/87 to 09/30/87	260±80
	Fourth Quarter	09/30/87 to 01/04/88	320±80

** Optional samples. Oswego City Water samples are composites of twice per week grab samples.

TABLE 4

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l $\pm$ 2 Sigma

Station Code*	Nuclide	January	February	March	April	May	June
OSWEGO STEAM STATION (08, CONTROL)	Ra-226	112+61.9	<107	<103	<113	127+75.0	75.7+49.0
	I-131	<0.25	<0.37	<0.31	<0.30	<0.36	<0.26
	Cs-134	<4.49	<4.11	<3.78	<3.57	<4.71	<4.24
	Cs-137	<4.64	<3.65	<4.76	<4.47	<4.63	<3.94
	Zr-95	<12.2	<8.88	<10.3	<10.7	<11.7	<12.5
	Nb-95	<6.15	<3.83	<5.64	<5.04	<5.29	<5.86
	Co-58	<5.23	<5.07	<4.51	<4.59	<4.65	<4.12
	Mn-54	<5.19	<4.25	<4.88	<4.88	<4.77	<4.38
	Fe-59	<11.8	<8.68	<9.00	<8.88	<13.0	<8.51
	Zn-65	<8.64	<7.99	<8.97	<8.96	<10.2	<8.09
	Co-60	<4.18	<5.73	<6.39	<4.74	<4.63	<4.44
	K-40	267+59.7	<54.1	<53.2	<70.2	115+44.8	49.3+31.5
	Ba/La-140	<13.0	<7.46	<14.1	<11.3	<8.99	<12.5
FITZPATRICK (03, INLET)	Ra-226	130+53.8	<112	127+61.6	<118	101+47.3	107+68.6
	I-131	<0.29	<0.33	<0.33	<0.20	<0.47	<0.27
	Cs-134	<3.72	<5.23	<4.75	<4.33	<4.41	<3.84
	Cs-137	<3.56	<4.69	<4.94	<4.69	<4.98	<4.98
	Zr-95	<9.31	<10.7	<13.6	<12.1	<10.2	<10.6
	Nb-95	<4.77	<4.60	<5.89	<6.71	<6.43	<5.65
	Co-58	<3.90	<6.12	<5.13	<4.67	<4.06	<4.14
	Mn-54	<3.75	<5.79	<4.69	<4.37	<4.90	<5.46
	Fe-59	<8.14	<11.6	<10.2	<12.9	<11.1	<10.1
	Zn-65	<3.42	<7.41	<10.6	<11.3	<9.91	<10.3
	Co-60	<3.13	<6.06	<4.50	<5.15	<5.14	<5.52
	K-40	236+43.0	<63.8	272+54.3	33.4+31.7	<63.9	76.8+44.6
	Ba/La-140	<6.48	<10.3	<10.7	<8.75	<11.0	<10.7

* Corresponds to sample locations listed on Figure IA, Section VII.

TABLE 4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l ± 2 Sigma

Station Code*	Nuclide	July	August	September	October	November	December
OSWEGO STEAM STATION (08, CONTROL)	Ra-226	97.0+44.2	86.7+39.4	106+78.6	83.4+48.4	<103	<84.4
	I-131	<0.28	<0.28	<0.25	<0.29	<0.25	<0.46
	Cs-134	<2.96	<3.35	<4.50	<3.82	<3.54	<2.53
	Cs-137	<3.40	<3.54	<4.10	<5.01	<3.69	<3.31
	Zr-95	<8.29	<7.81	<12.7	<12.2	<10.10	<9.03
	Nb-95	<4.04	<4.28	<5.27	<6.50	<4.55	<3.66
	Co-58	<3.46	<3.46	<5.64	<5.08	<3.79	<3.57
	Mn-54	<3.23	<3.47	<4.34	<4.25	<3.66	<3.02
	Fe-59	<7.33	<7.70	<12.3	<9.43	<7.23	<7.72
	Zn-65	<6.54	<6.35	<10.1	<8.20	<6.45	<6.08
	Co-60	<3.17	<2.71	<4.47	<3.95	<3.51	<2.80
	K-40	223+42.8	206+36.0	259+59.4	230+50.8	210+40	99.7+33.1
	Ba/La-140	<6.03	<7.28	<9.25	<8.33	<8.5	<8.64
FITZPATRICK (03, INLET)	Ra-226	117+47.1	110+46.3	54.1+38.1	109+56.1	113+40.8	<112
	I-131	<0.32	<0.28	<0.35	<0.32	<0.32	<0.44
	Cs-134	<3.60	<3.06	<3.22	<4.28	<3.45	<4.54
	Cs-137	<3.50	<3.29	<3.40	<4.10	<3.45	<4.69
	Zr-95	<9.63	<8.08	<8.12	<11.5	<9.10	<10.9
	Nb-95	<5.21	<3.92	<3.67	<5.26	<4.69	<5.34
	Co-58	<3.96	<3.63	<3.62	<4.81	<4.03	<4.79
	Mn-54	<4.00	<3.17	<3.29	<3.88	<3.66	<4.26
	Fe-59	<9.92	<6.28	<6.78	<10.9	<9.41	<9.68
	Zn-65	<8.41	<7.08	<7.41	<8.03	<7.16	<10.4
	Co-60	<3.49	<3.28	<3.04	<4.06	<3.23	<4.34
	K-40	233+46.1	253+39.3	263+45.0	258+56.7	196+36.6	53.5+43.4
	Ba/La-140	<8.42	<5.35	<6.47	<8.58	<8.17	<14.0

*Corresponds to sample locations listed on Figure 1A, Section VII.

TABLE 4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l ± 2 Sigma

Station Code*	Nuclide	January	February	March	April	May	June
NINE MILE POINT UNIT 1** (09, INLET)	Ra-226	137+58.3	98.2+42.9	<107	<117	<119	117+48.2
	I-131	<11.5	<12.9	<15.8	<13.0	<14.1	<13.8
	Cs-134	<3.37	<4.34	<4.41	<4.99	<4.65	<3.91
	Cs-137	<3.50	<4.47	<4.77	<4.55	<4.91	<4.46
	Zr-95	<10.0	<12.9	<11.4	<12.9	<10.6	<11.7
	Nb-95	<4.29	<5.67	<5.88	<7.11	<6.62	<3.07
	Co-58	<3.85	<5.00	<5.15	<5.12	<6.03	<4.74
	Mn-54	<3.48	<4.58	<4.08	<5.23	<4.73	<4.82
	Fe-59	<8.20	<11.8	<9.94	<11.8	<12.6	<10.7
	Zn-65	<6.96	<9.59	<9.67	<9.91	<12.7	<8.61
	Co-60	<2.69	<4.52	<4.52	<5.15	<5.52	<5.88
	K-40	212+42.2	<60.2	<45.6	<70.2	53.9+37.9	<60.1
	Ba/La-140	<7.04	<10.8	<10.9	<15.3	<11.2	<12.2
NINE MILE POINT UNIT 2** (11, INLET)	Ra-226	142+67.7	<112	<124	<104	174+70.3	100+50.8
	I-131	<13.1	<12.3	<15.5	<12.7	<14.8	<14.9
	Cs-134	<3.56	<3.76	<4.90	<3.72	<4.60	<4.48
	Cs-137	<3.47	<3.59	<4.81	<3.46	<4.94	<5.00
	Zr-95	<9.91	<9.99	<12.0	<9.60	<11.9	<12.7
	Nb-95	<4.39	<4.41	<5.95	<5.30	<5.31	<5.68
	Co-58	<4.04	<5.32	<5.50	<5.57	<4.76	<5.11
	Mn-54	<3.50	<3.42	<5.13	<3.99	<4.30	<4.35
	Fe-59	<8.53	<8.80	<11.1	<10.1	<11.1	<11.3
	Zn-65	<7.48	<9.90	<10.9	<9.54	<11.4	<8.93
	Co-60	<3.35	<4.94	<4.34	<4.28	<4.79	<3.64
	K-40	252+46.0	<64.2	143+46.3	<47.9	245+50.7	292+58.5
	Ba/La-140	<8.86	<8.30	<12.0	<8.19	<11.4	<8.56

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specifications.

TABLE 4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l ± 2 Sigma

Station Code*	Nuclide	July	August	September	October	November	December
NINE MILE	Ra-226	88.5+38.8	<116	<118	<115	<126	<85.4
POINT	I-131	<13.0	<13.1	<14.5	<16.8	<13.9	<11.4
UNIT 1**	Cs-134	<2.91	<4.04	<4.78	<4.43	<4.04	<2.86
(09, INLET)	Cs-137	<3.16	<5.06	<4.69	<4.61	<4.41	<2.90
	Zr-95	<8.50	<12.7	<11.1	<13.7	<12.1	<7.62
	Nb-95	<4.62	<5.53	<7.01	<5.23	<6.37	<3.94
	Co-58	<3.23	<4.94	<6.16	<4.26	<5.15	<3.68
	Mn-54	<3.28	<5.37	<4.69	<5.02	<3.31	<2.88
	Fe-59	<7.58	<10.5	<9.32	<11.9	<11.6	<8.52
	Zn-65	<5.90	<10.4	<8.73	<8.42	<10.3	<6.97
	Co-60	<3.04	<3.54	<5.78	<5.61	<4.06	<3.07
	K-40	227+39.3	<67.2	<54.0	<63.0	174+42.5	63.4+24.6
	Ba/La-140	<8.60	<10.5	<9.60	<12.6	<10.3	<8.76
NINE MILE	Ra-226	88.9+41.2	50.0+40.0	<100	70.1+46.2	<126	75.5+38.0
POINT	I-131	<10.4	<9.51	<14.4	<14.2	<14.3	<14.6
UNIT 2**	Cs-134	<2.37	<3.2[illegible]	<4.14	<3.46	<4.11	<3.44
(11, INLET)	Cs-137	<2.48	<3.11	<4.41	<3.59	<4.41	<3.30
	Zr-95	<6.17	<6.65	<11.2	<9.86	<10.1	<9.57
	Nb-95	<3.41	<4.40	<5.43	<4.97	<5.90	<4.38
	Co-58	<2.86	<4.08	<4.47	<3.29	<4.88	<4.01
	Mn-54	<2.62	<2.99	<3.81	<3.62	<4.05	<3.21
	Fe-59	<6.16	<8.72	<9.36	<7.91	<11.3	<8.16
	Zn-65	<5.32	<7.26	<9.00	<7.30	<9.45	<7.42
	Co-60	<2.55	<3.61	<4.26	<3.73	<3.84	<3.30
	K-40	31.8+16.3	51.9+22.9	<50.5	224+42.6	177+46.0	250+42.7
	Ba/La-140	<7.16	<7.02	<11.0	<8.00	<11.0	<9.62

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specifications.

TABLE 4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l ± 2 Sigma

Station Code*	Nuclide	January	February	March	April	May	June
OSWEGO CITY	Ra-226	101+53.5	<114	111+65.1	86.0+42.8	153+59.8	<85.0
WATER**	I-131	<16.1	<12.7	<14.6	<13.1	<16.0	<16.8
(10)	Cs-134	<4.62	<4.73	<4.23	<4.28	<4.57	<3.05
	Cs-137	<5.08	<5.25	<4.23	<4.91	<4.03	<3.07
	Zr-95	<12.4	<12.7	<11.5	<12.0	<12.7	<10.1
	Nb-95	<5.75	<6.33	<6.14	<5.56	<6.33	<5.03
	Co-58	<5.39	<5.53	<4.77	<5.06	<5.13	<4.34
	Mn-54	<5.04	<5.05	<3.95	<4.59	<4.41	<3.38
	Fe-59	<11.3	<10.6	<10.6	<10.0	<12.8	<8.37
	Zn-65	<8.17	<10.2	<12.2	<9.94	<9.27	<6.68
	Co-60	<4.18	<5.72	<5.72	<6.06	<4.21	<4.16
	K-40	292+60.9	<54.2	<49.6	<60.3	227+52.5	85.1+41.7
	Ba/La-140	<10.6	<14.1	<5.60	<12.6	<11.2	<9.42

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specifications.

TABLE 4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1987
Results in Units of pCi/l ± 2 Sigma

Station Code*	Nuclide	July	August	September	October	November	December
OSWEGO CITY	Ra-226	88.3+25.8	99.9+74.1	108+47.8	119+51.7	76.9+39.6	<74 3
WATER**	I-131	<7.73	<13.1	<11.7	<10.6	<9.52	<11.5
(10)	Cs-134	<1.51	<3.92	<3.24	<3.62	<3.27	<3.42
	Cs-137	<1.57	<4.22	<3.33	<3.59	<3.28	<2.69
	Zr-95	<4.36	<11.1	<8.43	<9.49	<7.29	<9.23
	Nb-95	<2.20	<5.37	<3.81	<4.41	<4.23	<3.96
	Co-58	<1.79	<4.79	<3.26	<4.16	<3.40	<3.79
	Mn-54	<1.55	<4.49	<3.05	<3.13	<3.36	<3.18
	Fe-59	<4.01	<10.4	<6.44	<7.83	<6.90	<7.39
	Zn-65	<3.19	<8.53	<7.20	<5.74	<4.97	<6.87
	Co-60	<1.57	<3.84	<2.78	<3.04	<3.61	<3.72
	K-40	250+21.1	195+42.3	257+44.6	233+44.3	<45.6	<40.3
	Ba/La-140	<4.50	<9.70	<7.60	<7.62	<6.54	<8.40

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specifications.

TABLE 5

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 2 Sigma

WEEK END DATE	LOCATION R1	R2	R3	R4	R5
87/01/06	0.020±0.003	0.025±0.003	0.020±0.003	0.018±0.003	0.023±0.003
87/01/13	0.020±0.003	0.018±0.003	0.023±0.003	0.015±0.003	0.019±0.003
87/01/20	0.022±0.003	0.025±0.003	0.024±0.003	0.023±0.003	0.025±0.003
87/01/27	0.020±0.003	0.024±0.003	0.019±0.003	0.024±0.003	0.014±0.003
87/02/03	0.032±0.004	0.030±0.004	0.030±0.004	0.027±0.004	0.033±0.004
87/02/10	0.024±0.003	0.021±0.003	0.022±0.003	0.023±0.003	0.025±0.003
87/02/17	0.025±0.003	0.027±0.003	0.027±0.003	0.025±0.003	0.026±0.003
87/02/24	0.018±0.003	0.020±0.003	0.022±0.003	0.021±0.003	0.022±0.003
87/03/03	0.009±0.002	0.011±0.003	0.010±0.002	0.012±0.003	0.013±0.003
87/03/10	0.025±0.003	0.023±0.003	0.026±0.003	0.028±0.003	0.028±0.003
87/03/17	0.028±0.004	0.028±0.004	0.029±0.004	0.028±0.004	0.029±0.004
87/03/24	0.020±0.003	0.019±0.003	0.018±0.003	0.015±0.003	0.012±0.002
87/03/31	0.019±0.003	0.020±0.003	0.017±0.003	0.019±0.003	0.018±0.003
87/04/07	0.013±0.003	0.013±0.003	0.010±0.002	0.012±0.002	0.014±0.003
87/04/14	0.021±0.003	0.022±0.003	0.021±0.003	0.022±0.003	0.024±0.003
87/04/21	0.016±0.003	0.015±0.003	0.014±0.003	0.015±0.003	0.016±0.003
87/04/28	0.016±0.003	0.015±0.003	0.018±0.003	0.014±0.003	0.017±0.003
87/05/05	0.020±0.003	0.018±0.003	0.020±0.003	0.021±0.003	0.022±0.003
87/05/12	0.030±0.003	0.028±0.003	0.029±0.003	0.028±0.003	0.029±0.003
87/05/19	0.015±0.003	0.016±0.003	0.018±0.003	0.016±0.003	0.019±0.003
87/05/26	0.013±0.002	0.011±0.002	0.014±0.003	0.013±0.002	0.015±0.003
87/06/02	0.034±0.004	0.036±0.004	0.035±0.004	0.035±0.004	0.034±0.004
87/06/09	0.022±0.003	0.022±0.003	0.021±0.003	0.020±0.003	0.019±0.003
87/06/16	0.027±0.003	0.027±0.003	0.023±0.003	0.026±0.003	0.022±0.003
87/06/23	0.018±0.003	0.020±0.003	0.019±0.003	0.019±0.003	0.019±0.003
87/06/30	0.026±0.003	0.025±0.003	0.030±0.003	0.026±0.003	0.028±0.006
87/07/07	0.017±0.004	0.015±0.004	0.017±0.004	0.015±0.004	0.015±0.005
87/07/14	0.026±0.003	0.028±0.003	0.025±0.003	0.025±0.003	0.028±0.004
87/07/22	0.019±0.003	0.017±0.002	0.019±0.003	0.016±0.002	0.019±0.003
87/07/28	0.025±0.003	0.029±0.004	0.026±0.003	0.028±0.004	0.031±0.004
87/08/04	0.020±0.003	0.018±0.003	0.017±0.003	0.020±0.003	0.014±0.003
87/08/11	0.019±0.003	0.020±0.003	0.018±0.003	0.019±0.003	0.022±0.003
87/08/18	0.026±0.003	0.023±0.003	0.024±0.003	0.024±0.003	0.025±0.003
87/08/25	0.016±0.003	0.018±0.003	0.021±0.003	0.019±0.003	0.017±0.003
87/09/01	0.016±0.002	0.016±0.003	0.017±0.003	0.017±0.003	0.014±0.002
87/09/08	0.017±0.003	0.017±0.003	0.020±0.003	0.016±0.003	0.018±0.003
87/09/15	0.017±0.003	0.018±0.003	0.020±0.003	0.016±0.003	0.016±0.003
87/09/22	0.011±0.002	0.012±0.002	0.011±0.002	0.014±0.003	0.012±0.002
87/09/29	0.022±0.003	0.022±0.003	0.022±0.003	0.024±0.003	0.023±0.003
87/10/06	0.021±0.003	0.022±0.003	0.022±0.003	0.018±0.003	0.019±0.003
87/10/13	0.020±0.003	0.023±0.003	0.020±0.003	0.020±0.003	0.019±0.003
87/10/20	0.040±0.004	0.037±0.004	0.036±0.004	0.039±0.004	0.037±0.004
87/10/27	0.024±0.003	0.026±0.003	0.026±0.003	0.027±0.003	0.023±0.003
87/11/03	0.022±0.003	0.023±0.003	0.021±0.003	0.024±0.003	0.017±0.004
87/11/10	0.028±0.003	0.032±0.003	0.029±0.003	0.028±0.003	0.026±0.003
87/11/17	0.026±0.003	0.027±0.003	0.024±0.003	0.027±0.003	0.027±0.003
87/11/24	0.018±0.003	0.017±0.003	0.016±0.003	0.015±0.003	0.020±0.003
87/12/01	0.015±0.002	0.016±0.002	0.015±0.002	0.015±0.002	0.012±0.002
87/12/08	0.011±0.002	0.009±0.002	0.010±0.002	0.009±0.002	0.009±0.002
87/12/15	0.019±0.002	0.017±0.002	0.016±0.002	0.016±0.002	0.017±0.002
87/12/22	0.016±0.002	0.015±0.002	0.015±0.002	0.016±0.002	0.014±0.002
87/12/29	0.023±0.003	0.023±0.003	0.023±0.003	0.024±0.003	0.023±0.003

TABLE 5
(Continued)
NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 2 Sigma

WEEK END DATE	LOCATION D2	E	F	G
87/01/06	0.026±0.004	0.027±0.003	0.027±0.003	0.028±0.004
87/01/13	0.022±0.004	0.022±0.003	0.020±0.003	0.019±0.003
87/01/20	0.018±0.003	0.020±0.003	0.019±0.003	0.027±0.004
87/01/27	0.020±0.003	0.021±0.003	0.025±0.003	0.019±0.003
87/02/03	0.025±0.004	0.027±0.003	0.029±0.003	0.026±0.004
87/02/10	0.022±0.003	0.018±0.003	0.020±0.003	0.025±0.003
87/02/17	0.021±0.003	0.025±0.003	0.022±0.003	0.025±0.003
87/02/24	0.020±0.003	0.022±0.003	0.024±0.003	0.022±0.003
87/03/03	0.012±0.003	0.010±0.002	0.010±0.002	0.011±0.003
87/03/10	0.024±0.003	0.025±0.003	0.027±0.003	0.023±0.003
87/03/17	0.025±0.004	0.026±0.003	0.030±0.004	0.028±0.004
87/03/24	0.013±0.003	0.013±0.002	0.015±0.003	0.014±0.003
87/03/31	0.017±0.003	0.019±0.003	0.021±0.003	0.021±0.003
87/04/07	0.012±0.003	0.013±0.003	0.013±0.002	0.014±0.003
87/04/14	0.015±0.003	0.021±0.003	0.021±0.003	0.022±0.003
87/04/21	0.011±0.002	0.016±0.003	0.015±0.003	0.014±0.003
87/04/28	0.013±0.003	0.016±0.003	0.020±0.003	0.012±0.003
87/05/05	0.024±0.003	0.021±0.003	0.023±0.003	0.021±0.003
87/05/12	0.026±0.003	0.026±0.003	0.030±0.004	0.028±0.004
87/05/19	0.016±0.003	0.014±0.002	0.016±0.003	0.019±0.003
87/05/26	0.014±0.002	0.015±0.003	0.012±0.002	0.015±0.003
87/06/02	0.037±0.004	0.032±0.004	0.031±0.003	0.034±0.004
87/06/09	0.021±0.003	0.020±0.003	0.019±0.003	0.020±0.003
87/06/16	0.027±0.003	0.026±0.003	0.024±0.003	0.023±0.003
87/06/23	0.020±0.003	0.019±0.003	0.021±0.003	0.022±0.003
87/06/30	0.025±0.003	0.028±0.003	0.026±0.003	0.029±0.003
87/07/07	0.016±0.004	0.012±0.004	0.014±0.004	0.016±0.004
87/07/14	0.026±0.003	0.027±0.003	0.026±0.003	0.026±0.003
87/07/22	0.018±0.002	0.019±0.003	0.018±0.002	0.022±0.003
87/07/28	0.027±0.003	0.027±0.003	0.030±0.004	0.029±0.004
87/08/04	0.018±0.003	0.019±0.003	0.022±0.003	0.020±0.003
87/08/11	0.019±0.003	0.019±0.003	0.019±0.003	0.019±0.003
87/08/18	0.027±0.003	0.025±0.003	0.022±0.003	0.022±0.003
87/08/25	0.023±0.003	0.021±0.003	0.021±0.003	0.020±0.003
87/09/01	0.020±0.003	0.017±0.003	0.015±0.002	0.015±0.002
87/09/08	0.015±0.002	0.013±0.002	0.016±0.002	0.016±0.003
87/09/15	0.018±0.003	0.020±0.003	0.020±0.003	0.016±0.003
87/09/22	0.010±0.002	0.011±0.002	0.010±0.002	0.012±0.002
87/09/29	0.024±0.003	0.021±0.003	0.024±0.003	0.022±0.003
87/10/06	0.019±0.003	0.020±0.003	0.018±0.003	0.020±0.003
87/10/13	0.021±0.003	0.020±0.003	0.017±0.003	0.022±0.003
87/10/20	0.041±0.004	0.034±0.003	0.035±0.004	0.037±0.004
87/10/27	0.026±0.003	0.028±0.003	0.024±0.003	0.028±0.003
87/11/03	0.022±0.003	0.018±0.003	0.021±0.003	0.022±0.003
87/11/10	0.029±0.003	0.028±0.003	0.026±0.003	0.028±0.003
87/11/17	0.026±0.003	0.027±0.003	0.026±0.003	0.028±0.003
87/11/24	0.018±0.003	0.016±0.003	0.018±0.003	0.019±0.003
87/12/01	0.014±0.002	0.015±0.002	0.016±0.002	0.013±0.002
87/12/08	0.010±0.002	0.009±0.002	0.009±0.002	0.008±0.002
87/12/15	0.015±0.002	0.016±0.002	0.016±0.002	0.014±0.002
87/12/22	0.015±0.002	0.015±0.002	0.013±0.002	0.014±0.002
87/12/29	0.023±0.002	0.020±0.002	0.022±0.002	0.022±0.002

TABLE 5

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 2 Sigma

WEEK END DATE	LOCATION D1	G	H	I	J	K
87/01/05	.023±.003	.025±.003	.025±.003	.024±.003	.024±.003	.024±.003
87/01/12	.020±.003	.021±.003	.020±.003	.021±.003	.016±.003	.021±.003
87/01/19	.022±.003	.024±.003	.020±.003	.019±.003	.020±.003	.019±.003
87/01/26	.020±.004	.018±.003	.021±.003	.020±.003	.022±.003	.023±.003
87/02/02	.029±.003	.031±.004	.029±.003	.029±.004	.022±.003	.036±.004
87/02/09	.022±.003	.020±.003	.023±.003	.025±.003	.022±.003	.024±.003
87/02/17	.024±.003	.026±.003	.026±.004	.057±.023	.026±.004	.030±.004
87/02/23	.017±.003	.020±.003	.020±.004	.023±.004	.020±.004	.027±.005
87/03/02	.013±.002	.011±.002	.011±.002	.012±.002	.010±.002	.015±.003
87/03/09	.025±.003	.027±.003	.022±.003	.025±.003	.021±.003	.028±.003
87/03/16	.027±.003	.032±.004	.024±.003	.025±.003	.031±.004	.025±.003
87/03/23	.020±.003	.022±.003	.017±.003	.017±.003	.016±.003	.017±.003
87/03/30	.020±.003	.017±.003	.018±.003	.018±.004	.018±.003	.017±.003
87/04/06	.012±.002	.013±.003	.014±.003	.019±.003	.015±.003	.013±.002
87/04/13	.019±.003	.019±.003	.018±.003	.017±.003	.018±.003	.015±.002
87/04/20	.020±.003	.019±.003	.019±.003	.019±.003	.019±.003	.018±.003
87/04/27	.017±.003	.016±.003	.013±.003	.017±.003	.017±.003	.019±.003
87/05/04	.023±.003	.019±.003	.021±.003	.022±.003	.023±.003	.024±.003
87/05/11	.026±.003	.025±.003	.026±.003	.028±.005	.022±.003	.024±.003
87/05/18	.023±.003	.022±.003	.017±.003	.022±.004	.019±.003	.021±.003
87/05/26	.013±.002	.012±.002	.013±.002	.011±.002	.014±.002	.011±.002
87/06/01	.031±.004	.024±.004	.012±.003	.027±.004	.031±.004	.030±.004
87/06/08	.025±.003	.020±.003	.023±.003	.021±.003	.022±.003	.023±.003
87/06/15	.027±.003	.023±.003	.008±.002	.023±.003	.016±.002	.022±.003
87/06/22	.023±.003	.023±.003	.023±.003	.023±.003	.023±.003	.018±.003
87/06/29	.021±.003	.018±.003	.023±.003	.019±.003	.021±.003	.021±.003
87/07/06	.020±.004	.011±.004	.018±.005	.017±.004	.016±.004	.018±.004
87/07/13	.021±.003	.019±.003	.024±.003	.017±.002	.019±.003	.016±.002
87/07/20	.023±.003	.021±.003	.022±.003	.019±.003	.020±.003	.018±.003
87/07/27	.027±.003	.026±.003	.026±.003	.031±.004	.029±.003	.028±.003
87/08/03	.018±.003	.018±.003	.016±.003	.017±.003	.016±.003	.015±.002
87/08/10	.021±.003	.016±.003	.018±.003	.018±.003	.022±.003	.017±.002
87/08/17	.027±.003	.024±.003	.023±.003	.025±.003	.026±.003	.026±.003
87/08/24	.020±.003	.020±.003	.018±.003	.019±.003	.019±.003	.020±.003
87/08/31	.018±.003	.016±.003	.009±.007	.013±.002	.018±.003	.016±.002
87/09/08	.018±.002	.017±.002	.016±.003	.015±.002	.016±.002	.014±.002
87/09/14	.015±.003	.013±.003	.014±.003	.015±.003	.016±.003	.012±.002
87/09/21	.016±.002	.013±.002	.013±.002	.012±.002	.014±.002	.012±.002
87/09/28	.017±.003	.016±.003	.016±.003	.020±.003	.016±.003	.015±.002
87/10/05	.025±.003	.022±.003	.024±.003	.022±.003	.024±.003	.022±.003
87/10/13	.021±.003	.021±.003	.018±.003	.021±.003	.018±.002	.018±.002
87/10/19	.035±.004	.037±.004	.035±.004	.040±.004	.035±.004	.036±.004
87/10/26	.029±.003	.027±.003	.028±.003	.027±.003	.027±.003	.022±.003
87/11/02	.019±.003	.019±.003	.018±.003	.024±.003	.021±.003	.020±.003
87/11/09	.035±.003	.036±.004	.031±.003	.036±.004	.031±.003	.034±.003
87/11/16	.025±.003	.024±.003	.025±.003	.024±.003	.024±.003	.024±.003
87/11/23	.019±.003	.019±.003	.020±.003	.019±.003	.018±.003	.018±.003
87/11/30	.018±.002	.019±.002	.018±.002	.017±.002	.016±.002	.019±.002
87/12/07	.009±.002	.009±.002	.011±.002	.014±.002	.011±.002	.011±.002
87/12/14	.014±.002	.015±.002	.018±.002	.017±.002	.015±.002	.014±.002
87/12/21	.012±.002	.015±.002	.014±.002	.015±.002	.014±.002	.016±.002
87/12/28	.021±.002	.021±.003	.023±.003	.026±.004	.017±.002	.024±.003

TABLE 7

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 2 sigma

WEEK END DATE	LOCATION R1	R2	R3	R4	R5
87/01/06	<0.009	<0.012	<0.009	<0.014	<0.012
87/01/13	<0.009	<0.008	<0.008	<0.006	<0.014
87/01/20	<0.010	<0.016	<0.015	<0.010	<0.013
87/01/27	<0.011	<0.011	<0.015	<0.013	<0.014
87/02/03	<0.015	<0.014	<0.013	<0.013	<0.013
87/02/10	<0.012	<0.011	<0.011	<0.008	<0.011
87/02/17	<0.014	<0.013	<0.014	<0.008	<0.003
87/02/24	<0.012	<0.013	<0.012	<0.012	<0.010
87/03/03	<0.009	<0.011	<0.012	<0.016	<0.010
87/03/10	<0.009	<0.013	<0.012	<0.010	<0.013
87/03/17	<0.005	<0.013	<0.011	<0.015	<0.013
87/03/24	<0.010	<0.012	<0.009	<0.009	<0.010
87/03/31	<0.010	<0.007	<0.011	<0.014	<0.010
87/04/07	<0.015	<0.009	<0.011	<0.008	<0.012
87/04/14	<0.008	<0.007	<0.014	<0.012	<0.014
87/04/21	<0.012	<0.012	<0.015	<0.008	<0.013
87/04/28	<0.011	<0.009	<0.008	<0.010	<0.014
87/05/05	<0.011	<0.009	<0.009	<0.011	<0.007
87/05/12	<0.012	<0.009	<0.010	<0.013	<0.012
87/05/19	<0.012	<0.009	<0.013	<0.012	<0.013
87/05/26	<0.010	<0.014	<0.006	<0.004	<0.009
87/06/02	<0.010	<0.009	<0.008	<0.010	<0.009
87/06/09	<0.012	<0.017	<0.013	<0.009	<0.012
87/06/16	<0.010	<0.013	<0.016	<0.015	<0.012
87/06/23	<0.014	<0.014	<0.006	<0.014	<0.013
87/06/30	<0.008	<0.009	<0.006	<0.010	<0.026
87/07/07	<0.014	<0.009	<0.009	<0.012	<0.018
87/07/14	<0.009	<0.011	<0.014	<0.012	<0.018
87/07/22	<0.011	<0.014	<0.010	<0.007	<0.015
87/07/28	<0.012	<0.016	<0.014	<0.012	<0.016
87/08/04	<0.009	<0.013	<0.011	<0.012	<0.010
87/08/11	<0.013	<0.010	<0.012	<0.011	<0.009
87/08/18	<0.010	<0.009	<0.013	<0.008	<0.007
87/08/25	<0.011	<0.009	<0.010	<0.008	<0.012
87/09/01	<0.012	<0.009	<0.011	<0.008	<0.007
87/09/08	0.011±0.006	0.018±0.008	<0.009	<0.011	<0.010
87/09/15	<0.010	<0.010	<0.010	<0.013	<0.010
87/09/22	<0.005	<0.009	<0.011	<0.009	<0.010
87/09/29	<0.012	<0.013	<0.012	<0.013	<0.013
87/10/06	<0.011	<0.010	<0.013	<0.008	<0.010
87/10/13	<0.008	<0.009	<0.010	<0.008	<0.009
87/10/20	<0.011	<0.009	<0.008	<0.011	<0.012
87/10/27	<0.009	<0.011	<0.011	<0.012	<0.013
87/11/03	<0.009	<0.011	<0.011	<0.010	<0.023
87/11/10	<0.010	<0.010	<0.009	<0.010	<0.013
87/11/17	<0.008	<0.011	<0.007	<0.006	<0.010
87/11/24	<0.008	<0.009	<0.010	<0.010	<0.012
87/12/01	<0.009	<0.006	<0.006	<0.008	<0.008
87/12/08	<0.005	<0.009	<0.010	<0.008	<0.010
87/12/15	<0.009	<0.007	<0.009	<0.010	<0.008
87/12/22	<0.010	<0.006	<0.008	<0.008	<0.009
87/12/29	<0.009	<0.008	<0.008	<0.009	<0.004

TABLE 7
(Continued)
NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 2 sigma

WEEK END DATE	LOCATION D2	E	F	G
87/01/06	<0.005	<0.012	<0.012	<0.011
87/01/13	<0.017	<0.013	<0.008	<0.011
87/01/20	<0.016	<0.010	<0.013	<0.014
87/01/27	<0.014	<0.009	<0.012	<0.016
87/02/03	<0.014	<0.012	<0.013	<0.022
87/02/10	<0.014	<0.013	<0.009	<0.011
87/02/17	<0.013	<0.011	<0.010	<0.013
87/02/24	<0.012	<0.010	<0.010	<0.013
87/03/03	<0.010	<0.010	<0.009	<0.013
87/03/10	<0.013	<0.012	<0.008	<0.013
87/03/17	<0.014	<0.012	<0.010	<0.011
87/03/24	<0.011	<0.012	<0.008	<0.014
87/03/31	<0.010	<0.014	<0.011	<0.020
87/04/07	<0.012	<0.010	<0.013	<0.009
87/04/14	<0.011	<0.016	<0.012	<0.012
87/04/21	<0.008	<0.011	<0.009	<0.011
87/04/28	<0.012	<0.006	<0.011	<0.008
87/05/05	<0.013	<0.009	<0.008	<0.010
87/05/12	<0.009	<0.013	<0.011	<0.012
87/05/19	<0.013	<0.010	<0.009	<0.011
87/05/26	<0.008	<0.010	<0.011	<0.013
87/06/02	<0.011	<0.010	<0.011	<0.015
87/06/09	<0.009	<0.012	<0.013	<0.014
87/06/16	<0.011	<0.014	<0.006	<0.011
87/06/23	<0.013	<0.011	<0.013	<0.012
87/06/30	<0.007	<0.015	<0.011	<0.012
87/07/07	<0.011	<0.011	<0.010	<0.012
87/07/14	<0.008	<0.007	<0.011	<0.013
87/07/22	<0.009	<0.012	<0.012	<0.011
87/07/28	<0.010	<0.012	<0.014	<0.013
87/08/04	<0.009	<0.010	<0.011	<0.011
87/08/11	<0.010	<0.013	<0.012	<0.012
87/08/18	<0.009	<0.011	<0.009	<0.009
87/08/25	<0.013	<0.010	<0.011	<0.011
87/09/01	<0.010	<0.012	<0.010	<0.007
87/09/08	<0.008	<0.008	<0.009	<0.011
87/09/15	<0.010	<0.013	<0.009	<0.011
87/09/22	<0.007	<0.009	<0.011	<0.012
87/09/29	<0.010	<0.010	<0.008	<0.011
87/10/06	<0.011	<0.010	<0.014	<0.013
87/10/13	<0.009	<0.009	<0.011	<0.010
87/10/20	<0.010	<0.012	<0.010	<0.012
87/10/27	<0.008	<0.008	<0.012	<0.009
87/11/03	<0.007	<0.012	<0.011	<0.016
87/11/10	<0.006	<0.007	<0.010	<0.010
87/11/17	<0.008	<0.010	<0.012	<0.008
87/11/24	<0.010	<0.009	<0.008	<0.010
87/12/01	<0.008	<0.009	<0.005	<0.007
87/12/08	<0.007	<0.008	<0.004	<0.009
87/12/15	<0.008	<0.008	<0.008	<0.007
87/12/22	<0.008	<0.007	<0.007	<0.008
87/12/29	<0.008	<0.007	<0.004	<0.009

TABLE 8

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 2 sigma

WEEK END DATE	LOCATION D1	G	H	I	J	K
87/01/05	<0.011	<0.014	<0.009	<0.013	<0.007	<0.010
87/01/12	<0.013	<0.010	<0.010	<0.011	<0.010	<0.014
87/01/19	<0.010	<0.015	<0.011	<0.014	<0.017	<0.007
87/01/26	<0.022	<0.013	<0.011	<0.013	<0.009	<0.015
87/02/02	<0.011	<0.014	<0.011	<0.013	<0.016	<0.017
87/02/09	<0.013	<0.006	<0.011	<0.011	<0.013	<0.012
87/02/17	<0.009	<0.012	<0.015	<0.030	<0.020	<0.010
87/02/23	<0.010	<0.011	<0.009	<0.013	<0.010	<0.012
87/03/02	<0.009	<0.012	<0.008	<0.011	<0.012	<0.009
87/03/09	<0.009	<0.015	<0.012	<0.010	<0.011	<0.011
87/03/16	<0.010	<0.009	<0.017	<0.009	<0.006	<0.011
87/03/23	<0.013	<0.012	<0.011	<0.017	<0.010	<0.010
87/03/30	<0.015	<0.012	<0.011	<0.022	<0.009	<0.011
87/04/06	<0.010	<0.010	<0.014	<0.014	<0.011	<0.008
87/04/13	<0.006	<0.011	<0.013	<0.011	<0.009	<0.013
87/04/20	<0.009	<0.013	<0.012	<0.009	<0.013	<0.007
87/04/27	<0.009	<0.013	<0.016	<0.009	<0.009	<0.005
87/05/04	<0.008	<0.011	<0.009	<0.011	<0.010	<0.009
87/05/11	<0.014	<0.008	<0.010	<0.021	<0.013	<0.009
87/05/18	<0.012	<0.008	<0.012	<0.020	<0.007	<0.009
87/05/26	<0.010	<0.008	<0.009	<0.010	<0.007	<0.007
87/06/01	<0.009	<0.011	<0.012	<0.009	<0.015	<0.011
87/06/08	<0.012	<0.013	<0.016	<0.012	<0.018	<0.012
87/06/15	<0.013	<0.013	<0.018	<0.013	<0.013	<0.011
87/06/22	<0.013	<0.012	<0.016	<0.009	<0.011	<0.010
87/06/29	<0.010	<0.014	<0.011	<0.010	<0.008	<0.009
87/07/06	<0.012	<0.010	<0.014	<0.010	<0.009	<0.012
87/07/13	<0.010	<0.012	<0.010	<0.012	<0.013	<0.011
87/07/20	<0.010	<0.011	<0.011	<0.008	<0.009	<0.013
87/07/27	<0.012	<0.011	<0.012	<0.013	<0.005	<0.010
87/08/03	<0.010	<0.012	<0.010	<0.012	<0.011	<0.011
87/08/10	<0.006	<0.014	<0.012	<0.013	<0.010	<0.011
87/08/17	<0.011	<0.016	<0.010	<0.014	<0.011	<0.013
87/08/24	<0.012	<0.013	<0.013	<0.022	<0.004	<0.008
87/08/31	<0.011	<0.011	<0.045	<0.011	<0.009	<0.006
87/09/08	<0.010	<0.012	<0.020	.016±.009	.061±.014	<0.014
87/09/14	<0.012	<0.001	<0.010	<0.015	<0.012	<0.014
87/09/21	<0.010	<0.011	<0.008	<0.008	<0.010	<0.010
87/09/28	<0.013	<0.009	<0.013	.008±.006	<0.012	<0.008
87/10/05	<0.007	<0.008	<0.010	<0.009	<0.010	<0.010
87/10/13	<0.010	<0.007	<0.008	<0.009	<0.010	<0.010
87/10/19	<0.012	<0.009	<0.013	<0.011	<0.013	<0.013
87/10/26	<0.011	<0.010	<0.008	<0.010	<0.012	<0.009
87/11/02	<0.010	<0.011	<0.011	<0.007	<0.010	<0.010
87/11/09	<0.008	<0.011	<0.013	<0.014	<0.009	<0.012
87/11/16	<0.009	<0.008	<0.011	<0.016	<0.010	<0.015
87/11/23	<0.005	<0.012	<0.011	<0.009	<0.011	<0.009
87/11/30	<0.010	<0.009	<0.009	<0.010	<0.009	<0.010
87/12/07	<0.006	<0.008	<0.014	<0.009	<0.013	<0.006
87/12/14	<0.006	<0.007	<0.012	<0.009	<0.010	<0.004
87/12/21	<0.007	<0.009	<0.008	<0.011	<0.010	<0.009
87/12/28	<0.008	<0.008	<0.009	<0.017	<0.013	<0.010

TABLE 9
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	January	February	March	April	May	June
			R1 OFFSITE COMPOSITE			
Ce-144	<6.49	<6.12	<6.37	<5.89	<5.72	<8.12
Ce-141	<2.12	<1.90	<2.09	<2.08	<1.89	<2.81
Be-7	93.3 ± 16.8	132 ± 23.1	131 ± 21.8	157 ± 21.8	162 ± 24.9	188 ± 27.2
Ru-103	<1.48	<2.41	<1.96	<1.56	<2.19	<2.55
Cs-134	<1.54	<1.27	<1.53	<1.10	<1.34	<1.57
Cs-137	<1.23	<1.27	<0.87	<1.39	<1.48	<1.54
Zr-95	<2.57	<4.18	<3.84	<3.32	<2.18	<4.58
Nb-95	<1.49	<2.06	<1.74	<1.34	<2.16	<2.07
Co-58	<1.39	<1.86	<1.72	<0.96	<1.49	<1.82
Mn-54	<1.29	<1.67	<1.45	<1.32	<0.95	<0.86
Co-60	<1.44	<2.69	<2.10	<1.76	<2.19	<1.65
K-40	53.7 ± 19.2	<26.3	<31.6	15.2±11.3	<26.2	<36.4
Ra-226	<24.2	<2.59	<31.3	<21.6	<25.8	<35.4
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R2 OFFSITE COMPOSITE			
Ce-144	<6.51	<6.26	<7.00	<5.26	<6.93	<8.03
Ce-141	<2.24	<2.62	<2.71	<1.90	<2.48	<2.91
Be-7	101 ± 16.0	122 ± 22.4	136 ± 25.7	169 ± 24.3	133 ± 22.8	153 ± 22.8
Ru-103	<1.74	<2.02	<2.16	<1.53	<1.99	<1.80
Cs-134	<1.34	<1.71	<1.52	<1.20	<1.59	<1.59
Cs-137	<1.36	<1.70	<1.03	<1.33	<1.73	<1.35
Zr-95	<3.46	<3.94	<4.48	<3.99	<3.62	<2.42
Nb-95	<1.63	<1.77	<2.99	<1.83	<2.04	<2.45
Co-58	<1.19	<1.88	<2.46	<1.56	<1.13	<2.07
Mn-54	<1.44	<1.92	<1.63	<1.63	<1.57	<1.83
Co-60	<1.42	<2.66	<1.64	<0.87	<2.46	<1.12
K-40	63.9 ± 18.4	20.7 ± 15.6	23.3±17.5	<27.8	36.4 ± 22.4	58.3 ± 23.5
Ra-226	22.5 ± 12.5	<29.8	<28.5	<22.1	<29.9	<31.4
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	January	February	March	April	May	June
			R3 OFFSITE COMPOSITE			
Ce-144	<6.87	<7.10	<6.79	<7.37	<8.55	<8.79
Ce-141	<2.22	<2.40	<2.25	<2.64	<2.70	<3.06
Be-7	102 ± 17.2	127 ± 23.2	143 ± 23.9	171 ± 24.1	135 ± 21.9	170 ± 24.1
Ru-103	<1.83	<2.27	<1.48	<2.00	<1.91	<2.08
Cs-134	<1.47	<1.71	<1.23	<1.71	<1.87	<1.41
Cs-137	<1.32	<1.36	<1.44	<1.74	<1.55	<1.53
Zr-95	<4.31	<3.39	<4.49	<3.98	<3.89	<4.89
Nb-95	<2.04	<2.02	<1.37	<2.14	<2.15	<2.18
Co-58	<1.93	<1.41	<1.24	<1.28	<1.66	<1.70
Mn-54	<1.39	<1.47	<1.94	<1.67	<1.84	<1.29
Co-60	<1.55	<2.05	<2.05	<0.69	<0.83	<2.17
K-40	50.5 ± 21.4	<33.4	<28.8	52.3 ± 20.7	46.2 ± 21.5	57.3 ± 22.7
Ra-226	18.4 ± 11.3	<27.8	<31.7	21.0 ± 13.1	<34.6	<37.1
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R4 OFFSITE COMPOSITE			
Ce-144	<6.57	<6.41	<7.41	<6.37	<4.79	<8.90
Ce-141	<2.13	<2.20	<2.48	<2.41	<1.95	<2.89
Be-7	107 ± 17.1	100 ± 20.3	147 ± 24.2	159 ± 24.0	161 ± 25.2	196 ± 30.2
Ru-103	<1.56	<1.86	<1.95	<1.85	<1.96	<1.56
Cs-134	<1.29	<1.44	<1.78	<1.20	<1.56	<1.76
Cs-137	<1.12	<1.31	<1.92	<1.19	<1.30	<1.30
Zr-95	<3.81	<5.35	<4.44	<4.51	<3.59	<4.04
Nb-95	<1.72	<2.84	<1.98	<1.86	<1.70	<2.36
Co-58	<1.40	<1.59	<1.98	<1.78	<1.34	<2.18
Mn-54	<1.12	<1.91	<1.63	<1.34	<1.57	<1.42
Co-60	<1.09	<2.01	<1.18	<1.36	<1.79	<0.99
K-40	41.2 ± 15.9	<30.[illegible]	<17.8	38.4 ± 18.2	<32.2	40.7 ± 23.1
Ra-226	15.1 ± 9.70	<27.7	24.7 ± 14.9	50.9 ± 24.5	<29.6	<34.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF AIR PARTICULATE SAMPLES 1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	January	February	March	April	May	June
			R5 OFFSITE COMPOSITE (CONTROL)			
Ce-144	<6.46	<6.01	[illegible]	<5.48	<7.77	<5.59
Ce-141	<2.32	<2.35	<2.57	<2.20	<2.49	<2.95
Be-7	99.5 ± 17.3	123 ± 23.4	140 ± 23.1	168 ± 26.4	169 ± 27.3	154 ± 27.0
Ru-103	<1.67	<1.85	<2.51	<1.98	<1.86	<2.54
Cs-134	<1.46	<1.47	<1.50	<1.25	<1.96	<1.38
Cs-137	<1.45	<1.29	<1.99	<1.16	<1.72	<1.30
Zr-95	<4.03	<3.68	<5.84	<6.21	<4.71	<3.80
Nb-95	<2.25	<2.36	<1.88	<1.75	<2.83	<1.76
Co-58	<1.68	<1.58	<1.85	<1.66	<1.59	<1.96
Mn-54	<1.42	<9.89	<1.67	<1.42	<1.70	<1.45
Co-60	<1.83	<2.25	<0.99	<2.03	<1.43	<1.72
K-40	54.5 ± 19.8	<24.0	17.5 ± 14.0	<15.3	<41.6	<23.5
Ra-226	20.0 ± 10.9	<25.5	<30.7	<24.5	<29.6	<27.0
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			D2 OFFSITE COMPOSITE			
Ce-144	<7.44	<7.42	<6.97	<7.73	<5.68	<7.74
Ce-141	<2.88	<2.38	<1.94	<2.20	<1.83	<2.73
Be-7	95.8 ± 16.6	127 ± 24.6	132 ± 23.6	137 ± 22.4	181 ± 26.4	182 ± 26.9
Ru-103	<2.10	<2.13	<1.95	<1.97	<1.51	<2.16
Cs-134	<1.55	<1.75	<1.78	<1.29	<1.51	<1.78
Cs-137	<1.38	<1.78	<2.10	<1.15	<1.69	<2.14
Zr-95	<3.56	<5.57	<2.90	<3.15	<3.48	<4.47
Nb-95	<1.70	<2.73	<1.98	<2.50	<2.02	<2.70
Co-58	<1.63	<1.79	<0.81	<1.83	<1.84	<2.56
Mn-54	<1.12	<2.45	<1.46	<2.02	<1.18	<2.15
Co-60	<0.86	<2.49	<3.11	<1.14	<1.10	<0.97
K-40	66.8 ± 20.6	<35.5	<39.7	<29.7	<33.3	<38.5
Ra-226	31.2 ± 19.8	<28.6	<32.5	<27.4	<26.3	<30.0
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	January	February	March	April	May	June
			E OFFSITE COMPOSITE			
Ce-144	<6.33	<6.65	<6.90	<4.67	<6.28	<7.61
Ce-141	<2.30	<2.86	<2.14	<1.80	<1.72	<3.06
Be-7	97.2 ± 16.3	103 ± 21.1	129 ± 21.7	116 ± 20.5	188 ± 26.8	162 ± 23.9
Ru-103	<1.59	<1.76	<2.33	<2.10	<1.62	<2.42
Cs-134	<1.30	<1.19	<1.43	<1.10	<1.44	<1.46
Cs-137	<1.11	<1.72	<1.52	<1.12	<1.70	<2.22
Zr-95	<3.01	<4.36	<2.78	<2.72	<4.42	<4.41
Nb-95	<2.19	<2.85	<1.80	<1.53	<2.34	<2.50
Co-58	<1.20	<0.79	<1.49	<1.84	<0.75	<1.84
Mn-54	<0.80	<1.70	<1.59	<1.25	<0.96	<2.10
Co-60	<1.26	<1.57	<2.12	<0.89	<2.21	<1.12
K-40	51.7 ± 18.6	22.9 ± 16.6	20.6 ± 13.6	<28.6	<11.8	64.7 ± 22.4
Ra-226	15.0 ± 9.94	17.35 ± 10.8	<26.5	<23.2	<24.8	<34.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			F OFFSITE COMPOSITE			
Ce-144	<6.73	<7.29	<6.73	<6.09	<6.14	<8.28
Ce-141	<2.16	<2.34	<2.06	<2.33	<2.04	<2.52
Be-7	103 ± 15.9	120 ± 22.2	148 ± 23.4	145 ± 20.2	144 ± 23.9	160 ± 25.5
Ru-103	<1.44	<1.45	<1.61	<1.90	<1.55	<2.20
Cs-134	<1.13	<1.55	<1.77	<1.36	<1.46	<1.37
Cs-137	<1.28	<1.13	<1.58	<1.33	<0.82	<1.75
Zr-95	<3.47	<5.17	<3.45	<3.59	<3.18	<4.63
Nb-95	<1.84	<1.90	<2.82	<1.61	<1.68	<2.28
Co-58	<1.23	<1.53	<1.66	<1.51	<1.53	<2.09
Mn-54	<1.40	<1.05	<0.95	<1.40	<1.70	<1.48
Co-60	<1.37	<1.80	<1.08	<1.81	<1.59	<1.63
K-40	47.0 ± 17.4	<26.7	27.7 ± 17.3	57.0 ± 18.7	<29.5	<45.9
Ra-226	26.9 ± 15.3	<27.0	<26.2	<23.7	<23.4	<32.8
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	January	February	March	April	May	June
			G OFFSITE COMPOSITE			
Ce-144	<8.10	<6.88	<8.27	<5.90	<5.62	<8.36
Ce-141	<2.54	<2.47	<2.25	<1.99	<2.46	<3.46
Be-7	108 + 19.0	137 + 26.0	137 + 24.7	152 + 22.8	161 + 27.6	194 + 26.8
Ru-103	<2.21	<2.66	<1.62	<2.03	<1.80	<2.79
Cs-134	<1.58	<1.59	<1.82	<1.48	<2.04	<1.83
Cs-137	<1.35	<1.87	<1.57	<0.75	<1.34	<1.87
Zr-95	<3.71	<4.63	<5.89	<3.85	<3.70	<4.87
Nb-95	<2.31	<2.51	<2.28	<1.44	<0.98	<1.97
Co-58	<1.69	<1.57	<1.92	<1.61	<1.99	<1.82
Mn-54	<1.86	<1.60	<1.58	<1.47	<1.14	<1.68
Co-60	<1.60	<2.23	<1.93	<1.13	<1.31	<1.51
K-40	38.5 + 18.6	<27.4	23.7 + 16.1	<25.5	<37.0	79.1 + 28.5
Ra-226	<30.5	<27.9	<33.7	<26.7	<30.8	<38.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	January	February	March	April	May	June
			D1 ONSITE COMPOSITE			
Ce-144	<5.86	<6.42	<5.95	<5.24	<6.20	<7.80
Ce-141	<2.01	<2.08	<2.05	<1.90	<2.00	<2.91
Be-7	79.9 ± 17.2	130 ± 21.8	141 ± 22.4	147 ± 22.9	162 ± 25.4	165 ± 26.4
Ru-103	<2.07	<2.03	<1.62	<1.65	<1.79	<2.09
Cs-134	<0.92	<1.32	<1.64	<1.32	<1.22	<1.34
Cs-137	<1.36	<1.30	<1.22	<1.09	<1.67	<1.66
Zr-95	<1.38	<3.83	<4.53	<3.56	<3.25	<5.41
Nb-95	<2.24	<2.02	<2.16	<1.53	<1.22	<2.17
Co-58	<0.94	<1.83	<0.65	<1.29	<2.07	<1.89
Mn-54	<1.17	<1.31	<1.32	<1.34	<1.00	<1.77
Co-60	<1.62	<2.44	<1.32	<1.52	<1.63	<1.38
K-40	<14.1	<27.8	<28.1	<18.7	<34.8	46.0 ± 23.1
Ra-226	<24.9	<25.2	<29.2	17.5 ± 9.08	20.5 ± 12.1	<36.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			G ONSITE COMPOSITE			
Ce-144	<4.60	<5.94	<6.66	<5.56	<7.48	<9.21
Ce-141	<1.97	<1.99	<2.39	<2.05	<2.49	<3.06
Be-7	90.3 ± 17.4	125 ± 24.9	137 ± 22.7	129 ± 19.8	144 ± 23.3	166 ± 26.3
Ru-103	<1.73	<1.46	<1.26	<2.12	<2.07	<2.45
Cs-134	<1.20	<1.85	<1.68	<1.41	<1.64	<1.62
Cs-137	<1.12	<1.55	<1.45	<1.37	<1.85	<1.84
Zr-95	<3.41	<3.61	<3.02	<3.47	<3.25	<4.93
Nb-95	<1.85	<2.26	<2.25	<1.68	<1.34	<2.59
Co-58	<0.57	<2.06	<1.61	<1.74	<1.21	<1.88
Mn-54	<1.13	<1.99	<1.84	<1.49	<2.45	<1.90
Co-60	<1.12	<1.61	<2.06	<1.71	<1.40	<2.26
K-40	<28.0	<27.1	<31.0	<29.3	<23.5	54.5 ± 22.0
Ra-226	<19.1	<27.7	<31.4	<21.3	<30.1	<34.9
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	January	February	March	April	May	June
			H ONSITE COMPOSITE			
Ce-144	<4.47	<7.78	<7.15	<7.43	<8.62	<10.5
Ce-141	<1.74	<2.44	<2.29	<2.15	<2.89	<2.77
Be-7	106 ± 19.6	116 ± 22.9	131 ± 25.3	112 ± 17.8	144 ± 25.6	130 ± 24.6
Ru-103	<1.56	<2.28	<1.97	<1.44	<2.63	<2.17
Cs-134	<1.10	<1.59	<1.22	<1.66	<1.73	<2.08
Cs-137	<1.38	<1.96	<1.71	<1.92	<1.65	<2.13
Zr-95	<3.21	<3.63	<4.37	<4.55	<2.78	<4.15
Nb-95	<2.01	<2.71	<1.33	<2.15	<3.49	<2.61
Co-58	<1.14	<1.10	<1.49	<1.55	<2.43	<2.13
Mn-54	<1.36	<2.10	<1.74	<1.18	<1.20	<2.24
Co-60	<1.78	<2.47	<3.07	<2.13	<1.54	<1.56
K-40	<19.0	26.5 ± 17.7	26.8 ± 19.8	60.8 ± 20.5	<41.8	<52.4
Ra-226	<22.0	<28.5	<32.4	<28.1	<38.2	<42.8
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ONSITE COMPOSITE			
Ce-144	<5.43	<8.91	<7.90	<4.96	<10.5	<7.41
Ce-141	<1.74	<3.15	<2.44	<2.40	<3.28	<2.97
Be-7	82.7 ± 16.7	108 ± 24.8	105 ± 22.3	145 ± 24.0	140 ± 24.4	151 ± 22.4
Ru-103	<1.04	<2.78	<1.97	<1.45	<2.73	<2.60
Cs-134	<1.15	<2.10	<1.63	<1.32	<2.21	<1.80
Cs-137	<1.35	<1.83	<1.71	<1.54	<1.98	<1.58
Zr-95	<2.97	<5.10	<4.99	<3.36	<5.02	<4.67
Nb-95	<1.31	<3.51	<2.91	<1.51	<2.86	<1.74
Co-58	<1.29	<2.45	<2.39	<1.24	<1.55	<1.90
Mn-54	<1.02	<1.27	<1.02	<1.66	<1.77	<1.83
Co-60	<1.60	<2.51	<1.97	<1.66	<2.19	<1.11
K-40	<17.0	36.0 ± 23.8	21.6 ± 17.2	<17.7	62.6 ± 26.8	77.8 ± 24.9
Ra-226	<18.7	<35.0	<30.7	<21.6	<42.4	<35.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	January	February	March	April	May	June
			J ONSITE COMPOSITE			
Ce-144	<6.33	<7.08	<6.63	<5.05	<6.27	<6.55
Ce-141	<1.86	<2.52	<2.02	<1.97	<1.77	<2.42
Be-7	90.6 ± 18.4	85.1 ± 19.3	121 ± 23.4	150 ± 25.7	138 ± 23.7	175 ± 28.0
Ru-103	<1.75	<2.12	<1.82	<1.77	<1.74	<2.31
Cs-134	<1.44	<1.60	<1.42	<1.24	<1.68	<1.55
Cs-137	<1.76	<1.71	<1.27	<1.08	<2.06	<1.82
Zr-95	<2.43	<4.70	<4.28	<2.90	<2.74	<4.57
Nb-95	<1.86	<2.76	<2.07	<2.00	<1.67	<2.21
Co-58	<2.12	<1.84	<1.46	<1.20	<1.32	<1.09
Mn-54	<1.68	<2.24	<2.01	<1.33	<1.38	<1.50
Co-60	<1.65	<1.51	<1.23	<2.51	<1.12	<1.52
K-40	<28.7	<27.8	30.0 ± 19.8	<30.4	<23.9	<34.4
Ra-226	<25.5	<27.8	<29.3	<23.9	<26.0	<26.5
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			K ONSITE COMPOSITE			
Ce-144	<6.51	<6.51	<6.38	<4.93	<6.42	<8.01
Ce-141	<2.09	<2.28	<1.15	<2.07	<1.97	<2.89
Be-7	89.9 ± 15.2	124 ± 24.7	110 ± 20.7	123 ± 19.1	133 ± 22.3	137 ± 21.5
Ru-103	<1.50	<1.27	<1.99	<1.37	<1.97	<2.09
Cs-134	<1.49	<1.93	<1.59	<1.23	<1.82	<1.19
Cs-137	<1.13	<1.52	<1.81	<1.63	<1.10	<1.40
Zr-95	<4.53	<3.44	<3.52	<4.60	<3.80	<4.98
Nb-95	<1.97	<2.04	<0.99	<1.95	<1.59	<1.98
Co-58	<1.30	<1.17	<1.68	<1.54	<1.93	<2.37
Mn-54	<1.39	<1.83	<0.81	<1.39	<1.16	<1.88
Co-60	<0.57	<1.71	<2.40	<1.43	<0.91	<2.07
K-40	53.9 ± 17.7	<38.7	<19.3	<15.1	<27.3	49.3 ± 20.6
Ra-226	<23.3	<29.2	<25.8	<22.0	<28.2	26.5 ± 17.9
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
CF JAF AIR PARTICULATE SAMPLES
1987
Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	July	August	September	October	November	December
			R1 OFFSITE COMPOSITE			
Ce-144	<6.23	<6.55	<5.83	<5.55	<4.99	<5.73
Ce-141	<2.06	<1.98	<2.28	<1.85	<1.68	<1.67
Be-7	154 ± 19.8	151 ± 23.1	91.3 ± 17.9	133 ± 19.5	73.3 ± 17.3	73.9 ± 14.4
Ru-103	<1.54	<1.96	<1.65	<1.34	<1.43	<1.81
Cs-134	<1.06	<1.76	<1.13	<1.28	<1.27	<1.14
Cs-137	<1.20	<1.52	<1.43	<1.51	<1.42	<1.32
Zr-95	<3.13	<2.97	<3.58	<2.92	<2.76	<2.44
Nb-95	<2.10	<1.11	<1.31	<1.45	<1.79	<1.70
Co-58	<1.62	<1.43	<1.49	<1.15	<1.76	<1.56
Mn-54	<1.37	<1.58	<1.46	<1.34	<0.60	<0.59
Co-60	<1.07	<1.05	<0.73	<1.63	<0.98	<1.0[illegible]
K-40	35.7 ± 17.0	<35.5	20.5 ± 12.8	<24.7	<23.4	27.9 ± 14.0
Ra-226	22.1 ± 13.9	<26.3	<27.5	<18.8	<21.7	16.1 ± 9.28
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R2 OFFSITE COMPOSITE			
Ce-144	<5.60	<7.07	<4.69	<4.89	<4.98	<4.85
Ce-141	<2.10	<2.13	<2.20	<1.58	<1.65	<1.56
Be-7	154 ± 18.6	154 ± 24.6	117 ± 21.9	115 ± 18.6	95.8 ± 18.4	62.3 ± 13.4
Ru-103	<1.25	<2.02	<2.35	<1.31	<1.58	<1.38
Cs-134	<0.90	<1.62	<1.24	<1.20	<1.32	<1.21
Cs-137	<1.09	<1.56	<1.45	<0.70	<1.10	<1.10
Zr-95	<2.64	<3.73	<5.07	<3.85	<3.04	<2.96
Nb-95	<1.29	<1.80	<2.58	<1.26	<1.61	<1.59
Co-58	<1.46	<1.64	<1.46	<1.37	<1.31	<1.25
Mn-54	<0.66	<1.99	<1.40	<1.56	<1.19	<1.23
Co-60	<1.32	<1.52	<1.42	<1.38	<1.67	<1.18
K-40	58.9 ± 19.7	<30.5	<24.0	<17.0	<14.5	<17.6
Ra-226	15.3 ± 11.5	<23.2	<21.9	<21.8	<23.3	18.9 ± 13.8
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	July	August	September	October	November	December
			R3 OFFSITE COMPOSITE			
Ce-144	<5.72	<7.72	<6.26	<5.14	<5.53	<6.46
Ce-141	<2.09	<2.52	<2.16	<1.95	<1.86	<2.10
Be-7	158 ± 20.7	148 ± 21.9	110 ± 22.0	128 ± 19.7	66.9 ± 14.6	48.1 ± 13.2
Ru-103	<1.94	<2.03	<1.65	<1.53	<1.64	<1.61
Cs-134	<1.30	<1.41	<1.47	<1.55	<1.59	<1.32
Cs-137	<1.43	<1.66	<1.33	<1.22	<1.55	<0.83
Zr-95	<3.13	<4.40	<3.79	<3.70	<4.08	<3.32
Nb-95	<2.30	<1.86	<2.04	<1.64	<1.33	<2.26
Co-58	<1.76	<1.59	<2.19	<1.03	<1.61	<1.51
Mn-54	<1.50	<1.75	<2.00	<0.91	<1.67	<1.27
Co-60	<1.71	<1.77	<1.51	<0.84	<1.47	<1.40
K-40	38.2 ± 18.1	53.0 ± 22.0	<30.1	<22.1	<17.3	29.5 ± 14.8
Ra-226	<23.3	<31.6	<24.2	<22.2	<24.6	<23.8
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R4 OFFSITE COMPOSITE			
Ce-144	<5.70	<7.28	<6.83	<6.43	<6.59	<5.65
Ce-141	<2.08	<2.08	<2.40	<2.32	<2.25	<1.41
Be-7	143 ± 21.6	177 ± 26.3	133 ± 25.3	143 ± 19.9	75.1 ± 16.7	83.2 ± 17.0
Ru-103	<1.69	<1.63	<2.31	<1.72	<1.79	<1.34
Cs-134	<1.22	<1.26	<1.40	<1.28	<1.54	<1.24
Cs-137	<1.20	<1.12	<1.54	<1.29	<1.39	<1.25
Zr-95	<3.44	<4.69	<4.59	<2.85	<4.50	<2.18
Nb-95	<2.00	<1.67	<2.58	<1.99	<1.85	<2.05
Co-58	<1.39	<2.13	<0.83	<1.57	<1.52	<1.60
Mn-54	<1.23	<1.17	<1.74	<1.26	<1.52	<1.20
Co-60	<1.26	<1.10	<1.97	<1.75	<1.[illegible]	<1.93
K-40	<21.2	<28.7	<21.0	42.3 ± 16.9	39.2 ± 16.7	<16.0
Ra-226	<24.3	<28.9	<25.9	<24.7	<29.8	<23.0
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} $pCi/m^3 \pm 2$ sigma

Nuclides	July	August	September	October	November	December
R5 OFFSITE COMPOSITE (CONTROL)						
Ce-144	<7.13	<5.41	<5.88	<5.22	<7.25	<6.09
Ce-141	<2.21	<2.19	<2.60	<1.89	<2.30	<1.82
Be-7	138 + 21.8	167 + 23.1	111 + 20.6	143 + 22.1	72.0 + 18.1	68.6 + 15.1
Ru-103	<1.59	<1.63	<2.30	<2.04	<2.03	<1.50
Cs-134	<1.59	<1.36	<1.66	<1.71	<1.62	<1.08
Cs-137	<1.27	<0.98	<1.58	<1.03	<1.66	<1.18
Zr-95	<4.02	<2.96	<3.50	<4.04	<3.89	<3.22
Nb-95	<2.56	<1.57	<2.30	<1.49	<2.21	<1.93
Co-58	<1.59	<1.72	<1.43	<1.71	<1.48	<1.41
Mn-54	<1.05	<1.54	<1.65	<1.13	<1.45	<1.19
Co-60	<1.38	<1.56	<1.49	<2.02	<1.84	<1.01
K-40	21.6 + 13.7	<28.4	<17.6	<15.3	44.8 + 18.2	26.2 + 12.5
Ra-226	<21.6	<26.9	30.8 + 18.7	<25.4	<29.2	<21.0
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
D2 OFFSITE COMPOSITE						
Ce-144	<5.48	<6.46	<5.79	<5.41	<4.31	<5.05
Ce-141	<1.81	<2.41	<2.39	<1.54	<1.84	<2.08
Be-7	132 + 17.6	141 + 19.2	112 + 19.5	123 + 17.9	88.4 + 17.1	66.6 + 13.3
Ru-103	<1.26	<1.68	<1.60	<1.19	<1.17	<1.42
Cs-134	<1.08	<1.13	<1.35	<1.07	<1.26	<1.08
Cs-137	<1.22	<1.01	<1.40	<0.85	<1.33	<1.03
Zr-95	<2.57	<2.79	<3.14	<2.41	<3.68	<3.59
Nb-95	<1.51	<1.69	<1.48	<1.39	<1.19	<1.30
Co-58	<1.21	<1.57	<1.77	<1.14	<6.26	<1.27
Mn-54	<1.20	<1.30	<1.07	<1.31	<0.57	<1.00
Co-60	<1.38	<1.51	<1.43	<1.27	<1.84	<0.78
K-40	44.1 + 14.6	42.6 + 16.8	<19.9	<10.4	<24.1	34.0 + 14.5
Ra-226	<22.5	<24.7	<24.7	<19.7	<20.7	15.8 + 12.9
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ±.2 sigma

Nuclides	July	August	September	October	November	December
			E OFFSITE COMPOSITE			
Ce-144	<5.70	<6.67	<6.28	<4.85	<5.42	<4.90
Ce-141	<1.72	<2.54	<2.63	<1.81	<1.99	<1.86
Be-7	123 ± 19.9	146 ± 21.8	105 ± 19.0	126 ± 19.1	78.7 ± 16.6	65.6 ± 12.6
Ru-103	<1.43	<1.89	<1.91	<1.33	<1.55	<1.29
Cs-134	<1.31	<1.45	<1.36	<1.16	<1.30	<0.92
Cs-137	<0.63	<1.36	<1.18	<1.09	<1.22	<1.08
Zr-95	<3.83	<3.78	<3.62	<3.33	<3.68	<2.30
Nb-95	<1.70	<2.10	<2.01	<1.11	<1.54	<1.10
Co-58	<1.06	<1.54	<1.15	<0.80	<1.29	<1.35
Mn-54	<1.79	<1.29	<1.35	<1.41	<1.16	<1.31
Co-60	<0.87	<1.32	<1.01	<0.81	<2.03	<1.07
K-40	<16.1	47.5 ± 20.1	62.8 ± 19.1	<21.1	28.2 ± 14.4	44.3 ± 15.1
Ra-226	<22.3	<28.4	<25.4	<21.4	<25.9	<21.7
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			F OFFSITE COMPOSITE			
Ce-144	<5.69	<7.43	<7.33	<4.61	<5.17	<4.83
Ce-141	<2.19	<2.31	<2.94	<1.70	<1.79	<1.65
Be-7	122 ± 18.1	136 ± 21.8	108 ± 20.3	118 ± 17.2	90.5 ± 17.9	63.9 ± 13.6
Ru-103	<1.68	<1.95	<2.02	<1.53	<1.31	<1.45
Cs-134	<1.18	<1.53	<1.47	<1.34	<1.17	<1.10
Cs-137	<0.92	<1.29	<1.24	<0.82	<1.09	<0.94
Zr-95	<2.62	<5.06	<4.51	<3.26	<2.34	<3.25
Nb-95	<1.67	<1.33	<1.71	<1.43	<1.75	<1.69
Co-58	<1.77	<1.42	<0.98	<1.26	<0.92	<0.99
Mn-54	<1.45	<1.60	<1.34	<0.55	<1.56	<0.95
Co-60	<1.21	<2.29	<1.63	<1.32	<1.66	<0.58
K-40	41.3 ± 17.0	15.0 ± 11.2	43.5 ± 17.9	16.0 ± 9.79	<25.0	29.1 ± 13.1
Ra-226	<24.8	12.3 ± 11.8	<28.3	<20.0	<22.6	22.7
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	July	August	September	October	November	December
G OFFSITE COMPOSITE						
Ce-144	<6.25	<6.82	<6.59	<6.58	<6.88	<5.53
Ce-141	<2.27	<2.51	<2.79	<2.19	<2.09	<1.97
Be-7	157 + 20.8	157 + 21.3	112 + 18.8	130 + 19.5	82.0 + 15.2	52.5 + 13.0
Ru-103	<1.95	<2.02	<2.41	<1.50	<1.89	<1.36
Cs-134	<1.09	<1.74	<1.21	<1.41	<1.42	<1.32
Cs-137	<1.27	<1.29	<1.27	<1.06	<1.17	<1.19
Zr-95	<3.09	<3.95	<3.60	<3.01	<3.42	<3.05
Nb-95	<1.74	<1.57	<2.62	<2.10	<1.42	<1.73
Co-58	<1.33	<1.52	<1.29	<1.43	<1.40	<1.45
Mn-54	3.16 + 1.13	<1.46	<1.40	<1.19	<1.03	<0.90
Co-60	1.72 ∓ 0.98	<1.92	<1.56	<1.48	<1.46	<1.84 <1.14
K-40	54.0 ∓ 17.5	76.6 + 21.8	44.1 + 16.5	34.0 + 16.4	59.2 + 18.7	33.4 + 14.7
Ra-226	<24.4	<27.7	17.1 ∓ 11.2	<26.5	<29.2	14.4 ∓ 8.89
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	July	August	September	October	November	December
			D1 ONSITE COMPOSITE			
Ce-144	<5.20	<6.33	<6.67	<5.52	<5.65	<5.20
Ce-141	<1.76	<2.18	<1.81	<2.01	<2.30	<1.75
Be-7	141 ± 21.5	152 ± 20.6	100 ± 19.4	135 ± 16.9	77.1 ± 15.0	63.8 ± 12.6
Ru-103	<1.46	<1.24	<1.32	<1.37	<1.66	<1.53
Cs-134	<1.02	<1.55	<2.06	<1.19	<1.28	<1.08
Cs-137	<1.28	<1.36	<1.84	<1.11	<1.14	<0.96
Zr-95	<3.17	<3.48	<2.93	<2.57	<3.52	<2.90
Nb-95	<1.86	<1.38	<2.45	<1.26	<1.38	<1.21
Co-58	<1.52	<1.71	<1.58	<1.26	<1.36	<1.29
Mn-54	<1.82	<1.43	<1.43	<1.34	<1.18	<1.01
Co-60	<1.25	<1.60	<1.46	<1.14	<1.53	<1.24
K-40	<18.9	51.6 ± 19.7	<15.7	51.8 ± 16.1	53.2 ± 17.3	41.3 ± 14.8
Ra-226	<24.0	16.3 ± 10.6	<29.1	<21.0	<26.7	<21.3
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			G ONSITE COMPOSITE			
Ce-144	<5.84	<8.31	<7.31	<6.00	<6.77	<6.32
Ce-141	<2.19	<2.91	<2.44	<2.02	<2.23	<2.16
Be-7	138 ± 20.1	167 ± 23.8	92.3 ± 17.4	108 ± 17.0	71.6 ± 15.2	63.4 ± 13.1
Ru-103	<1.72	<1.69	<1.62	<1.44	<1.81	<1.43
Cs-134	<1.11	<1.82	<1.20	<1.13	<1.54	<1.35
Cs-137	<1.13	<1.36	<1.57	<1.01	<1.39	<1.21
Zr-95	<2.35	<3.53	<4.44	<2.40	<3.33	<3.80
Nb-95	<1.36	<2.17	<1.65	<1.30	<1.83	<1.51
Co-58	<1.52	<1.46	<1.68	<1.37	<1.81	<1.32
Mn-54	<1.28	<1.52	<1.27	<1.47	<1.51	<1.02
Co-60	<1.58	<1.89	<1.50	<0.59	<1.89	<1.47
K-40	65.0 ± 19.2	76.9 ± 26.1	42.5 ± 19.5	41.4 ± 17.7	30.7 ± 15.4	34.0 ± 14.5
Ra-226	27.3 ± 17.5	31.5 ± 17.6	<29.8	<24.8	22.7 ± 11.1	<22.2
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987
Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	July	August	September	October	November	December
			H ONSITE COMPOSITE			
Ce-144	<6.71	<8.97	<7.11	<4.57	<5.39	<5.62
Ce-141	<2.35	<2.41	<1.94	<1.76	<1.90	<2.08
Be-7	132 ± 19.6	139 ± 22.0	72.3 ± 19.5	116 ± 20.0	71.6 ± 16.8	61.2 ± 15.5
Ru-103	<1.63	<1.98	<1.82	<1.25	<1.01	<1.46
Cs-134	<1.11	<1.94	<1.18	<1.54	<1.45	<1.49
Cs-137	<1.24	<1.83	<1.08	<0.88	<1.11	<1.34
Zr-95	<3.96	<4.18	<3.47	<3.99	<3.88	<4.38
Nb-95	<1.84	<2.10	<2.07	<1.53	<1.92	<1.60
Co-58	<1.09	<1.99	<0.84	<1.05	<1.48	<0.70
Mn-54	<1.48	<1.55	<1.30	<1.07	<1.19	<1.23
Co-60	<1.76	<1.36	<3.21	<1.22	<0.97	<1.40
K-40	37.4 ± 16.8	73.2 ± 25.5	<22.5	<9.22	<20.7	19.3 ± 13.5
Ra-226	<28.6	<34.2	<26.9	<19.4	<24.8	<23.1
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ONSITE COMPOSITE			
Ce-144	<4.95	<7.45	<5.04	<5.49	<6.33	<5.50
Ce-141	<1.79	<2.98	<1.59	<1.58	<2.09	<2.36
Be-7	107 ± 17.9	110 ± 20.0	73.5 ± 17.5	110 ± 17.1	86.0 ± 18.7	64.9 ± 16.3
Ru-103	<1.44	<2.46	<1.42	<1.45	<1.77	<1.78
Cs-134	<1.42	<1.35	<1.46	<1.12	<1.63	<1.26
Cs-137	<1.16	<1.71	<1.17	<0.95	<1.27	<1.63
Zr-95	<3.63	<4.16	<3.85	<2.12	<3.67	<3.79
Nb-95	<1.71	<2.55	<1.90	<1.69	<2.40	<2.26
Co-58	<1.72	<2.24	<2.10	<1.61	<1.53	<1.60
Mn-54	<1.56	<1.79	<1.66	<1.04	<1.81	<1.57
Co-60	<1.46	<1.47	<2.50	<1.68	<1.38	<1.29
K-40	21.2 ± 2.1	47.6 ± 21.4	<28.8	10.1 ± 9.4	18.9 ± 13.3	24.2 ± 15.0
Ra-226	<21.6	<35.3	<23.8	<21.7	<24.9	<26.8
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1987

Results in Units of 10^{-3} pCi/m³ ± 2 sigma

Nuclides	July	August	September	October	November	December
			J ONSITE COMPOSITE			
Ce-144	<5.61	<6.11	<5.70	<4.23	<5.69	<5.42
Ce-141	<1.93	<2.24	<1.96	<1.70	<2.04	<2.43
Be-7	146 ± 18.9	148 ± 22.4	76.5 ± 17.8	107 ± 18.0	69.7 ± 17.0	59.8 ± 13.7
Ru-103	<1.34	<1.48	<1.87	<1.43	<1.63	<1.69
Cs-134	<1.16	<1.62	<1.53	<1.24	<1.32	<1.01
Cs-137	<0.99	<1.41	<1.81	<1.40	<1.48	<1.06
Zr-95	<2.32	<4.02	<3.73	<3.81	<4.51	<3.45
Nb-95	<1.26	<2.20	<1.82	<1.85	<2.29	<1.70
Co-58	<1.28	<1.52	<1.04	<1.00	<1.10	<1.31
Mn-54	<1.31	<1.47	<1.61	<1.69	<1.49	<1.62
Co-60	<1.35	<1.36	<1.51	<1.16	<1.85	<1.28
K-40	57.9 ± 18.3	42.8 ± 17.8	<22.8	<19.7	<22.6	53.3 ± 16.9
Ra-226	<22.6	<31.3	<25.9	<19.2	<29.1	<24.5
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			K ONSITE COMPOSITE			
Ce-144	<5.21	<5.15	<6.29	<5.01	<6.28	<6.05
Ce-141	<1.86	<1.79	<2.16	<1.62	<1.97	<2.19
Be-7	109 ± 18.1	125 ± 22.2	<34.1	119 ± 17.6	81.9 ± 17.6	63.6 ± 15.0
Ru-103	<1.33	<1.57	<1.72	<1.34	<1.86	<1.90
Cs-134	<0.82	<1.07	<1.10	<1.19	<1.43	<1.29
Cs-137	<1.22	<1.27	<1.11	<1.06	<1.53	<1.33
Zr-95	<4.33	<1.43	<3.06	<3.27	<3.45	<4.68
Nb-95	<2.05	<1.07	<1.55	<1.69	<1.66	<1.47
Co-58	<1.80	<1.37	<1.57	<1.09	<2.03	<1.19
Mn-54	<1.66	<1.08	<1.24	<1.30	<1.50	<1.41
Co-60	<2.07	<1.01	<0.57	<1.03	<1.72	<0.66
K-40	<18.0	14.7 ± 12.4	42.6 ± 17.9	13.4 ± 8.90	<23.8	26.1 ± 14.1
Ra-226	<20.7	<23.3	<25.6	19.9 ± 11.9	<19.8	<28.7
Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

TABLE 10

DIRECT RADIATION MEASUREMENT RESULTS (1987)
Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND DISTANCE)[2]
3	D1 on Site	6.4±1.1	8.8±0.9	11.3±1.2	11.4±1.4	0.2 miles @ 69°
4	D2 on Site	4.6±0.3	5.6±0.6	5.7±0.5	5.8±0.5	0.4 miles @ 140°
5	E on Site	5.5±0.2	5.2±0.4	6.3±0.4	6.1±0.4	0.4 miles @ 175°
6	F on Site	4.0±0.3	4.7±0.4	5.7±0.3	4.0±1.1	0.5 miles @ 210°
7*	G on Site	4.4±0.2	4.4±0.2	5.5±0.2	4.6±0.2	0.7 miles @ 250°
8*	R-5 off-Site-Control	5.3±0.4	5.6±0.4	6.6±0.5	5.4±0.5	16.4 miles @ 42°
9	D1 off Site	5.1±0.2	4.8±0.9	5.7±0.4	5.2±0.4	11.4 miles @ 80°
10	D2 off Site	5.0±0.2	4.8±0.2	5.2±0.4	5.0±0.4	9.0 miles @ 117°
11	E off Site	5.1±0.3	4.4±0.3	5.7±0.3	5.2±0.4	7.2 miles @ 160°
12	F off Site	5.0±0.6	4.5±0.4	5.8±0.4	5.0±0.4	7.7 miles @ 190°
13	G off Site	5.2±0.4	4.6±0.2	5.6±0.3	5.2±0.4	5.3 miles @ 225°
14*	DeMass Rd., SW Oswego-Control	5.2±0.3	5.4±0.6	5.8±0.4	5.0±0.4	12.6 miles @ 226°
15*	Pole 66, W. Boundary-Bible Camp	4.8±0.4	4.2±0.3	5.2±0.4	4.9±0.4	0.9 miles @ 237°
18*	Energy Info. Center-Lamp Post, SW	5.7±0.2	5.8±0.4	6.2±0.4	5.8±0.4	0.4 miles @ 265°
19	East Boundary-JAF, Pole 9	5.4±0.6	5.2±0.5	6.0±0.4	5.2±0.2	1.3 miles @ 81°
23*	H on Site	6.2±0.5	5.8±0.4	7.0±0.4	6.4±0.5	0.8 miles @ 70°
24	I on Site	5.5±0.5	4.9±0.4	6.2±0.5	5.8±0.5	0.8 miles @ 98°
25	J on Site	5.4±0.6	4.8±0.3	4.9±0.3	5.1±0.4	0.9 miles @ 110°
26	K on Site	5.6±0.4	5.0±0.3	4.9±0.5	5.1±0.3	0.5 miles @ 132°
27	N. Fence, N. of Switchyard, JAF	9.8±2.4	13.6±3.0	16.4±3.0	18.2±4.0	0.4 miles @ 60°
28	N. Light Pole, N. of Screenhouse, JAF	14.4±4.8	18.1±5.2	21.1±5.8	23.0±8.4	0.5 miles @ 68°
29	N. Fence, N. of W. Side	30.8±5.4	32.8±6.8	31.0±8.0	31.8±9.7	0.5 miles @ 65°
30	N. Fence (NW) JAF	9.1±1.8	11.6±2.0	13.6±1.6	14.6±2.6	0.4 miles @ 57°
31	N. Fence (NW) NMP-1	------ (1)	8.4±1.2	8.1±1.2	7.9±1.1	0.2 miles @ 276°
39	N. Fence, Rad. Waste-NMP-1	12.2±1.8	11.0±1.6	11.1±1.2	11.4±2.2	0.2 miles @ 292°
47	N. Fence, (NE) JAF	8.6±1.2	10.6±1.5	11.8±1.9	11.4±1.6	0.6 miles @ 69°
49*	Phoenix, NY-Control	5.0±0.2	4.6±0.2	5.4±0.2	5.1±0.6	19.8 miles @ 170°
51	Liberty & Bronson Sts., E of OSS	5.8±0.3	4.7±0.2	5.4±0.2	5.8±0.5	7.4 miles @ 233°
52	East 12th & Cayuga Sts., Osw. School	5.6±0.4	4.8±0.2	5.6±0.2	5.3±0.4	5.8 miles @ 227°

TABLE 10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1987)
Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND DISTANCE)[2]
53	Broadwell & Chestnut Sts. - Fulton H.S.	5.6±0.2	4.8±0.3	6.1±0.5	5.4±0.4	13.7 miles @ 183°
54	Liberty St. & Co. Rt. 16 - Mexico H.S.	5.5±0.6	4.8±0.2	5.3±0.4	4.6±0.4	9.3 miles @ 115°
55	Gas Substation Co. Rt. 5 - Pulaski	5.4±0.6	4.6±0.3	5.4±0.2	5.1±0.2	13.0 miles @ 75°
56*	Rt. 104-New Haven SCH. (SE Corner)	5.6±0.5	4.5±0.3	5.8±0.5	5.1±0.3	5.3 miles @ 123°
58*	Co. Rt. 1A-ALCAN (E. of Entrance Rd.)	5.3±0.3	4.1±2.1	4.7±0.4	5.4±0.3	3.1 miles @ 220°
75*	Unit 2, N. Fence, N. of Reactor Bldg.	6.0±0.3	4.9±0.5	5.6±0.5	5.1±0.4	0.1 miles @ 5°
76*	Unit 2, N. Fence, N. of Change House	4.4±0.4	5.3±0.6	5.6±0.4	5.5±0.5	0.1 miles @ 25°
77*	Unit 2, N. Fence, N. of Pipe Bldg.	5.8±0.3	7.5±0.5	7.5±1.2	6.0±0.6	9.2 miles @ 45°
78*	JAF, E. of E. Old Lay Down Area	6.0±0.5	6.0±0.4	6.0±0.4	5.5±0.5	1.0 miles @ 90°
79*	Co. Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd.	5.0±0.3	5.4±0.2	5.5±0.4	5.2±0.2	1.1 miles @ 115°
80*	Co. Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd.	5.0±0.3	4.5±0.1	5.4±0.2	5.1±0.3	1.4 miles @ 133°
81*	Miner Rd., Pole #16, 0.5 mi. W. of Rt. 29	5.4±0.3	4.5±0.3	5.8±0.3	5.6±0.5	1.6 miles @ 159°
82*	Miner Rd., Pole #1 1/2, 1.1 mi. W. of Rt. 29	5.2±0.3	4.4±0.2	4.8±0.2	5.5±0.4	1.6 miles @ 181°
83*	Lakeview Rd., Tree 0.45 mi. N. of Miner Rd.	5.4±0.5	5.2±0.9	5.6±0.2	5.3±0.4	1.2 miles @ 200°
84*	Lakeview Rd., N., Pole #6117, 200ft. N. of Lake Rd.	5.7±0.5	5.8±1.0	5.6±0.5	5.5±0.5	1.1 miles @ 225°
85*	Unit 1, N. Fence, N. of W. Side of Screen House	13.2±2.6	12.1±3.4	12.1±1.6	14.3±2.1	0.2 Miles @ 294°
86*	Unit 2, N. Fence, N. of W. Side of Screen House	6.8±0.9	7.3±1.6	7.1±0.7	6.4±0.9	0.1 miles @ 315°

TABLE 10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1987)
Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND DISTANCE)[2]
87*	Unit 2, N. Fence, N. of E. Side of Screen House	6.0±0.4	5.6±0.5	6.1±0.6	5.9±0.6	0.1 miles @ 341°
88*	Hickory Grove Rd., Pole #2. 0.6 mi. N. of Rt. 1	6.0±1.2	4.5±0.4	5.8±0.3	5.0±0.4	4.5 miles @ 97°
89*	Leavitt Rd., Pole #16, 0.4 mi. S. of Rt. 1	5.7±0.2	5.4±0.3	6.0±0.4	5.3±0.4	4.1 miles @ 111°
90*	Rt. 104, Pole #300, 150ft. E. of Keefe Rd.	5.4±0.4	4.7±0.3	5.4±0.2	5.0±0.3	4.2 miles @ 135°
91*	Rt. 51A, Pole #59, 0.8 mi. W. of Rt. 51	5.0±0.1	4.3±0.5	5.0±0.2	4.8±0.5	4.8 miles @ 156°
92*	Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104	5.5±0.2	5.2±0.4	6.1±0.5	5.5±0.3	4.4 miles @ 183°
93*	Rt. 53, Pole 1-1, 120 ft. S. of Rt. 104	4.5±0.3	5.2±0.3	5.7±0.6	5.0±0.2	4.4 miles @ 205°
94*	Rt. 1, Pole #82, 250ft. E. of Kocher Rd.	4.9±0.5	5.4±0.3	5.0±0.4	5.0±0.3	4.7 miles @ 223°
95*	Lakeshore Camp Site, from Alcan W. Access Rd. Pole #21, 1.2 mi. N. of Rt. 1	4.6±0.2	4.6±0.1	5.1±0.2	4.5±0.1	4.1 miles @ 237°
96*	Creamery Rd., 0.3 mi. S. of Middle Rd. Pole 1 1/2	5.5±0.6	4.6±0.2	5.2±0.2	5.5±0.4	3.6 miles @ 199°
97*	Rt. 29, Pole #50, 200 ft. N. of Miner Rd.	5.6±0.3	3.5±1.2	5.6±0.3	4.9±0.3	1.8 miles @ 143°
98*	Lake Rd., Pole #145, 0.15 mi. of of Rt. 29	6.1±0.2	4.9±0.3	5.9±0.3	6.1±0.4	1.2 miles @ 101°
99	NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 off-site	4.9±0.1	5.0±0.2	5.6±0.4	5.5±0.4	1.8 miles @ 88°
100	Rt. 29 and Lake Rd., Env. Station R2 off-site	5.0±0.3	4.6±0.3	6.0±0.3	5.3±0.4	1.1 miles @ 104°
101	Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3	5.3±0.3	4.5±0.6	5.6±0.2	5.4±0.3	1.5 miles @ 132°

TABLE 10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1987)
Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND DISTANCE)[2]
102	EOF/Env. Lab, Oswego Co. Airport (Fulton Airport, Rt. 176)	6.8±0.4	4.7±0.3	5.8±0.4	5.8±0.3	11.9 miles @ 175°
103	EIC, East Garage Rd., Lamp Post R3 off-site	5.8±0.2	5.4±0.4	5.5±0.3	6.3±0.4	0.4 miles @ 267°
104	Parkhurst Road, Pole #148 1/2-A, 0.1 miles South of Lake Rd.	5.4±0.5	4.8±0.2	5.2±0.4	5.3±0.4	1.4 miles @ 102°
105	Lakeview Rd., Pole #6125, 0.6 mi. South of Lake Rd.	5.4±0.4	5.0±0.2	5.8±0.4	5.0±0.3	1.4 miles @ 198°
106	Shoreline Cove, East of NMP-1, Tree on West Edge	6.3±0.5	6.0±0.6	6.5±0.5	6.2±0.4	0.3 miles @ 274°
107	Shoreline Cove, East of NMP-1	---- (3)	19.5±1.9	6.7±0.6	5.7±0.5	0.3 miles @ 272°

(1) TLD lost in field.

(3) Station established April, 1987.

[2] Direction and distance based on NMP-2 reactor centerline and sixteen 22.5° sector grid.

* Technical specification location.

TABLE 11

CONCENTRATIONS OF IODINE-131 IN MILK
Results in Units of pCi/l ± 2 sigma

Station*	04/06/87	04/20/87	05/04/87	05/18/87	06/01/87	06/15/87	07/06/87	07/20/87	08/03/87
No. 60	<0.41	<0.26	<0.30	<0.49	<0.44	<0.26	<0.29	<0.25	<0.28
No. 55	<0.37	<0.33	<0.24	<0.26	<0.28	<0.19	<0.37	<0.24	<0.24
No. 50	<0.32	<0.39	<0.31	<0.41	<0.50	<0.22	<0.43	<0.29	<0.23
No. 7	<0.26	<0.22	<0.34	<0.37	<0.40	<0.22	<0.34	<0.31	<0.29
No. 4	<0.47	<0.26	<0.33	<0.17	<0.38	<0.22	<0.45	<0.37	<0.34
No. 16	<0.29	<0.28	<0.29	<0.24	<0.28	<0.25	<0.32	<0.21	<0.23
No. 65 (Control)	<0.21	<0.29	<0.24	<0.25	<0.42	<0.25	<0.36	<0.38	<0.28

*Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 11 (Continued)

CONCENTRATIONS OF IODINE-131 IN MILK
Results in Units of pCi/l ± 2 sigma

Station*	08/17/87	09/08/87	09/21/87	10/05/87	10/19/87	11/02/87	11/16/87	12/07/87	12/21/87
No. 60	<0.28	<0.46	<0.43	<0.32	<0.28	<0.24	<0.32	<0.33	<0.38
No. 55	<0.41	<0.20	<0.28	<0.20	<0.25	<0.18	<0.33	<0.41	<0.24
No. 50	<0.31	<0.49	<0.14	<0.22	<0.27	<0.20	<0.39	<0.22	<0.18
No. 7	<0.44	<0.26	<0.12	<0.23	<0.34	<0.26	<0.39	<0.23	<0.20
No. 4	<0.38	<0.26	<0.30	<0.17	<0.36	<0.25	<0.23	<0.18	<0.18
No. 16	<0.38	<0.29	<0.33	<0.29	<0.34	<0.23	<0.24	<0.31	<0.14
No. 65 (Control)	<0.38	<0.21	<0.28	<0.29	<0.19	<0.19	<0.34	<0.16	<0.21

*Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 12

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/l ± 2 sigma

Station*	Nuclides	04/06/87	04/20/87	05/04/87	05/18/87	06/01/87	06/15/87
No. 60	K-40	1300+197	1430+224	1420+190	1590+189	1400+165	1530+188
	Cs-134	<8.4	<9.5	<7.6	<8.4	<7.6	<6.7
	Cs-137	<8.9	<13.6	<9.8	<8.3	<7.7	<8.1
	Ba/La-140	<8.6	<9.8	<6.5	<7.4	<7.5	<6.7
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1710+205	1400+262	1640+168	1510+173	1660+169	1270+183
	Cs-134	<8.4	<10.7	<8.4	<7.7	<6.3	<6.6
	Cs-137	<8.9	<13.3	8.1+4.6	<9.0	<8.2	<6.1
	Ba/La-140	<7.0	<13.5	<7.3	<8.5	<7.7	<8.3
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1410+174	1670+271	1330+159	1740+182	1400+189	1730+172
	Cs-134	<8.0	<9.0	<6.6	<7.0	<8.2	<6.4
	Cs-137	<8.3	<12.0	<8.1	<8.9	<8.4	<8.3
	Ba/La-140	<7.7	<8.5	<8.0	<8.5	<6.4	<5.1
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1450+203	1530+241	1490+170	1590+167	1540+189	1630+189
	Cs-134	<9.4	<10.6	<6.9	<7.8	<6.6	<6.2
	Cs-137	<8.3	<11.1	5.5+4.0	<7.9	<7.8	<8.1
	Ba/La-140	<9.8	<4.9	<6.0	<4.8	<7.4	<7.5
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1470+178	1730+250	1730+196	1570+198	1510+197	1590+188
	Cs-134	<6.6	<9.3	<7.1	<8.6	<8.9	<7.4
	Cs-137	<8.6	<11.7	<9.7	<10.5	<8.6	<8.0
	Ba/La-140	<7.5	<9.4	<7.0	<11.1	<5.4	<5.5
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1390+196	1550+286	1650+172	1740+194	1380+181	1730+173
	Cs-134	<8.3	<10.6	<7.2	<7.0	<6.4	<7.1
	Cs-137	<9.7	<15.4	<8.0	<9.1	<8.8	<9.0
	Ba/La-140	<7.7	<12.9	<7.2	<9.0	<6.0	<6.8
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1490+263	1370+225	1670+192	1710+174	1530+164	1610+166
	Cs-134	<11.8	<8.9	<7.8	<7.7	<6.3	<7.0
	Cs-137	<11.3	<11.4	<6.8	<8.5	<7.3	<7.4
	Ba/La-140	<8.9	<13.5	<6.0	<2.4	<5.9	<5.6
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

*Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 12 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/l ± 2 sigma

Station*	Nuclides	07/06/87	07/20/87	08/03/87	08/17/87	09/08/87	09/21/87
No. 60	K-40	1660±61.3	744±93.6	1520±167	1580±165	1500±166	1490±136
	Cs-134	<2.4	<4.2	<7.2	<6.1	<6.4	<4.1
	Cs-137	<2.8	<4.6	<7.7	<7.4	<6.9	<5.5
	Ba/La-140	<2.6	<2.9	<5.1	<4.2	<5.1	<4.5
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1260±185	1540±185	1640±135	1810±143	1600±142	1530±142
	Cs-134	<6.3	<7.4	<4.9	<5.1	<4.9	<4.7
	Cs-137	<9.2	<8.5	<5.4	<5.3	<5.5	<5.5
	Ba/La-140	<9.7	<5.0	<5.8	<5.3	<3.8	<3.7
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1690±71.8	1370±163	1680±173	1610±134	1470±139	1270±148
	Cs-134	<2.6	<6.8	<7.0	<4.8	<4.5	<7.1
	Cs-137	<2.8	<7.2	<7.0	<5.2	<5.9	<6.3
	Ba/La-140	<3.0	<7.7	<7.1	<6.1	<4.9	<6.1
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1430±194	1740±173	1450±198	1580±169	1780±147	1670±144
	Cs-134	<7.8	<5.7	<8.4	<5.9	<4.9	<4.7
	Cs-137	<9.7	<8.7	<8.0	<7.7	<5.7	<5.4
	Ba/La-140	<9.8	<7.7	<10.5	<4.8	<5.1	<4.8
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1360±165	1400±157	1430±193	1440±139	1440±137	1570±201
	Cs-134	<6.5	<7.1	<5.3	<3.8	<5.0	<7.0
	Cs-137	<8.1	<8.2	<9.2	<6.6	<5.5	<7.8
	Ba/La-140	<8.9	<6.1	<7.9	<4.9	<5.6	<9.2
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1820±176	1570±183	1430±191	1570±201	1340±188	1640±175
	Cs-134	<6.3	<5.5	<7.4	<7.8	<8.4	<6.6
	Cs-137	<9.2	<7.5	<9.8	<10.7	<7.1	<7.5
	Ba/La-140	<8.0	<6.1	<5.7	<7.5	<8.4	<3.6
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1610±177	1190±176	1360±191	1720±140	1640±172	1610±142
	Cs-134	<6.7	<7.2	<6.5	<4.5	<6.6	<4.8
	Cs-137	<8.0	<8.9	<8.9	<5.3	<8.2	<[illegible].2
	Ba/La-140	<7.2	<8.0	<10.7	<5.3	<7.3	<5.6
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

*Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 12 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/l ± 2 sigma

Station*	Nuclides	10/05/87	10/19/87	11/02/87	11/16/87	12/07/87	12/21/87
No. 60	K-40	1400+156	1500+161	1400+134	1350+190	1450+189	1640+169
	Cs-134	<6.9	<6.6	<5.3	<7.3	<5.6	<6.1
	Cs-137	<7.3	<7.8	<5.4	<8.2	<9.2	<7.9
	Ba/La-140	<7.7	<8.0	<5.3	<8.1	<10.2	<5.1
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1520+165	1440+197	1660+138	1550+203	1560+204	1630+136
	Cs-134	<6.9	<7.8	<4.9	<7.7	<7.3	<5.2
	Cs-137	<7.4	<8.2	<5.5	<7.8	<8.7	<5.3
	Ba/La-140	<4.8	<7.2	<5.8	<9.6	<6.2	<4.8
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1620+135	1550+134	1670+174	1450+135	1720+141	1450+193
	Cs-134	<4.4	<5.6	<7.0	<4.8	<5.3	<6.3
	Cs-137	<5.1	<5.9	<7.5	<5.4	<5.4	<8.7
	Ba/La-140	<5.3	<5.0	<8.7	<3.0	<4.8	<11.2
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1180+40.9	1370+133	1620+167	1690+170	1320+132	1550+140
	Cs-134	<1.6	<5.2	<6.3	<6.3	<5.1	<5.5
	Cs-137	<1.8	<5.3	<7.7	<7.4	<5.1	<5.5
	Ba/La-140	<1.9	<3.1	<4.0	<5.1	<3.9	<6.4
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1340+187	1370+189	1620+141	1540+165	1770+145	1820+144
	Cs-134	<6.7	<7.1	<5.8	<6.0	<5.3	<4.6
	Cs-137	<10.0	<9.5	<6.0	<7.7	<6.1	<5.3
	Ba/La-140	<8.1	<8.4	<5.5	<9.1	<4.9	<5.4
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1700+177	1560+165	1430+192	1820+143	1680+137	1400+134
	Cs-134	<6.4	<6.6	<7.0	<5.4	<5.0	<5.0
	Cs-137	<7.6	<8.4	<10.4	<6.3	<5.7	<5.9
	Ba/La-140	<7.6	<7.2	<11.9	<5.0	<6.2	<5.3
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1790+144	1410+197	1350+186	1450+136	1670+169	1470+198
	Cs-134	<5.0	<7.8	<7.7	<5.3	<6.7	<8.5
	Cs-137	<6.1	<7.5	<8.4	<5.2	<7.8	<8.0
	Ba/La-140	<5.2	<5.1	<6.5	<5.9	<6.9	<5.1
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

*Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 13

MILCH ANIMAL CENSUS 1987

TOWN OR AREA(a)	NUMBER OF CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILCH ANIMALS
Scriba	1(b)	220°	3.0 miles	None
	16*	190°	5.2	40C
	2	195°	8.0	ND
	3(b)	190°	4.5	2C
	6(b)	62°	2.2	1C
	26(b)	115°	1.6	ND
	61(b)	140°	3.0	15G
	62	183°	6.7	5G
	63	185°	8.0	39C
New Haven	8	130°	9.2	32C
	9	95°	5.2	40C
	4*	113°	7.8	95C
	45	125°	8.0	None
	10(b)	130°	2.6	32C
	5	146°	7.2	52C
	11	130°	8.5	36C
	7*	107°	5.5	67C
	64	107°	7.9	50C
Mexico	12	107°	11.5	22C
	13	114°	11.2	1C
	14	120°	9.8	57C
	15	100°	10.8	None
	17	115°	10.2	45C
	18	110°	10.0	42C
	19	132°	10.5	40C
	20	123°	11.2	None
	60*	90°	9.5	40C
	50*	93°	8.2	170C
	55*	95°	9.0	55C
	21	112°	10.5	80C
	49	88°	7.9	6G
Richland	22	85°	10.2	42C
Pulaski	23	92°	10.5	55C
Oswego	24	214°	8.8	None

TABLE 13 (Continued)

MILCH ANIMAL CENSUS 1987

TOWN OR AREA(a)	NUMBER OF CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILCH ANIMALS
Hannibal	40	220°	15.2	None
Sterling	65**	220°	17.0	42C
Volney	25	182°	9.5	None
	70	147°	9.4	17C
	66	158°	7.8	90C;1G
	67	152°	8.3	3G
		TOTALS:		957 Cows (c)
				30 Goats
				1284 Cows (d)

C = Cows

G = Goats

* = Milk sample location

** = Milk sample control location

ND = Did not wish to participate in the survey

(1) = References Figure 4

(2) = Based on Nine Mile Point Unit 2 Reactor Centerline

None = No cows or goats at that location. Location was a previous location with cows or goats.

(a) = Census performed out to a distance of approximately ten miles.

(b) = Location within five miles.

(c) = Number of cows within ten miles.

(d) = Number of cows within entire census area.

TABLE 14

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS
Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	OTHERS
(T)	09/14/87	Cabbage	<0.14	2.66±0.27	<0.027	<0.014	<0.016	<LLD
(T)	09/14/87	Squash Leaves	1.88±0.19	2.22±0.22	<0.019	<0.011	<0.012	<LLD
(T)	09/14/87	Beet Greens	0.47±0.15	4.87±0.49	<0.037	<0.018	<0.017	<LLD
(P)	09/15/87	Cabbage	<0.15	2.02±0.25	<0.028	<0.015	<0.016	<LLD
(P)	09/15/87	Squash Leaves	1.47±0.15	2.05±0.20	<0.024	<0.012	<0.012	<LLD
(P)	09/15/87	Green Beans	1.46±0.15	1.16±0.12	<0.026	<0.011	<0.013	<LLD
(J)	09/14/87	Swiss Chard	0.27±0.10	5.22±0.52	<0.026	<0.010	<0.011	<LLD
(J)	09/14/87	Lettuce	0.54±0.17	1.85±0.27	<0.036	<0.016	<0.018	<LLD
(J)	09/14/87	Pumpkin Leaves	1.23±0.14	2.51±0.25	<0.023	<0.011	<0.013	<LLD
(R)	09/15/87	Squash Leaves	0.97±0.11	2.37±0.24	<0.019	<0.012	<0.012	<LLD
(R)	09/15/87	Cucumber Leaves	1.81±0.18	1.33±0.15	<0.020	<0.010	<0.011	<LLD
(R)	09/15/87	Green Beans	0.94±0.12	1.06±0.12	<0.027	<0.011	<0.013	<LLD
(N)	09/15/87	Squash Leaves	1.74±0.17	2.21±0.22	<0.025	<0.014	<0.014	<LLD
(S)	09/15/87	Grape Leaves	0.75±0.10	1.18±0.14	<0.020	<0.009	<0.009	<LLD

TABLE 14 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS
Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	OTHERS
(V)	09/15/87	Cabbage	<0.12	2.85±0.29	<0.025	<0.013	<0.012	<LLD
(W)	09/15/87	Squash Leaves	1.69±0.17	2.43±0.24	<0.020	<0.009	<0.009	<LLD
(W)	09/15/87	Cabbage	0.10±0.06	2.55±0.25	<0.021	<0.009	<0.008	<LLD
(W)	09/15/87	Swiss Chard	<0.12	5.01±0.50	<0.028	<0.013	<0.012	<LLD
(W)	09/15/87	Beet Greens	0.34±0.13	5.81±0.58	<0.032	<0.014	<0.013	<LLD
(T)	09/14/87	Tomatoes	<0.08	2.35±0.24	<0.018	<0.010	<0.009	<LLD
(P)	09/15/87	Tomatoes	<0.09	2.61±0.26	<0.020	<0.013	<0.012	<LLD
(J)	09/14/87	Tomatoes	<0.09	2.48±0.25	<0.020	<0.011	<0.011	<LLD
(R)	09/15/87	Tomatoes	<0.08	2.62±0.26	<0.016	<0.010	<0.009	<LLD
(N)	09/15/87	Tomatoes	<0.07	1.84±0.19	<0.018	<0.009	<0.010	<LLD
(S)	09/15/87	Tomatoes	<0.08	2.17±0.22	<0.018	<0.009	0.0162±0.008	<LLD
(V)	09/15/87	Tomatoes	<0.11	1.91±0.20	<0.025	<0.011	<0.011	<LLD
(W)	09/15/87	Tomatoes	<0.20	2.95±0.29	<0.049	<0.019	<0.020	<LLD
(S)	09/15/87	Weed	0.76±0.15	4.93±0.49	<0.027	<0.015	<0.016	<LLD

TABLE 15

CONCENTRATIONS OF GAMMA EMITTERS IN SITE BOUNDARY VEGETATION
Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	OTHERS
(K)	09/14/87	Viburnum	1.83±0.13	3.75±0.24	<0.015	<0.012	<0.001	<LLD
(K)	09/14/87	Grape Leaves	1.19±0.11	2.64±0.22	<0.017	<0.001	<0.014	<LLD
(K)	09/14/87	Goldenrod	2.48±0.21	6.54±0.48	<0.032	<0.022	<0.025	<LLD
(L)	09/14/87	Viburnum	1.40±0.11	2.75±0.22	<0.015	<0.010	<0.011	<LLD
(L)	09/14/87	Grape Leaves	1.19±0.11	3.58±0.20	<0.019	<0.013	<0.012	<LLD
(L)	09/14/87	Goldenrod	2.10±0.18	5.18±0.45	<0.022	<0.018	<0.022	<LLD
(M)	09/14/87	Viburnum	1.79±0.14	2.36±0.23	<0.017	<0.012	<0.013	<LLD
(M)	09/14/87	Grape Leaves	1.40±0.13	2.45±0.24	<0.016	<0.013	<0.012	<LLD
(M)	09/14/87	Goldenrod	2.37±0.24	5.39±0.55	<0.038	<0.025	<0.028	<LLD

TABLE 16

1987 RESIDENCE CENSUS

LOCATION	MAP DESIGNATION[a]	METEOROLOGICAL SECTOR	DEGREES[b]	DISTANCE[b]
w		N	-	-
w		NNE	-	-
w		NE	-	-
w		ENE	-	-
Sunset Bay	A	E	82°	1.0 miles
Lake Road	B	ESE	118°	0.8 miles
Parkhurst Road	C	SE	130°	1.4 miles
County Route 29	D	SSE	148°	1.2 miles
Miner Road	E	S	170°	1.6 miles
Lakeview Road	F	SSW	212°	1.8 miles
Lakeview Road	G	SW	234°	1.4 miles
Bible Camp Retreat	H	WSW	248°	1.4 miles
w		W	-	-
w		WNW	-	-
w		NW	-	-
w		NNW	-	-

w This meteorological sector is over Lake Ontario. There are no residences within three miles.

(a) See Figure 3, Section VII.

(b) Based on Nine Mile Point Unit 2 Reactor Centerline.

TABLE 17

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES AND DISTANCE[1]
Shoreline Sediment	05*	Figure 1	Sunset Bay	80° at 1.5 miles
	06	Figure 1	Langs Beach, Control	230° at 5.8 miles
Fish	02*	Figure 1	Nine Mile Point Transect	315° at 0.3 miles
	03*	Figure 1	FitzPatrick Transect	55° at 0.6 miles
	00*	Figure 1	Oswego Transect	235° at 6.2 miles
Surface Water	03*	Figure 1	FitzPatrick Inlet	70° at 0.5 miles
	08*	Figure 1	Oswego Steam Station	235° at 7.6 miles
	09	Figure 1	Nine Mile Point Unit 1 Inlet	305° at 0.3 miles
	10	Figure 1	Oswego City Water	240° at 7.8 miles
	11	Figure 1	Nine Mile Point Unit 2 Inlet	304 at 0.1 miles
Air Radioiodine and Particulates	R-1*	Figure 1	R-1 Station, Nine Mile Pt. Rd.	88° at 1.8 miles
	R-2*	Figure 2	R-2 Station, Lake Road	104° at 1.1 miles
	R-3*	Figure 2	R-3 Station, Co. Rt. 29	132° at 1.5 miles
	R-4*	Figure 2	R-4 Station, Co. Rt. 29	143° at 1.8 miles
	R-5*	Figure 1	R-5 Station, Montario Point Rd.	42° at 16.4 miles
	D1	Figure 2	D1 Onsite Station, Onsite	69° at 0.2 miles
	D2	Figure 1	D2 Offsite Station, Offsite	117° at 9.0 miles
	E	Figure 1	E Offsite Station, Offsite	160° at 7.2 miles
	F	Figure 1	F Offsite Station, Offsite	190° at 7.7 miles
	G	Figure 2	G Onsite Station, Onsite	250° at 0.7 miles
	H	Figure 2	H Onsite Station, Onsite	71° at 0.8 miles
	I	Figure 2	I Onsite Station, Onsite	98° at 0.8 miles
	J	Figure 2	J Onsite Station, Onsite	110° at 0.9 miles
	K	Figure 2	K Onsite Station, Onsite	132° at 0.5 miles
	G	Figure 1	G Offsite Station, St. Paul St.	225° at 5.3 miles

*Technical Specification location

(1) Based on Nine Mile Point Unit 2 Reactor Centerline

TABLE 17
(continued)
ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	3	Figure 2	D1 Onsite Station	69° at 0.2 miles
	4	Figure 2	D2 Onsite Station	140° at 0.4 miles
	5	Figure 2	E Onsite Station	175° at 0.4 miles
	6	Figure 2	F Onsite Station	210° at 0.5 miles
	7*	Figure 2	G Onsite Station	250° at 0.7 miles
	8*	Figure 1	R-5 Offsite Station	42° at 16.4 miles
	9	Figure 1	D1 Offsite Location	80° at 11.4 miles
	10	Figure 1	D2 Offsite Location	117° at 9.0 miles
	11	Figure 1	E Offsite Location	160° at 7.2 miles
	12	Figure 1	F Offsite Location	190° at 7.7 miles
	13	Figure 1	G Offsite Location	225° at 5.3 miles
	14*	Figure 1	SW Oswego - Control	226° at 12.6 miles
	15*	Figure 2	West Site Boundary	237° at 0.9 miles
	18*	Figure 2	Energy Information Center	265° at 0.4 miles
	19	Figure 2	East Site Boundary	81° at 1.3 miles
	23*	Figure 2	H Onsite Station, Onsite	70° at 0.8 miles
	24	Figure 2	I Onsite Station, Onsite	98° at 0.8 miles
	25	Figure 2	J Onsite Station, Onsite	110° at 0.9 miles
	26	Figure 2	K Onsite Station, Onsite	132° at 0.5 miles
	27	Figure 2	North Fence, JAFNPP	60° at 0.4 miles
	28	Figure 2	North Fence, JAFNPP	68° at 0.5 miles
	29	Figure 2	North Fence, JAFNPP	65° at 0.5 miles
	30	Figure 2	North Fence, JAFNPP	57° at 0.4 miles
	31	Figure 2	North Fence, NMP-1	276° at 0.2 miles
	39	Figure 2	North Fence, NMP-1	292° at 0.2 miles
	47	Figure 2	North Fence, JAFNPP	69° at 0.6 miles
	49*	Figure 1	Phoenix, N.Y. - Control	170° at 19.8 miles
	51	Figure 1	Oswego Steam Station, East	233° at 7.4 miles
	52	Figure 1	Oswego Elementary School, East	227° at 5.8 miles
	53	Figure 1	Fulton High School	183° at 13.7 miles
	54	Figure 1	Mexico High School	115° at 9.3 miles
	55	Figure 1	Pulaski Gas Substation, Rt. 5	75° at 13.0 miles
	56*	Figure 1	New Haven Elementary School	123° at 5.3 miles

*Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 17
(Continued)
ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES AND DISTANCE[1]
Thermo-luminescent Dosimeters (TLDs)	58*	Figure 1	Co. Rt. 1 and Alcan	220° at 3.1 miles
	75*	Figure 2	North Fence, NMP-2	5° at 0.1 miles
	76*	Figure 2	North Fence, NMP-2	25° at 0.1 miles
	77*	Figure 2	North Fence, NMP-2	45° at 0.2 miles
	78*	Figure 2	East Boundary, JAFNPP	90° at 1.0 miles
	79*	Figure 2	County Route 29	115° at 1.1 miles
	80*	Figure 2	County Route 29	133° at 1.4 miles
	81*	Figure 2	Miner Road	159° at 1.6 miles
	82*	Figure 2	Miner Road	181° at 1.6 miles
	83*	Figure 2	Lakeview Road	200° at 1.2 miles
	84*	Figure 2	Lakeview Road	225° at 1.1 miles
	85*	Figure 2	North Fence, NMP-1	[illegible]4° at 0.2 miles
	86*	Figure 2	North Fence, NMP-1	315° at 0.1 miles
	87*	Figure 2	North Fence, NMP-2	341° at 0.1 miles
	88*	Figure 1	Hickory Grove Road	97° at 4.5 miles
	89*	Figure 1	Leavitt Road	111° at 4.1 miles
	90*	Figure 1	Route 104 and Keefe Road	135° at 4.2 miles
	91*	Figure 1	County Route 51A	156° at 4.8 miles
	92*	Figure 1	Maiden Lane Road	183° at 4.4 miles
	93*	Figure 1	County Route 53	205° at 4.4 miles
	94*	Figure 1	Co. Rt. 1 and Kocher Road	223° at 4.7 miles
	95*	Figure 1	Lakeshore Camp Site	237° at 4.1 miles
	96*	Figure 1	Creamery Road	199° at 3.6 miles
	97*	Figure 2	County Route 29	143° at 1.8 miles
	98*	Figure 1	Lake Road	101° at 1.2 miles
	99	Figure 2	Nine Mile Point Road	88° at 1.8 miles
	100	Figure 2	Co. Rt. 29 and Lake Road	104° at 1.1 miles
	101	Figure 2	County Route 29	132° at 1.5 miles
	102	Figure 1	Oswego County Airport	175° at 11.9 miles
	103	Figure 2	Energy Information Center, East	267° at 0.4 miles
	104	Figure 1	Parkhurst Road	102° at 1.4 miles
	105	Figure 2	Lakeview Road	198° at 1.4 miles
	106	Figure 2	Shoreline Cove, East of NMP-1	274° at 0.3 miles
	107	Figure 2	Shoreline Cove, East of NMP-1	272° at 0.3 miles

*Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 17
(continued)
ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES AND DISTANCE[1]
Cows Milk	7	Figure 4	Indicator Location	107° at 5.5 miles
	16	Figure 4	Indicator Location	190° at 5.2 miles
	50	Figure 4	Indicator Location	93° at 8.2 miles
	55	Figure 4	Indicator Location	95° at 9.0 miles
	60	Figure 4	Indicator Location	90° at 9.5 miles
	4	Figure 4	Indicator Location	113° at 7.8 miles
	65*	Figure 4	Control Location	220° at 17.0 miles
Food Products	J	Figure 3	Indicator Location	103° at 1.9 miles
	K*	Figure 3	Indicator Location	106° at 0.9 miles
	L*	Figure 3	Indicator Location	82° at 0.8 miles
	M*	Figure 3	Control Location	223° at 15.0 miles
	N	Figure 3	Indicator Location	171° at 1.6 miles
	P	Figure 3	Indicator Location	101° at 1.9 miles
	R	Figure 3	Indicator Location	114° at 1.5 miles
	S	Figure 3	Indicator Location	141° at 1.9 miles
	T	Figure 3	Indicator Location	84° at 1.6 miles
	V	Figure 3	Indicator Location	112° at 2.0 miles
	W	Figure 3	Control Location	225° at 12.6 miles

*Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

V DATA SUMMARIES AND CONCLUSIONS

The results of the 1987 Radiological Environmental Monitoring Program are evaluated considering the natural processes of the environment and the aggregate of past data. A number of factors are considered in the course of this radiological data evaluation and interpretation. The interpretation of data can be made at several levels including trend analysis, population dose, risk estimates to the general population based on environmental concentrations, effectiveness of plant effluent controls and specific research areas, among others. An attempt has been made in this report not only to report the data collected during the 1987 sample program but also to assess the significance of the radionuclides detected in the environment. It is important to note that detection of an isotope is not of itself an indication of its environmental significance. Evaluation of the impact of the radionuclide in terms of potential increased dose to man, in relation to natural background, is necessary.

There are four separate groups of radionuclides that were detected in the environment during 1987. Several of these radionuclides could possibly fall into three of the four groups. The first of these groups is naturally occurring radionuclides. It must be realized that the environment contains a broad inventory of naturally occurring radioactive elements. Background radiation as a function of primordial radioactive elements and cosmic radiation of solar origin, offers a constant exposure to the environment and man. These radionuclides, such as Th-228, Ra-226, Be-7 and especially K-40, account for a majority of the annual per capita background dose.

A second group of radionuclides that were detected are a result of the detonation of thermonuclear devices in the earth's upper atmosphere. The detonation frequency during the early 1950's produced a significant inventory of radionuclides found in the lower atmosphere as well as in ecological systems. A ban was placed on weapons testing in 1963 which greatly reduced the global inventory through the decay of short lived radionuclides, deposition, and the removal (by natural processes) of radionuclides from the food chain by such processes as weathering and sedimentation. Since 1963, several atmospheric weapons tests have been conducted by the People's Republic of China. In each case, the usual radionuclides associated with nuclear detonations were detected several months afterwards and then after a peak detection period, diminished to a point where most could not be detected. The last such weapons test was conducted in October of 1980. The resulting fallout or deposition from this test has influenced the background radiation in the vicinity of the site and was very evident in many of the sample medias analyzed during the 1981 sample program. Quantities of Nb-95, Zr-95, Ce-141, Ce-144, Ru-106, Ru-103, La-140, Cs-137, Mn-54 and Co-60 were typical in air particulate samples during 1981 and have a weapons test origin.

A third group of radionuclides was detected as a result of the Chernobyl accident which occurred in the Soviet Union during April, 1986. The resulting fallout or deposition from this accident influenced the background radiation in the vicinity of the site and was very evident in many of the sample media analyzed during 1986. Calculations of the resulting dose to man from Chernobyl related radionuclides in the environment show that the contribution from such nuclides in some cases (such as I-131 and Cs-137) is significant and second in intensity only to natural background radiation. Quantities of Nb-95, Ru-103, Ru-106, I-131, La-140, Cs-134, and Cs-137 were detected in air particulate samples during May and June of 1986. Milk samples collected and analyzed after April, 1986 contained measurable concentrations of I-131 and Cs-137. The origin of these radionuclides was a direct result of fallout from the Chernobyl accident. During 1987, Cs-137 was detected in several milk samples collected during the first half of the grazing season. The presence of Cs-137 in the milk samples is attributed to the ubiquitous concentrations of Cs-137 from weapons testing and from the Chernobyl releases.

The fourth group of radionuclides detected in the environment during 1987 were those that could be related to operations at the site. These select radionuclides were detected in a few of the sample medias collected and at very low concentrations. Many of these radionuclides are a by-product of nuclear detonations, the Chernobyl accident, and the operation of light water reactors thus making a distinction between the sources difficult, if not impossible, using routine sampling programs. The dose to man as a result of these radionuclides is small and significantly less than the radiation exposure from naturally occurring sources of radiation and fallout from the Chernobyl accident.

Thus, a number of factors must be considered in the course of radiological data evaluation and interpretation. The evaluation and interpretation is made at several levels including trend analysis, dose to man, etc. An attempt has been made not only to report the data collected during 1987, but also to assess the significance of the radionuclides detected in the environment as compared to natural radiation sources. It is important to note that detected concentrations of radionuclides that are possibly related to operations at the site are very small and are not of environmental significance. In regard to these very small quantities, it will be further noted that at such minute concentrations the assessment of the significance of detected radionuclides is very difficult. Therefore, concentrations in one sample that are two times the concentration of another, for example, are not significant overall. Moreover, concentrations at such low levels may show a particular radionuclide in one sample and yet not in another.

In Section V each sample medium is discussed. Concentrations of radionuclides detected and exposure to man are presented and scrutinized.

In the routine implementation of the Radiological Environmental Monitoring Program, additional or optional environmental pathway media are sampled and analyzed. These samples are obtained to monitor the secondary pathways not required by Technical Specifications and to maintain the analytical data base established in 1975 when the plant began commercial operation. These additional samples include; aquatic vegetation (cladophora), bottom sediment, mollusk, milk (Sr-90), meat/poultry and soil samples. In addition to the optional sample media, many additional locations are sampled and analyzed for those pathways required by Technical Specifications. These additional sample locations are obtained to insure that the important environmental pathways are monitored in a comprehensive manner and again, to maintain the analytical data base. Data are presented and evaluated only for those pathways/media required by

Technical Specification. Data from additional sample locations common with Technical Specification required sample media are normally included in the data presentation and evaluation. When additional locations are included, the use of this data will be specifically noted in section V.

Section VI, titled HISTORICAL DATA, contains sample statistics from previous environmental sampling. The process of determining the impact (or lack of impact) of plant operation on the environment includes the scrutiny of past analytical data, a tool by which trends are discerned. The interpretation of historical data in this report is done to a limited degree. Because of the constant change in analytical sensitivities, as state-of-the-art detection capabilities improve, data comparisons become difficult. For example, minimum detection capabilities for the 1969 analyses of environmental samples would be considered anomalous by current standards.

SURFACE WATER (LAKE) PROGRAM

Tables 1 through 4 list the 1987 analytical results for the aquatic/lake water media sampled during the 1987 sampling program. Fish samples were obtained at two onsite locations. The transect designations used for the onsite sampling locations are NMPP (02) and JAF (03). Offsite samples were collected in the vicinity of the Oswego Harbor (offsite - 00) area or further to the west (or east) and, therefore, served as control samples.

Lake water samples were collected from the inlet canals of Nine Mile Point Unit #1, Nine Mile Point Unit #2, J. A. FitzPatrick N.P.P., and the Oswego Steam Station. In addition to power plant samples, a routine sample of the Oswego city drinking water inlet was also obtained. The Oswego Steam Station served as the control location. Shoreline sediment samples were obtained in an area downstream from the site which proved to have existing recreation value and a physical make up which was suitable for sampling. The control sample was collected from an area upstream from the site with a similar physical makeup.

1. SHORELINE SEDIMENT - TABLE 1

Shoreline sediment samples were collected twice during 1987. Collections were made in April and October at one indicator location (Sunset Beach), and at one control location (Lang's Beach). The results of these samples collected at the indicator and control locations are presented in Table 1.

Several radionuclides were detected in sediment samples using gamma spectral analysis. These radionuclides were all naturally occurring. K-40 was detected at both the control location and indicator location. The results ranged from 15.4 pCi/g (dry) to 15.7 pCi/g (dry) at the indicator location, and 8.1 pCi/g (dry) to 14.7 pCi/g (dry) at the control location. AcTh-228 and Ra-226 were detected at both the indicator locations. The maximum detectable concentrations for AcTh-228 and Ra-226 were 0.93 pCi/g (dry) and 2.16 pCi/g (dry) respectively at the indicator location and 0.67 pCi/g (dry) and 1.11 pCi/g (dry) respectively for the control location.

No other radionuclides were detected in shoreline sediment samples using gamma spectral analysis.

No dose to man assessment can be made due to the fact that no radionuclides related to the operation of the power plants were detected in the 1987 shoreline sediment samples.
No long term historical data exists to compare the shoreline sediment indicator sample results with previous results. The Technical Specification Requirement to collect and analyze shoreline sediment was first initiated in the second half of 1985. A review of sample results for 1985 and 1986 indicated only naturally occurring radionuclides present in shoreline sediment. The inventory of nuclides identified in 1987 is the identical to that seen in 1985 and 1986. The 1987 concentration are consistent with previous determinations.

2. FISH - TABLE 2

A total of 24 fish samples were collected in the spring season (June 1987) and in the fall season (October 1987). Collections were made utilizing gill nets at one offsite location greater than five miles from the site (Oswego Harbor area), and at two onsite locations in the vicinity of the Nine Mile Point Unit #1 (02), and the James A. Fitz-Patrick (03) generating facilities. The Oswego Harbor samples served as control samples while the NMP (02) and JAF (03) samples served as indicator samples. Samples were analyzed for gamma emitters. Data is presented in the ANALYTICAL RESULTS section of the report on Table 2.

Analysis of the 1987 fish samples contained detectable concentrations of radionuclides related to past weapons testing and natural origins (naturally occurring). Small detectable concentrations of Cs-137 were found in all but six of the fish samples (including control samples) collected in 1987. Detectable concentrations of K-40, a naturally occurring radionuclide, were found in all fish samples collected for the 1987 program.

Spring fish collections were comprised of three separate species and ten individual samples. The three species represented one feeding type. Lake trout, brown trout and small mouth bass are highly predacious and feed on significant quantities of smaller fish such as smelt, alewife, and other smaller predacious species. Because of the limited availability of species present in the catches, no bottom feeder species were collected in the spring samples.

Cs-137 was detected in five of the seven indicator samples and in all of the control samples collected in the spring samples. The indicator samples contained a mean Cs-137 concentration that was slightly higher than the control sample mean concentration. The concentrations detected in the indicator samples are not significantly different from the control results and are considered to be representative of normal base line or background concentrations of Cs-137 found in Lake Ontario fish. Cs-137 in the spring indicator samples ranged from

0.026 pCi/g (wet) to 0.036 pCi/g (wet) and averaged 0.030 pCi/g (wet) with one sample analysis resulting in a value of 0.025 pCi/g (wet) and one resulting in a lower limit of detection (LLD) value of 0.027 pCi/g (wet). Control samples for this same period ranged from 0.017 pCi/g (wet) to 0.039 pCi/g (wet) and averaged 0.026 pCi/g (wet). All three of the control samples had positive identification of Cs-137.

K-40 was detected in all of the spring samples collected. K-40 is a naturally occurring radionuclide and is not related to power plant operations. Detectable concentrations of K-40 in the indicator samples ranged from 1.95 to 3.85 pCi/g (wet) and 3.62 to 4.02 pCi/g (wet) for the control samples. No other radionuclides were detected in any of the spring fish samples.

Fall sample collections were comprised of five separate species and fourteen individual samples. Six samples of lake trout, two samples of Chinook Salmon, three samples of Walleye, two samples of Suckers, and one sample of Small Mouth Bass were collected at a combination of two onsite sample locations (NMP and JAF) and one offsite sample location (Oswego Harbor area). Samples were collected by gill net in

October and November and included two additional species not found in the spring.

Cs-137 was detected in ten of the fall indicator samples and all four of the control samples. The indicator samples showed an average Cs-137 concentration that was equal to the control location average. Cs-137 in lake trout samples at the indicator locations ranged from 0.024to 0.032 pCi/g (wet) and averaged 0.028 pCi/g (wet). The lake trout samples from the control location had a Cs-137 concentration ranging from 0.034 to 0.040 pCi/g (wet), and a mean of 0.037 pCi/g (wet). Chinook Salmon samples showed Cs-137 concentrations of 0.037 pCi/g (wet) for the control sample and 0.063 pCi/g (wet) for the indicator sample (only one sample collected at both locations). Walleye samples showed a concentration of 0.030 pCi/g (wet) at the control location. Cs-137 was not detected in the Walleye samples from the indicator locations. Only one sample of Small Mouth Bass was available during the fall season (Nine Mile Point indicator location). The associated Cs-137 concentration was 0.036 pCi/g (wet). White Sucker samples were available only at the indicator locations. Cs-137 was not detected in these samples. The one species of bottom feeder collected during the fall season (white sucker) showed no detectable Cs-137 because of different feeding habits and because this species is not in the same position on the food chain as the other predacious species.

K-40 was detected in all of the fall fish samples collected. Detectable concentrations of K-40 in the indicator samples ranged from 2.48 to 6.19 pCi/g (wet) and 3.19 to 4.28 pCi/g (wet) for the control samples. No other radionuclides were detected in any of the fall fish samples.

A review of historical data shows that since 1980 the Cs-137 concentration in Lake Ontario fish, in the vicinity of the Nine Mile Point promitory, has remained stable. The average Cs-137 concentration in fish for this time period was 0.0421 pCi/g (wet) including both the indicator and control results. During this time period of 1980-1987, the measured concentration for the indicator and control sample locations demonstrate little significant difference in measured concentrations. This fact would strongly indicate that the source of Cs-137 found in the fish population is most likely residual cesium from the weapon testing. The specific data for 1987 did show a slight increase from 1986 results for both the indicator and control location. This increase can be attributed to the natural variation in resident fish population of the area. A review of figure 6 (section VII) demonstrates the relative stability of Cs-137 concentrations from 1980 to the present. Figure 6 also shows that the current level of Cs-137 in the indicator fish samples has decreased significantly since 1976 when a peak concentration of 1.4 pCi/g (wet) was detected. The current mean indicator concentration of 0.033 pCi/g (wet) shows a decrease in concentration from 1976 by a factor of approximately 40. Control sample results have also decreased from a maximum level of 0.12 pCi/g (wet) in 1976 to a level of 0.031 pCi/g (wet) in 1987.

The general decreasing trend for Cs-137 is most probably a result of the cesium becoming unavailable through ecological cycling. A significant portion of Cs-137 detected since 1978 in fish is a result of weapons testing fallout, and the general downward trend in concentrations will continue as a function of inventory reduction through the natural processes and radiological decay of the cesium. There was no apparent effect from 1986 Chernobyl Nuclear Plant accident during 1987 relative to Cs-137 results in fish samples, although an minor effect may have been detected in 1987 since both indicator and control location mean results increased slightly. The Chernobyl accident may have increased the Cs-137 inventory slightly in the area but the increase in fish Cs-137 concentration is most likely due to natural variables as noted above.

Lake Ontario fish are considered an important food source by many, therefore, fish is an integral part of the human food chain. Based on the importance of fish in the local diet, a reasonable estimate of dose to man can be calculated. Assuming that the adult consumes 21.0 kg of fish per year (Regulatory Guide 1.109, maximum exposed age group) and the fish consumed contains an average Cs-137 concentration of 0.033 pCi/g (wet) (annual mean result of indicator samples for 1987), the whole body dose received would be 0.049 mrem per year. The critical organ in this case is the liver which would receive a calculated dose of 0.076 mrem per year. The Cs-137 whole body and critical organ doses are conservative calculated doses associated with consuming fish from the Nine Mile Point area (indicator samples). No radiological decay is assumed for the calculation of doses.
Conservative whole body and critical organ doses can be calculated for the consumption of fish from the control location as well. In this case the consumption rate is assumed to remain the same (21.0 kg per year) but the average annual Cs-137 mean concentration for the control samples is 0.031 pCi/g (wet). The calculated Cs-137 whole body dose is 0.046 mrem per year and the associated dose to the liver is 0.071 mrem per year.

In summary, the whole body and critical organ doses observed as a result of consumption of fish is small. Doses received from the consumption of indicator and control sample fish are approximately the same with the dose from indicator samples being slightly higher. Doses from both sample groups are considered of background exposure.

A graph of past Cs-137 concentrations can be found in Section VII and a Historical Data Table is included in Section VI.

3. SURFACE WATER - TABLES 3 AND 4

1987 surface water samples were analyzed monthly for gamma emitters (using gamma spectral analysis). Tritium analyses were performed quarterly. Quarterly samples (i.e., analysis for Tritium) were composites of monthly samples. In addition, three optional sample locations were sampled and analyzed for gamma emitters and Tritium. These additional sample locations include the Nine Mile Point Unit #1 and Unit #2 inlet canals and the City of Oswego drinking water supply which is drawn from Lake Ontario. The drinking water supply sample consisted of twice per week grab-sampling.

The analytical results for the 1987 surface water sample showed no evidence of plant related radionuclide buildup in the surface water in the vicinity of the site. Indicator samples were collected from the inlet canal at the James A. FitzPatrick facility. The control location samples were collected at the inlet canal of Niagara Mohawk's Oswego Steam Station. These two locations are required to be sampled by the Technical Specifications (RETS). Tables 3 and 4 show the results of surface water samples analyzed during 1987.

Gamma spectral analysis was performed on 24 monthly composite samples (two locations) required by the RETS. With the exception of Tritium, only two radionuclides were detected in samples from the five locations over the course of 1987. Both these radionuclides are naturally occurring and not plant related.
K-40 was detected intermittently in both Technical Specification required intake canals. The James A. FitzPatrick inlet canal samples showed K-40 was detected in ten of the 12 monthly samples and ranged from 33 to 272 pCi/liter. K-40 in the Oswego Steam Station inlet canal was detected in nine of the twelve samples and ranged from 49 to 267 pCi/liter. The Nine Mile Point Unit #1 Inlet Canal, Unit #2 Inlet Canal, and the Oswego City water samples showed K-40 detections in five, nine, and seven respectively of the twelve monthly samples from each location. The K-40 concentrations for these samples ranged 54-227 pCi/liter, 32-292 pCi/liter, and 85-292 pCi/liter respectively.

Ra-226 was also detected intermittently in both locations required by technical specifications and the other optional sample locations. Samples from the FitzPatrick location showed Ra-226 in nine of the twelve monthly samples and concentrations ranged from 54 to 130 pCi/liter. The control sample location (Oswego Steam Station) showed Ra-226 in seven of the twelve monthly samples and ranged in concentrations from 76 to 127 pCi/liter. Ra-226 was detected in four of the twelve samples taken from the Nine Mile Point Unit #1 Inlet Canal and ranged from 88 to 137 pCi/liter. The Nine Mile Point Unit #2 Inlet Canal showed Ra-226 detected in seven of the twelve samples and ranged in concentration from 50 to 174 pCi/liter.

Tritium samples are quarterly samples that were a composite of the appropriate monthly samples. Tritium was detected in each sample taken at both locations. Tritium concentrations for the James A. FitzPatrick inlet canal ranged from 160 pCi/liter to 410 pCi/liter and showed a mean concentration of 322 pCi/liter. The Technical Specification control location (Oswego Steam Station inlet canal) showed Tritium results which ranged from 140 pCi/liter to 270 pCi/liter with a mean concentration of 210 pCi/liter. Tritium was also detected in each of the optional samples taken with the exception of the Nine Mile Point Unit #1 Inlet Canal first quarter composite. This particular sample analyses indicated that the Tritium concentration was below the Low Limit of Detection (LLD) or the sensitivity of the analyses. A summary of Tritium results for the 1987 sample program is listed below:

Sample Location	Tritium Concentration pCi/liter Minimum	Maximum	Mean (Annual)
JAF Inlet	160	410	322
Oswego Steam Inlet	140	270	210
NMP #1 Inlet	210	390	283
NMP #2 Inlet	260	310	292
City Water Intake	210	320	275

A review of current data shows that the Tritium concentrations in the lake are consistent relative to location. The source of Tritium detected in the lake water is past testing of thermonuclear devices in the atmosphere. It has been estimated that in the early 1960's the concentration of Tritium of surface water in the United States was as high as 4000 pCi/liter. The levels of Tritium in the environment has been reduced over the years through physical process to the levels that are currently being measured. The Tritium concentration measured during the 1987 sampling program are considered to be background levels and are not the result of the operation of the nuclear facilities at Nine Mile Point.

Review of past environmental surface water data for Cs-137 from 1979 through 1987 shows that this radionuclide was detected only once at the control location during 1979, at a concentration of 2.5 pCi/liter. Cs-137 at the indicator location (JAF inlet canal) was detected only once, in 1982, at a concentration of 0.43 pCi/liter. The 1979 control sample result is suspect and may have been a result of contamination during handling or instrument background since Cs-137 was not detected in the indicator inlet canal. The one positive Cs-137 result from the indicator location (JAF inlet canal) during 1982 was detected in a January composite sample and may have been a result of inlet canal tempering (the addition of discharge water to the inlet canal) or instrument background. Cs-137 was not detected during 1987 in surface water samples.

Other plant related radionuclides detected during a review period of 1979 - 1987 include only Co-60. The control sample location results showed that Co-60 was detected once in 1981 (the May composite sample). This result is suspect and, as noted above, may be the result of contamination during handling or may be instrument background. This result was 1.4 pCi/liter. Results from the indicator location showed that Co-60 was detected three times during 1982 and averaged 1.9 pCi/liter. These positive results were attributed to inlet canal tempering and instrument background. Co-60 was not detected during 1987 in surface water samples.

Review of previous environmental data for K-40 and Ra-226 showed that the detectable concentrations found during 1987 were representative of concentrations found during 1979-1986.

Previous annual mean results for Tritium at the indicator sample location (FitzPatrick inlet canal) have been variable since 1976. Mean sample results were reviewed from 1976 through 1987 and showed a peak average value of 641 pCi/liter (1982) and a minimum average value of 234 pCi/liter (1979). The annual mean Tritium result at the indicator location for 1987 was 322 pCi/liter.

Mean Tritium results of the control location (Oswego Steam Station) cannot be evaluated with regard to long term historical data since sampling was only initiated at this location in 1985. The maximum Tritium value for the control station for the period of 1985-1987 was 550 pCi/liter. The minimum value for this same time period was 230 pCi/liter. Some idea of the variability of historical control sample data can be obtained, however, by review of previous data from the City of Oswego drinking water samples. The drinking water samples are not likely to be affected by the station because of the effects of the distance, lake currents, and the discharge of the Oswego River. Therefore, this previous sample data represents acceptable control sample data for evaluation purposes. The Oswego City water intake is located in the same general vicinity as the Oswego Steam Station Inlet.

Mean annual Tritium results from previous city water samples from 1976 to 1987 show that the Tritium concentrations have decreased. The maximum annual average was found in 1976 (652 pCi/liter) and the minimum in 1982 (165 pCi/liter). The 1987 City water annual mean results was calculated as 275 pCi/liter. Mean annual results from 1979-1987 have remained relatively consistent. The 1985, 1986, and 1987 annual mean Tritium results for the Oswego Steam Station were 287, 373, and 210 pCi/liters respectively. These results were slightly higher than the drinking water samples (with the exception of 1987) but were within the natural variability range.

The impact, as expressed as a dose to man, is not evaluated because no plant related radionuclides were detected in surface water samples with the exception of Tritium. Any impact associated with the fluctuation of Tritium levels are considered to be background and not a result of operations at the site.

TERRESTRIAL PROGRAM

Tables 5 through 14 represent the analytical results for the terrestrial samples collected for the 1987 reporting period.

1. AIR PARTICULATE GROSS BETA - TABLES 5 and 6

Tables 5 and 6 contain the results for the weekly air particulate gross beta analysis for a total of nine offsite and six onsite sample locations. Five of the nine offsite locations are required by Technical Specifications. These sample locations are R-1, R-2, R-3, R-4, (all located near the site boundary) and R-5 (located at a control location beyond any significant influence from the site). Data contained on Tables 5 and 6 also shows the results from other air sampling locations not required by the RETS. These locations are designated as D-1 onsite, G onsite, H onsite, I onsite, J onsite, K onsite, D-2 offsite, E offsite, F offsite, and G offsite locations. A total of 52 samples were collected from the control location R-5 and 208 indicator samples were collected from indicator locations R-1, R-2, R-3, and R-4 during 1987.

The gross beta analysis requires that samples are counted a minimum of twenty-four hours after collection to allow for the decay of naturally occurring radionuclides with short half-lives. The average yearly gross beta indicator concentration was 0.021 pCi/m^3 in 1987. The average yearly control concentration was also 0.021 pCi/m^3 for the same time period. The minimum, maximum, and average gross beta results for sample locations required by Technical Specification are presented below:

Location**	Minimum*	Maximum*	Average*
R-1	0.009	0.040	0.021
R-2	0.009	0.037	0.021
R-3	0.010	0.036	0.021
R-4	0.009	0.039	0.021
R-5 (control)	0.009	0.037	0.021

* - Concentration in pCi/m^3

** - Locations required by the Technical Specifications

The small fluctuations observed in the general gross beta activity can be attributed to changes in the environment, especially seasonal changes. The concentration of naturally occurring radionuclides in the lower limits of the atmosphere directly above land areas are affected by time related processes such as wind direction, snow cover, soil temperature, and soil moisture content.

With the exception of the 1986 sample data, which was effected by the Chernobyl accident, the general trend in air particulate gross beta activity has been one of decreasing activity since 1974. The mean gross beta concentration at the control station has decreased from a level of 0.121 pCi/m^3 in 1974 to 0.021 pCi/m^3 in 1987. Results from the indicator stations ranged from 0.111 pCi/m^3 in 1974 to 0.021 pCi/m^3 in 1987. For both the indicator stations and control stations, the gross beta concentration during 1974 to 1982 fluctuated as a result of fallout from the detonation of thermonuclear weapons. The annual mean results for the years 1983, 1984, 1985, and 1987 from both the indicator and control locations have been approximately similar and ranged from 0.021 to 0.026 pCi/m^3. This level of activity appears to be a baseline range. The 1986 annual mean result was 0.039 pCi/m^3 for both the indicator and control stations. This concentration is slightly higher than 1983-85 and 1987 levels, and is attributed to fallout from the Chernobyl accident.

Graphic representations and historical data of air particulate gross beta activity are presented in Sections VI and VII.

2. MONTHLY PARTICULATE COMPOSITES (GAMMA EMITTERS) - TBL. 9

Weekly air particulate samples were composited by location to form monthly composite samples. The monthly composite samples required by the Technical Specifications (RETS) include R-1, R-2, R-3, R-4, and R-5. Other sample locations not required by the Technical Specifications for which analytical results are presented include D-1 onsite, G onsite, H onsite, I onsite, J onsite, K onsite, D-2 offsite, E offsite, F offsite, and G offsite locations. The results of all monthly composite samples are included on Table 9.

The results for the monthly composite samples showed positive detections for Be-7, K-40, and Ra-226. Each of these radionuclides, are naturally occurring. Be-7 was detected in each of the monthly composite samples from all locations required by Technical Specifications. Be-7 concentrations ranged from 0.048 to 0.196 pCi/m^3 for the indicator locations (R-1, R-2, R-3, and R-4). The control location results (R-5) showed Be-7 ranging from 0.069 to 0.169 pCi/m^3. K-40 was found intermittently in the Technical Specification required monthly composite samples and ranged from 0.018 to 0.054 pCi/m^3 at the control location (R-5). The Technical Specification required indicator location results for K-40 ranged from 0.015 to 0.051 pCi/m^3. Ra-226 was detected in ten Technical Specification required indicator samples and the values ranged from 0.015 to 0.051 pCi/m^3. The Technical Specification control locations yielded two positive identifications of Ra-226 which ranged from 0.020 to 0.031 pCi/m^3.

Historically, the naturally occurring radionuclides Ra-226, K-40, and Be-7 have shown fluctuations that are representative of naturally changing conditions. No significant trends were noted during 1987.

Two plant related fission product radionuclides were detected during 1987 at an optional sampling location. Co-60 and Mn-54 were detected at the G offsite air monitoring station during the month of July. Co-60 was detected at a concentration of 0.0017 pCi/m^3 and Mn-54 was detected at a concentration of 0.0032 pCi/m^3. The presence of

Co-60 or Mn-54 was not detected at any of the other air monitoring stations, including the control station during, this same time period.

An evaluation of the presence of Co-60 and Mn-54 on the monthly air particulate composite was made. The weekly samples, which make up the monthly composite were analyzed separately, and it was determined that the detected activity was present on a filter which represents the time period of 06/30/87 - 07/07/87. Meteorological data was reviewed for the sample period in question, and it was determined that the wind was toward the general location of the G offsite air monitoring station for a duration of less than one hour during the sample period.

Plant effluent records were also reviewed for this same sample period. The review of effluents show that the measured concentrations of Co-60 and Mn-54 in the sample were inconsistent with the measured release rate of these radionuclides in plant effluents. Using a historical meteorological dispersion factor, the calculated release rate from the plant would be significantly above that which was actually measured during the sample period.

The location of G offsite monitoring air station was evaluated with respect to the site. G offsite is at a distant location (approximately 5.3 miles) from the site. Two other air monitoring stations are located in the same general direction as G offsite but at a distance of less than one mile from the site. No plant related radionuclides were detected at these air monitoring stations during this same sample period. For ground level release, the air sampling stations located closer to the site would have a much higher D/Q (deposition coefficient, $1/m^2$) and X/Q (dispersion factor sec/m^3) factors and would have a higher potential for detecting concentrations of plant effluents in the environment if present in the sector in which G offsite is located.

Based on the above evaluation, it was concluded that the activity detected on G offsite filter, July 07, 1987, was the result of contamination from improper handling of the sample. Contamination of air particulate samples has occurred in a few isolated cases in the past. On such occasions, activation products such as Co-60 and Mn-54 were detected.

No other plant related or naturally occurring radionuclides were detected using gamma spectroscopy during 1987.

The location, concentration, range, mean, and frequency of occurrence of each radionuclide detected during 1987 at the Technical Specification required locations are included below.

Radionuclide	Location	Range*	Mean*	Frequency**
Ra-226	Indicator	0.015 - 0.051	0.022	10/48
	Control	0.020 - 0.031	0.025	2/12
K-40	Indicator	0.015 - 0.064	0.041	23/48
	Control	0.018 - 0.054	0.033	5/12
Be-7	Indicator	0.048 - 0.196	0.129	48/48
	Control	0.069 - 0.169	0.129	12/12
Mn-54***	Indicator	0.003	0.003	1/12
	Control	ND	ND	ND
Co-60***	Indicator	0.002	0.002	1/12
	Control	ND	ND	ND

* - Results in units of pCi/m^3.

** - Frequency is number of times detected over the number of samples.

*** - Location is optional location C offsite.

ND - Not detected.

A review of historical data shows that the presence of Co-60 has been noted in the past. Co-60 can be a result of weapons testing, contamination during handling, and operations at the site.

Co-60 average concentrations at the onsite or indicator and offsite or control locations from 1977 to 1978 decreased from approximately 0.0175 to 0.0015 pCi/m^3. Average concentrations decreased significantly during 1979 and increased in 1980 from approximately 0.0007 to

0.0016 pCi/m^3 respectively. 1981 and 1982 average Co-60 concentrations decreased to 0.0007 and 0.0005 pCi/m^3. Average indicator and control concentrations were approximately equal during 1977 to 1982. The 1983 indicator average Co-60 concentration was 0.0007 pCi/m^3 or slightly greater than the 1982 concentration. The 1983 average control and indicator mean Co-60 concentration was 0.0007 pCi/m^3 which also was slightly greater than 1982 results. As noted previously, however, a portion of the Co-60 detected during 1983 was attributed to contamination during handling of the unused filters. Co-60 during 1984 averaged 0.00079 pCi/m^3 at the control stations and 0.00123 pCi/m^3 at the indicator stations. However, the 1984 Co-60 positive results were a result of contamination during handling and not a result of operations at the site. The general reduction in previous indicator and control Co-60 concentrations (1981 - 1984) was a result of nuclear decay and ecological cycling of Co-60 initially produced by the 1980 Chinese weapons test. Co-60 was not detected during 1985-86 in air particulate samples. During 1987, Co-60 was detected once at a concentration of 0.0017 pCi/m^3. This measured value was considered to be the result of contamination as noted above.

Historically, Cs-137 has been variable during the past and has been present in air particulate samples since 1977 and prior to 1977. During 1977, both onsite, or indicator, and offsite, or control, Cs-137 average concentrations were approximately equal and averaged 0.039 pCi/m^3. Cs-137 average concentrations at the indicator and control locations decreased during 1978 and 1979 to 0.0017 and 0.0013 pCi/m^3 respectively. Average concentrations during 1980 and 1981 were approximately equal at control and indicator locations. Cs-137 during 1980 was approximately equal to 1979 and increased slightly in 1981 from 1979 levels. The 1980 and 1981 average concentrations were 0.0013 and 0.0015 pCi/m^3 respectively. The mean 1982 concentration for Cs-137 decreased to 0.0004 pCi/m^3. The 1983 mean Cs-137 concentration for the indicator and control composite samples were 0.0002 and 0.0002 pCi/m^3 which was a reduction from 1982 results. Cs-137 was not detected during 1984 in any of the indicator or control air particulate composite samples. As noted above for the average annual

Co-60 results, the reduction in Cs-137 results is attributed to nuclear decay and ecological cycling of Cs-137 initially produced by the 1980 Chinese weapons test. Cs-137 was not detected during 1985 in air particulate samples, but was detected in 1986 due to the fallout from the Chernobyl accident. Cs-137 was not detected during the 1987 air monitoring program.

Prior to 1983 and 1984, several radionuclides were detected that were associated with the 1980 Chinese weapons test and other weapons tests prior to 1980. These radionuclides were not detected during 1984 and 1985 as a result of nuclear decay and ecological cycling. These include Zr-95, Ce-141, Nb-95, Ce-144, Mn-54, Ru-103, Ru-106 and Ba-140. In addition, La-140 was detected once during 1983 and infrequently during 1978 and 1981. La-140 was not detected during 1984 and 1985. However, La-140, Nb-95, Ru-103, Ru-106, and I-131 were detected in air particulate composite samples during 1986 as a result of the fallout from the Chernobyl accident. The above referenced radionuclides were not detected in the 1987 air monitoring program.

Detectable radionuclides in air particulate samples during 1987 were a result of improper handling of one of the air particulate filters. Since the contamination of this filter was not a result of effluents from the site, no assessment of the impact to man is presented here.

Graphic representations of air particulate composite Co-60 and Cs-137 concentrations are presented in Section VII.

3. AIRBORNE RADIOIODINE (I-131) - TABLES 7 AND 8

Airborne radioiodine is monitored at the air sampling stations that are also used to collect air particulate samples (see Section V.3). The air monitoring network is made up of fifteen sample locations. There are nine stations considered offsite locations. Of these nine, five are required by Technical Specifications and are designated as R-1, R-2, R-3, and R-4. These stations are located near the site boundary and one indicator station. A fifth Technical Specification location designated as R-5 is located beyond any significant influence from the plant and is considered a control location. As noted under the air particulate gross beta section, ten additional air sampling locations are maintained in addition to those required by Technical Specification. Six of these stations are located within the site boundary and are designated as D1 onsite, G onsite, H onsite, I onsite, J onsite, and K onsite. The four remaining optional stations are located offsite and are designated as D2 offsite, E offsite, F offsite, and G offsite. The analytical data for each of these sample locations is included in this report.

During the 1987 sampling program, airborne radioiodine was not detected in any of the fifty-two weekly samples collected at the control location required by Technical specifications. The LLD values for the control location ranged from < 0.004 to < 0.026 pCi/m³. Iodine-131 (I-131) has been detected in the past at control locations. During 1976, the mean off-site I-131 concentration averaged 0.604 pCi/m³. 1977 showed an I-131 concentration that decreased to 0.323 pCi/m³ and for 1978 the concentration decreased by a factor of ten to 0.032 pCi/m³. During 1979 - 1981 and 1983 - 1985, I-131 was not detected. I-131 was detected once during 1982 at a concentration of 0.039 pCi/m³.

In 1987 Radioiodine-131 (I-131) was detected in 2 of the 208 indicator samples required by Technical Specifications. I-131 was also detected in 2 of the 312 optional indicator samples taken during 1987. I-131 was detected at R-1 offsite and R-2 offsite sample locations during the sample period of September 1-8, 1987. The concentrations detected were 0.011 pCi/m³ at R-1 and 0.018 pCi/m³ at R-2 with the mean concentration equal to 0.014 pCi/m³. During this same sample period, Iodine-131 was also detected at two of the optional onsite air monitoring stations, I onsite and J onsite. The detected concentrations were 0.016 pCi/m³ at I onsite and 0.061 pCi/m³ at J onsite. Radioiodine was also detected at the I onsite location for the sample period of September 21-28, 1988. The measured concentration was 0.008 pCi/m³. The two onsite locations which showed positive detections are located within the site boundary and the concentrations detected are not representative of concentrations present onsite. The R-1 and R-2 stations are located near the site boundary and are representative of offsite concentrations.

The environmental I-131 concentrations detected in 1987 are outlined as follows:

Sample End Date	Sample Station	Concentration pCi/m³
09/08/87	R1 (offsite)*	0.011 ± 0.006
	R2 (offsite)*	0.018 ± 0.008
	I (onsite)**	0.016 ± 0.009
	J (onsite)**	0.061 ± 0.014
09/28/88	I (onsite)**	0.008 ± 0.006

* Sample locations required Technical Specification

** Optional sample locations

A meaningful dose estimate is difficult to make for the I-131 concentrations measured at the onsite sampling stations as there are no residence or individuals in the immediate vicinity of the sample location. An accurate estimate of the dose to man can be made using the measured offsite concentrations. The critical organ for iodine isotopes is the thyroid gland, and the maximum exposed age group is the child. Using Standard Regulatory Guide 1.109 methodology, an inhalation rate of 3700 m³ per year and the average indicator location I-131 concentration, conservative doses can be calculated. In order to be conservative and to simplify the computations, no radiological decay is assumed, and the maximum exposed individual is assumed to remain at the site boundary for one week. Maximum child thyroid and whole body doses are presented below.

Sample Locations(s)	Mean Concentration (1)	Weeks Detected	Thyroid Dose (2)	Whole Body Dose (2)
Indicator	0.014	1	0.004	0.000007
Control	< LLD	0	-----	--------

(1) - Concentration in pCi/m^3

(2) - Dose in mrem for 1987

The calculated dose for the critical individual would be 0.004 mrem to the thyroid and 0.000007 mrem to the whole body. These doses are very small and of no significance.

A review of plant gaseous effluent data for the sample periods in which I-131 was detected in the environment was performed. This data shows that the I-131 release rates are well within the design objective of the plant as outlined in the appropriate sections of the Environmental Technical Specifications. The detectable levels of I-131 in the environment are consistent with the measured source terms at the plant for the same sample period.

A review of historical data shows that I-131 has been detected in the past at offsite stations. During 1976, the mean offsite I-131 concentration averaged 0.604 pCi/m^3. 1977 showed an I-131 concentration that decreased to 0.323 pCi/m^3 and for 1978, the concentration decreased by a factor of ten to 0.032 pCi/m^3. During 1979, 1980, 1981, 1983, 1984, and 1985, I-131 was not detected. I-131 was detected once during 1982 at a concentration of 0.039 pCi/m^3.

I-131 has been detected in the past at the onsite stations and was detected at a mean concentration of 0.328 and 0.309 pCi/m^3 during 1976 and 1977. The average concentration decreased to 0.041 pCi/m^3 during 1978 and was not detected during 1979. The 1980-82 average concentrations were 0.013, 0.029, and 0.016 pCi/m^3 which were reductions in view of previous I-131 concentrations. During 1983, the mean I-131 concentration was 0.028 pCi/m^3 which represented a slight increase compared to 1982. I-131 in onsite and offsite samples was a result of I-131 from weapons testing. The concentrations detected during 1983 at the onsite sample stations were a result of operations at the site. I-131 was not detected in any of the 1984 or 1985 onsite samples. I-131 was detected in a total of 75 weekly samples collected during the 1986 sample program. The concentrations detected in 1986 ranged from a minimum of 0.011 pCi/m^3 to a maximum of 0.36 pCi/m^3. Each of the positive detections of I-131 in 1986 were a direct result of the Chernobyl Nuclear accident.

The end result of the 1987 I-131 sampling effort showed no significant impact due to the operation of the plant. During 1987, I-131 was not detected in any other environmental sample media including milk and green leafy vegetables.

4. TLD (ENVIRONMENTAL DOSIMETRY) - TABLE 10

TLD's were collected once per quarter during the 1987 sample year. The TLD results are, for the most part, an average of eight independent readings at each location and are reported in mrem per standard month. TLD's required by the Technical Specifications (RETS) include two TLD's at each location with four independent readings per TLD or a total of eight readings. TLD results included on Table 10 are comprised of TLD's required by the RETS and special interest TLD's not required by the RETS. In 1986, TLD's were collected on approximately April 1, 1987, June 30, 1987, September 30, 1987, and December 30, 1987.

TLD results are evaluated by organizing environmental TLD's into five different groups. These groups include: (1) onsite TLD's (TLD's within the site boundary not required by the RETS), (2) site boundary TLD's (one in each of the sixteen 22½ degree meteorological sectors), (3) a ring of TLD's four to five miles from the site (in each of the land based 22½ degree meteorological sectors), (4) special interest TLD's (in areas of high population density), and (5) control TLD's (in areas beyond any significant influence of the generating facilities). Special interest TLD's are located at or near large industrial sites, schools, or proximal town or communities. Control TLD's are located to the southwest, south, and east-northeast of the site at distances of 12.8 to 19.8 miles from the site.

Most of the TLDs required by the Technical Specifications during 1987 were initiated in 1985 as a result of the issue of new Technical Specifications by the NRC. Therefore, these TLDs can only be compared to 1985-1986 results. Other TLDs, which include a few TLDs required by the Technical Specifications (i.e., numbers 7, 14, 15, 18, 23, 49, 56, and 58) and other optional TLDs, can be compared to results prior to 1985 since these TLDs were established before to 1985.

Onsite TLD's are TLD's at special interest areas and are not required by the RETS. These are located near the generating facilities and at previous or existing onsite air sampling stations. TLD's located at the air sampling stations include numbers 3, 4, 5, 6, 7, 23, 24, 25, and 26. The results for TLD's are generally consistent with previous years results although a slight decrease is noted when compared to 1986 figures. TLD #3 is located in the vicinity of Nine Mile Point Unit 2 and is between the Unit 1 facility and FitzPatrick. The results for TLD #3 were approximately double the results of the other TLD's during the third and fourth quarters because of the effects from Unit 1 and FitzPatrick as well as the startup and testing program at NPMNS Unit #2.

Other onsite TLD's include special interest TLD's located near the north shoreline of the Unit 1, Unit 2, and FitzPatrick facilities but in close proximity to radwaste facilities and the Unit 1 reactor building. These TLD's include numbers 27, 28, 29, 30, 31, 39, and 47. Results for these TLD's during 1987 were variable and ranged from 5.0 to 32.8 mrem per standard month as a result of activities at the radwaste facilities and the operating modes of the generating facilities. Results for 1987 were within the ranges of variability noted in previous years for TLD's at or near these locations. TLD's in this group ranged up to approximately six times control TLD results.

Additional on-site TLD's are located near the on-site Energy Information Center and the associated northeast shoreline. These TLD's include numbers 18, 103, 106, and 107. TLD number 107 is a new TLD and was established in the second quarter of 1987. Therefore, no previous results for this TLD exist, although results were slightly greater than control TLD results and ranged from 5.7 to 6.7 mrem per standard month. TLD number 18 results during 1987 were fairly consistent with previous years and ranged from 5.7 to 6.2 mrem per standard month. TLD number 103 was established during the second quarter of 1985. This TLD is located on the east side of the Energy Information Center. Results were consistent with the results from 1985 and ranged from 5.4 to 6.2 mrem per standard month. TLD number 106 was established during the second quarter of 1986 and is in close proximity to TLD #107. Results for #106 ranged from 6.0 to 6.6 mrem per standard month and where slightly less than 1986 results. TLD numbers 28, 106, and 107 (noted above) are located to the West of the Energy Information Center and to the East of the Unit 1 facility.

Site boundary TLD's are located in the approximate area of the site boundary, one in each of the sixteen 22½ degree meteorological sectors. These TLD's include numbers 75, 76, 77, 23, 78, 79, 80, 81, 82, 83, 84, 7, 18, 85, 86, and 87. TLD numbers 78, 79, 80, 81, 82, 83, 84, 7, and 18 showed results that were consistent with Control TLD results, and ranged from 4.4 to 6.2 mrem per standard month. TLD numbers 75, 76, 77, 23, 85, 86 and 87 showed results that ranged up to twice the results of Control TLD's. These results ranged from 4.4 to 14.3 mrem per standard month. This latter group of TLD's are located near the Lake shoreline (approximately 100 feet from the shoreline) but are also located in close proximity of the Reactor Building and Radwaste facilities of Nine Mile Point Unit 1, Unit 2, and the radwaste facilities of FitzPatrick.

A net site boundary dose can be estimated from available TLD results and Control TLD results. TLD results from TLD's located near the site boundary in sectors facing the land occupied by members of the public (excluding TLD's near the generating facilities and facing Lake Ontario) are compared to control TLD results. The site boundary TLD's include numbers 78, 79, 80. 81, 82, 83, 84, 7 and 18. Control TLD's include numbers 8, 14 and 49. Net site boundary doses for third and fourth quarters in mrem per standard month are as follows.

Quarter	Net Site Property Boundary Dose*
1	+0.1
2	-0.1
3	-0.3
4	+0.2

*Dose in mrem per standard month.

Site boundary TLD numbers 75, 76, 77, 23, 85, 86 and 87 were excluded from the net site boundary dose calculation since these TLD's are not representative of doses received where a member of the public may be located. These areas are near the north shoreline which are in close proximity to the generating facilities and are not accessible to members of the public.

The third group of environmental TLD's are those TLD's located four to five miles from the site in each of the land based 22½ degree meteorological sectors. These TLDs are required by Technical Specifications. At this distance, TLD's are not present in eight of the sixteen meteorological sectors over Lake Ontario.

Results for this group of TLD's during 1987 fluctuated slightly as a result of changing naturally occurring conditions and the normal variation in the concentration of naturally occurring radionuclide found in the ground at each of the locations. These TLD's were established in 1985 and included numbers 88, 89, 90, 91, 92, 93, 94 and 95. Results fluctuated from 4.3 to 6.0 mrem per standard month. Results during 1987 can only be compared to 1985-1986 yearly results since this group of TLD's was established in 1985. These results are generally consistent with control data results during 1987. The overall results for this group of TLDs were consistent with 1985 and 1986 results although 1986 data was slightly higher.

The fourth group of environmental TLD's are those TLD's located beyond the site boundary and at special interest areas such as industrial sites, schools, nearby communities, towns, offsite air sampling stations, the closest residence to the site and the offsite environmental laboratory. This group of TLD's include numbers 9, 10, 11, 12, 13, 15, 19, 51, 52, 53, 54, 55, 56, 58, 96, 97, 98, 99, 100, 101, and 102 and ranged from 3.5 to 6.8 mrem per standard month. All the TLD results from this group were within the general variation noted for the Control TLD's. Results during 1987 for TLD's established during previous years were consistent with results noted for those years.

The fifth group of TLD's include those TLD's considered as Control TLD's and are required by RETS. These TLD's include numbers 14, 49, and number 8 which is an optional location. Results for 1987 ranged from 4.6 to 6.6 mrem per standard month. Results from 1987 were consistent with previous years results. A slight increase was noted in the second quarter of 1986 and may have been the result of the Chernobyl Nuclear Plant accident. This trend was also noted in the other groups of TLD's evaluated during 1986.

Review of past TLD results required by the Technical Specifications (RETS) show that TLD's can be separated into four groups. These groups include site boundary TLD's in each meteorological sector (16 TLD's total), TLD's located offsite in each land based sector at a distance of 4 - 5 miles (8 TLD's total), TLD's located at special interest areas (6 TLD's total) and TLD's located at control locations (2 TLD's total). As noted previously, since the present RETS became effective in 1985, these TLD's for the most part, can only be evaluated for 1985 through 1987.

TLDs located at the site boundary averaged 6.2 mrem per standard month during 1985. During 1986, site boundary TLDs averaged 7.0 mrem per standard month. As noted previously, this group of TLDs can fluctuate

TLD's located at the site boundary averaged 6.2 mrem per standard month during 1985. During 1986, site boundary TLD's averaged 7.0 mrem per standard month. As noted previously, this group of TLD's can fluctuate because several of these TLD's are located in close proximity to the generating facilities. An increase was noted during 1986, although such an increase was noted for all TLD's including control TLD's. During 1987, site boundary TLDs averaged 6.1 mrem per standard month.

TLD's located offsite at a distance of 4 - 5 miles from the site in each of the land based meteorological sectors averaged 5.0 mrem during 1985. During 1986 and 1987, offsite sector TLD's averaged 6.0 and 5.2 mrem per standard month respectively. 1986 results also demonstrated an increase for this group of TLD's.

Special interest TLD's are located at areas of high population density, such as major work sites, communities, schools, etc. and residences near the site (critical receptor areas). This group of TLD's averaged 5.3 mrem per standard month during 1985. During 1986, this same group of TLD's averaged 6.1 mrem. The 1987 results showed a slight decrease when compared to the 1985 - 1986 results. The 1987 average for the special interest TLDs was 5.1 mrem per standard month.

The final group of TLD's required by the RETS is the control group. This group utilizes two TLD locations well beyond the site. Results from 1985 averaged 5.4 mrem. During 1986, this same group of TLD's averaged 6.3 mrem per standard month. The 1987 average was equal to 5.2 mrem per standard month. A measurable increase was noted in the second quarter of 1986. This increase may have been the result of the Chernobyl Nuclear Plant accident.

During 1987 all TLD groups required by the RETS showed a decrease when compared to 1986. The percent decrease for all groups ranged from 13% to 17% with the average decrease equal to 15%. The site boundary TLD's showed the smallest decrease (13%). The offsite TLD's, located 4 - 5 miles from the site also showed a decrease of 13%. The control TLD's showed a 17% decrease from 1986 to 1987.

Overall, environmental TLD results for 1987 showed no significant impact from direct radiation measured outside the site boundary.

5. MILK - TABLES 11 AND 12

Milk samples were collected from a total of six indicator locations (within 10 miles of the site), and one control location (beyond 10 miles from the site) during 1987. The RETS require that three locations be sampled for milk within 5.0 miles of the site. During 1987, there were no milk sample locations within 5.0 miles of the site. The locations that were sampled during 1987 are located from 5.5 to 9.5 miles from the site. Control milk samples were collected from location #65 which is located 17 miles from the site. Sample location descriptions for all milk sample locations utilized during 1987 are listed below.

Location No.	Direction from Site	Distance from Site (miles)
7	ESE	5.5
16	S	5.9
50	E	8.2
55	E	9.0
60	E	9.5
4	ESE	7.8
65 (Control)	SW	17.0

During 1987, milk samples were collected at each of the six indicator locations and the control location in the first half and the second half of each month. Samples were collected during the months of April through December 1987. Since I-131 was not detected during November and December of 1986 no additional samples were collected in January through March of 1987. For each sample, analyses were performed for gamma emitters (analysis by GeLi, Ge detectors) and I-131 using a resin extraction. Sample analysis results for gamma emitters are found on Table 12 and for I-131 on Table 11.

The gamma spectral analysis of the bimonthly samples showed K-40 to be the most abundant radionuclide detected in the milk samples collected during 1987. K-40 was detected in every sample analyzed and ranged in concentration from 744 pCi/liter to 1,820 pCi/liter at the indicator locations and 1,190 pCi/liter to 1,790 pCi/liter at the control location. K-40 is a naturally occurring radionuclide and is found in many of the environmental media sampled.

Cs-137 was detected in 2 of 108 indicator milk samples collected during 1987. Cs-137 was not detected in any of the control location samples during 1987. The LLD values for the control location analysis range from < 5.2 to < 11.4 pCi/l. The Cs-137 concentration measured at the indicator locations ranged from 5.5 pCi/liter (location #7) to 8.1 pCi/liter (location #55).

Both Cs-137 concentration were detected in the May 4, 1987 samples. Location #1 is located 5.5 miles from the site and location #55 is 9.0 miles from the site.

The cause of the low concentration of Cs-137 found during May is a result of the 1986 Chernobyl Nuclear Plant accident. During 1986, Cs-137 was detected fifteen times and was found at both indicator and control locations. Cs-137 was not detected after September, 1986 which corresponds to the end of the grazing season. A monthly questionnaire showed that there were no milk animals released for pasturing during May of 1987 at locations #7 and #55. Therefore, these animals were fed stored feed from 1986. Animals at other locations were released for pasturing during May except for one location. Information relative to other nuclear sites on the East Coast showed that Cs-137 was also detected during the first half of 1987 and, at some sites, during the entire year.

It is felt that stored feed consumed during May, 1987 at locations 7 and 55 contained enough Cs-137 fallout from the 1986 Chernobyl accident that analyses showed detectable levels of Cs-137. The amount of stored feed consumed at the other locations was considerably less than at locations #7 and 55 except for one location. In addition, the greatest of the two detectable levels was found at location #55 which is 9.0 miles from the site. In the event Cs--137 in May milk samples was a result of activities at the site, it would be improbable that the greatest detected quantity would be found at a distance of 9.0 miles from the site. Cs-137 release levels from the site during April and May, 1987 were normal. The fact that no other plant related radionuclides were detected in the two samples which contained Cs-137 further supports the conclusion that the power plant at the Nine Mile Point site was not the source of the Cs-137. Each of the milk samples collected in 1987 were also analyzed for radioiodine (I-131). I-131 was not detected during 1987 in any of the indicator or control samples. All 1987 I-131 milk sample results are reported as the lower limit of detection (LLD). The LLD results for 1987 milk samples ranged from < 0.1 pCi/liter to < 0.5 pCi/liter.

The impact as a result of Cs-137 in 1987 milk samples can be assessed by calculating conservative doses to man from the consumption of milk with detectable quantities of Cs-137. For the purposes of a calculated dose, the 1987 mean indicator sample Cs-137 concentration is used (6.8 pCi/liter).

Assuming a consumption rate of 330 liters (87.18 gallons) per year for an infant (Regulatory Guide 1.109 maximum exposed individual), the whole body dose would be 0.008 mrem and the critical organ dose would be 0.114 mrem to the liver. The calculated doses are based on 1 month of milk consumption.

The calculated dose to an adult can also be determined assuming a consumption rate of 110 liters (29.06 gallons) per year (Regulatory Guide 1.109) and a mean Cs-137 concentration of 6.8 pCi/liter for the indicator locations. The resultant doses are 0.019 mrem to the whole body and 0.012 mrem to the liver (critical organ). The calculated doses are based on 1 month of milk consumption.

For the purpose of illustration, the significance of the above doses can be brought into perspective by a comparison to the U. S. Department of Health and Human Services (US/DHHS) Guide for Cs-137 ingestion. The EPA/PAG maximum limit for Cs-137 ingestion is 240,000 pCi. The resultant whole body and liver doses to the maximum exposed individual (infant) would be 10.4 mrem and 146.6 mrem respectively. The total calculated doses as a result of the measured Cs-137 concentrations are very small by comparison.

An additional comparison can be made to naturally occurring K-40. K-40 has been noted in almost all environmental samples at significant levels. A 70 kilogram adult weighs approximately 154 pounds and contains approximately 0.1 microcuries of K-40 as a result of normal life functions (inhalation, consumption, etc.). The dose to the bone tissue is about 20 mrem per year as a result of internally deposited K-40 (Eisenbud). For comparison purposes, an adult bone dose can be calculated that results from the consumption of milk with an average 1987 concentration of Cs-137. Using the same criteria used for calculating the preceding doses, the adult bone dose is 0.014 mrem per year. This calculated dose is small and is only 0.0007 of the annual bone dose received from naturally occurring K-40.

Historical data shows the absence of Cs-137 in milk during 1984 and 1985. It should be noted that the two generating facilities (NMP Unit #1 and JAFNPP) were, for the most part, at full capacity during the 1984 and 1985 grazing season and Cs-137 was not detected in milk samples. Cs-137 was detected in milk during 1983, however, at a concentration of 5.1 pCi/liter (detected only once). This observation may indicate that the source of the Cs-137 during the years of 1981-1983 was the October 1980 Chinese Weapons Test. Results from 1986 showed a mean Cs-137 concentration of 8.6 pCi/liter at the indicator locations. Cs-137 in 1986 milk samples was a result of the 1986 Chernobyl Nuclear Plant accident. During 1987, Cs-137 was found in two indicator samples only at a mean concentration of 6.8 pCi/liter and was also a result of the Chernobyl accident.

In addition to gamma spectral analysis, each of the milk samples collected in 1987 were analyzed for I-131. Iodine-131 was not detected during 1987 in any of the control or indicator samples. All I-131 milk results are reported as lower limits of detection (LLD). The LLD results ranged from < 0.1 to < 0.5 pCi/l for all milk samples.

No other radionuclides were detected in milk samples using gamma spectral analysis or resin extraction.

A review of past historical data shows that the detection of I-131 in milk samples has not been routine. In past sampling programs, I-131 has been detected in milk samples only in conjunction with fresh fallout from atmospheric testing or from the Chernobyl Nuclear Plant accident in 1986. Numerical evaluation shows that annual mean results ranged from 0.2 pCi/liter to 6.9 pCi/liter at the indicator locations during 1976-1978. I-131 during these years is a result of intermittent weapons testing. During 1979 - 1985, I-131 in milk samples at the indicator locations was not detected, except during 1980. The mean result during 1980 was 0.4 pCi/liter and was a result of the 1980 Chinese Weapons Test. Results from 1986 showed that I-131 was detected at a mean concentration of 5.2 pCi/liter as a result of the Chernobyl accident. I-131 was not detected during 1987 in milk samples.

Historical data for I-131 from the control location showed that I-131 was detected during 1980 at a mean concentration of 1.4 pCi/liter. There was not detectable I-131 during the period of 1978-1985 with the exception of 1980. During 1986, I-131 from the control location showed a mean concentration of 13.6 pCi/liter as a result of the Chernobyl accident. I-131 was not detected during 1987 at the control location.

Historical data and graphic representations of milk sample results for Cs-137 and I-131 are presented in Sections VI and VII.

6. LAND USE CENSUS - TABLES 13 AND 16

A land use census was conducted during 1986 to identify within a distance of five miles the location of all milk animals (cows and goats) and the location of the nearest residence in each of the sixteen 22½ degree meteorological sectors. The milch animal census (milk animal) was actually conducted out to a distance of ten miles in order to provide a more comprehensive census.

The milch animal census is an estimation of the number of cows and goats within a ten mile radius of the Nine Mile Point Site. A census is conducted once per year in the spring. The census is conducted by sending questionnaires to previous milk animal owners and also by road surveys to locate any possible new owners. In the event questionnaires are not answered, then the owners are contacted by telephone or in person. The local agricultural agency was also contacted.

The number of milch animals located within the ten mile radius of the site was estimated to be 1,245 cows and 30 goats for the spring 1987 census. No new locations with milk animals were found since the 1986 census. The number of cows decreased by 8 and the number of goats increased by 20 with respect to the 1986 census.

The residence census was conducted during the late summer to identify the nearest residence in each of the sixteen 22½ degree meteorological sectors within a distance of five miles from the site. At this distance, some of the meteorological sectors are over water. These sectors include: N, NNE, NE, ENE, W, WNW, NW and NNW. There are no residences in these sectors. The results of the 1987 residence census showing the applicable sectors, degrees and distance of each of the nearest residences are found on Table 15. The nearest residence locations are shown on the census map, figure 3.

7. FOOD PRODUCTS - TABLE 14

Food product samples collected during 1986 were comprised of garden vegetables, fruit, and other types of vegetation.

Samples were collected during the late Summer/Fall harvest season as part of the required samples for the Nine Mile Point Unit #1 and #2 Technical Specifications. The collection of monthly food product samples is not required by the JAF Technical Specifications when milk sampling is being performed. The food product sample results presented on Table 14 are for optional samples.

Samples were collected from seven indicator locations and one control location. The indicator locations were represented by nearby gardens in areas of highest D/Q (deposition factor) values based on historical meteorology and all site release points at operating facilities. The control location was represented by a garden location 9-20 miles distant in a least prevalent wind direction. Garden vegetables were comprised of cabbage, beet greens, lettuce, squash leaves, and swiss chard which are all considered broadleaf vegetables. Where broadleaf vegetables were not available, non-edible broad leaf vegetation, non-broadleaf fruits, or vegetables were collected. Non-edible broad leaf vegetation collected in 1987 consisted of pumpkin leaves, green bean leaves, cucumber leaves, and grape leaves. Non-broadleaf fruits or vegetables collected in 1987 consisted of tomatoes. At the control location, one sample of each similar type of fruit or vegetable was collected. Fruits and vegetables were coll[illegible]ed in the late summer harvest season.

K-40 was detected in all broadleaf and non-broadleaf vegetables and fruits. Broadleaf vegetables (Swiss chard, squash leaves, grape leaves, beet greens, cabbage, lettuce, pumpkin leaves, and green bean leaves) showed concentrations of K-40 ranging from 1.06 pCi/g to 5.81 pCi/g (wet). Non-broadleaf fruits (tomatoes) showed concentrations of K-40 ranging from 1.84 pCi/g to 2.95 pCi/g (wet). Be-7 was detected in a number of the broadleaf vegetables, but was not detected in any of the non-broadleaf fruits (tomatoes). The Be-7 concentrations in the broadleaf vegetables ranged from 0.10 pCi/g (wet) to 1.88 pCi/g (wet).

Cs-137 was detected in one non-broadleaf sample (tomato) from the indicator locations. The detected quantity was near the limit of detection and was 0.016 pCi/g (wet). LLD values for all samples ranged from 0.009 to 0.020 pCi/g (wet). The detected quantity of Cs-137 was found at location "S". Cs-137 was not detected in any of the broadleaf samples, as would be expected. It is likely that the quantity of Cs-137 found is a result of uptake by the tomato plant. The source of the cesium is most likely from the soil. The ultimate source of Cs-137 is from weapons testing, operations at the site, or both. Cs-137 has been detected in soil samples from areas at the site and at areas well beyond the site as a result of past weapons testing. A portion of the detected quantity may be a result of past operations at the site. Cs-137 was not detected at the control location.

No other radionuclides were detected in the 1987 collection of fruits and vegetables.

Review of past environmental data indicates that K-40 has been consistently detected in food crop samples. K-40 concentrations have fluctuated from one sample to another but the annual ranges have remained relatively consistent from year to year. Be-7 has been detected occasionally during the past on leafy vegetables (1978 through 1982, and 1984).

Cs-137 has been detected intermittently during the years of 1976-1986 at the indicator locations and during the years of 1980-1986 at the control locations (control samples were not obtained prior to 1980). Review of indicator sample results from 1976-1986 showed that Cs-137 was not detected during 1976-1978, 1981-1984 and 1986. During 1979 and 1980, Cs-137 in fruits and/or vegetables showed annual mean concentrations of 0.004 and 0.036 pCi/g (wet) respectively. Cs-137 was found at one indicator location during 1985 at a concentration of 0.047 pCi/g (wet). Control samples during 1980-1986 showed Cs-137 detected only during 1980 at a concentration of 0.02

pCi/g (wet). Cs-137 detected during the past at both indicator and control locations is indicative of weapons testing.

During 1987, Cs-137 was found at the indicator locations at a mean concentration of 0.016 pCi/g (wet). Cs-137 was not detected at the control location during 1987.

The impact of detectable Cs-137 in food product samples can be evaluated by calculating a dose to the maximum exposed individual as a result of consumption. Using standard methodology from NRC Regulatory Guide 1.109, the maximum exposed organ is the bone of a child. The maximum whole body dose would be to an adult. The Cs-137 concentration is 0.016 pCi/g (wet) and is conservatively assumed to be a result of operations at the site and is assumed to remain consistent throughout the year. The consumption rate is assumed to be a maximum consumption rate of 26 kg per year for a child. The calculated doses are 0.14 mrem per year to a child's bone tissue (maximum organ dose) and 0.02 mrem per year to the whole body. The maximum whole body dose occurs to the adult. Assuming a Regulatory Guide 1.109 maximum consumption rate of 64 kg per year for an adult, the maximum organ dose is 0.11 mrem to the liver and 0.07 mrem to the whole body. A maximum child organ dose of 0.14 mrem/yr. and an adult whole body dose of 0.07 mrem per year are small and insignificant when compared to dose from the natural radiation environment.

8. SITE BOUNDARY VEGETATION - TABLE 15

The Radiological Effluent Technical Specifications (RETS) require that samples of three different kinds of broad-leaf vegetation (edible or inedible) be collected at the site boundary in two areas of highest D/Q (deposition factor) for a total of six samples. The sampling of broad leaf vegetation is performed in accordance with Table 6.1-1 (RETS) in lieu of the garden census specified in section 6.2 (RETS). The control location was represented by samples of three similar broad-leaf varieties grown 9-20 miles distant in a least prevalent wind direction. The three broad-leaf varieties were comprised of wild grape leaves, viburnum, and goldenrod (all non-edible). The site boundary and control vegetation samples were collected during the late summer harvest season.

Two naturally occurring radionuclides (K-40 and Be-7) were detected in the 1987 samples. K-40 was detected in all the broad-leaf vegetation samples collected in September, 1987. The site boundary vegetation samples (indicators) showed concentrations of K-40 ranging from 2.64 pCi/g (wet) to 6.54 pCi/g (wet). The control samples showed concentrations of K-40 ranging from 2.36 pCi/g (wet) to 5.39 pCi/g (wet).

Be-7 was also detected in all the broad-leaf vegetation samples. The site boundary samples (indicators) showed concentrations of Be-7 ranging from 1.19 pCi/g (wet) to 2.48 pCi/g (wet). The control samples showed concentrations of Be-7 ranging from 1.40 pCi/g (wet) to 2.37 pCi/g (wet). Both Be-7 and K-40 are naturally occurring radionuclides.

No other radionuclides were detected in the 1987 RETS vegetation samples.

The vegetation samples collected during 1987 at the site boundary are not consumed by humans. These samples are collected as indicator samples because of the high D/Q values which exist at the site boundary. The collection of site boundary vegetation samples was started in the Fall of 1985 with the implementation of the Radiological Effluent Technical Specifications.

A review of the 1985 - 1986 site boundary vegetation sample results show that K-40 and Be-7 are routinely detected in these samples. In 1986 K-40 samples ranged from 2.83 to 9.80 pCi/g (wet) for the indicator samples and 3.99 to 8.33 pCi/g (wet) for the control samples. The K-40 concentration detected in the 1985 samples are similar in range as those found in 1986 - 1987, as expected. In 1985, 1986, and 1987 Be-7 was detected in each of broad leaf samples taken. The analytical results for Be-7 have been consistent from year to year.

Cs-137 was detected in both 1985 and 1986. The 1985 sample results showed positive detections of Cs-137 in three of the six indicator sample and no positive detections of Cs-137 in the control samples. The 1985 Cs-137 indicator concentrations ranged from 0.043 to 0.259 pCi/g (wet) with a mean concentration of 0.162 pCi/g (wet). Cs-137 was detected in four of six indicator samples collected in 1986. The 1986 sample concentrations ranged from 0.031 to 0.035 pCi/g (wet) with a mean concentration of 0.033 pCi/g (wet). Cs-137 was detected in one of the control samples at a concentration of 0.035 pCi/g (wet). The presence of Cs-137 in 1985 and 1986 site boundary vegetation samples can be attributed to several sources: atmospheric nuclear testing, fall out from the Chernobyl Nuclear Plant accident, and/or plant operations at the site. The presence of Cs-137 in the control vegetation sample in 1986 indicates that the source may be past weapons testing or fall out from the Chernobyl accident.

9. ENVIRONMENTAL SAMPLE LOCATIONS - TABLE 17

Table 16 contains the locations of the environmental samples presented in the data tables of Section IV. The locations are give in degrees and distance in miles from the Nine Mile Point Nuclear Station Unit# 2 reactor centerline (middle site reactor). Table 16 also gives the figure (map) number as well as the map destination for each sample location by sample medium type.

10. INTERLABORATORY COMPARISON PROGRAM - SECTION VIII

Section 6.3.a of the Radiological Effluent Technical Specifications for the James A. FitzPatrick Nuclear Power Plant requires that a summary of the results obtained as part of an interlaboratory comparison program be included in the Annual Radiological Environmental Operating Report. Presently, the only NRC approved interlaboratory comparison program is the USEPA Cross Check Program. Section VIII shows the results of the EPA's reference results and the licensee's results in tabular form. Some of the EPA reference samples have been analyzed by the site. Other EPA reference samples have been analyzed by a vendor who normally analyzes those types of sample media for the site. Participation in the EPA Cross Check Program includes sample media for which environmental samples are routinely collected, and for which intercomparison samples are available from the EPA.

CONCLUSION

The Radiological Environmental Monitoring Program is conducted each year to determine the radiological impact of the James A. FitzPatrick Nuclear Power Plant on the local environment. As demonstrated by the analytical results of the 1987 program, the major radiological impact on the environment was the result of fallout from atmospheric nuclear testing and the 1986 Chernobyl accident.

Samples representing food sources consumed at higher trophic levels, such as fish and milk, were reviewed closely to evaluate any impact to the general environment or to man. In addition, the data was reviewed for any possible historical trophic level bioaccumulation trends. In regard to doses as a result of man-made radionuclides, a significant portion of the small doses received by a member of the public was from past nuclear weapons testing and fallout from the Chernobyl accident. It should be noted that most of the radionuclide detected in 1986, as a result of the Chernobyl accident, were not present in the sample media collected for the 1987 program. Doses as a result of naturally occurring radionuclides, such as K-40, contributed a major portion of the total annual dose to members of the public.

Any possible impact as a result of site operations is extremely minimal when compared to the impact from natural background levels and sources other than plant operation. It has been demonstrated that almost all environmental samples contain traces of radionuclides which are a result of weapons testing, Chernobyl, or naturally occurring sources (primordial and/or cosmic related). Whole body doses to man as a result of natural sources (naturally occurring radionuclides in the soil and lower atmosphere) in Oswego County account for approximately 67 mrem per year as demonstrated by control environmental TLD's. Possible doses due to site operations are a minute fraction of this particular natural exposure.

Using the data presented in this report, and earlier reports as a basis, it can be concluded that no appreciable radiological environmental impact has resulted from the operation of the James A. FitzPatrick Nuclear Power Plant.

REFERENCES

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VI HISTORICAL DATA

Sample Statistics from Previous Environmental Sampling

The mean, standard deviation, minimum value, maximum value, and range, were calculated for selected sample mediums and isotopes.

Special Considerations:

1. Sample data listed as 1969 was taken from the NINE MILE POINT, PREOPERATION SURVEY, 1969 and ENVIRONMENTAL MONITORING REPORT FOR NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT NUCLEAR STATION, NOVEMBER, 1970.

2. Sample data listed as 1974, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, and 1986 was taken from the respective environmental operating reports for Nine Mile Point Nuclear Station and James A. FitzPatrick Nuclear Power Plant.

3. Only measured values were used for statistical calculations.

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Fish Samples Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	0.031	0.009	0.040	0.017	0.023
1986	0.025	0.004	0.032	0.021	0.011
1985	0.034	0.008	0.047	0.026	0.021
1984	0.032	0.009	0.038	0.015	0.023
1983	0.050	0.009	0.060	0.040	0.020
1982	0.047	0.009	0.055	0.027	0.028
1981	0.043	0.016	0.062	0.028	0.034
1980	0.059	0.032	0.110	0.029	0.081
1979	0.04	0.01	0.06	0.03	0.03
1978	0.09	0.05	0.20	0.04	0.16
1977	0.13	ONLY	ONE	DATA	POINT
1974	0.43	0.37	0.94	0.09	0.85
1969 (PRE-OPERATIONAL)	NO DATA	----	----	----	----

INDICATOR					
Fish Samples Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	0.033	0.011	0.063	0.024	0.039
1986	0.028	0.012	0.051	0.009	0.042
1985	0.030	0.009	0.045	0.018	0.027
1984	0.043	0.008	0.061	0.033	0.028
1983	0.050	0.009	0.060	0.030	0.030
1982	0.050	0.008	0.064	0.034	0.030
1981	0.061	0.021	0.10	0.027	0.073
1980	0.061	0.029	0.100	0.030	0.070
1979	0.10	0.14	0.55	0.02	0.53
1978	0.08	0.02	0.10	0.03	0.07
1977	0.29	0.21	0.79	0.13	0.66
1974	0.57	0.82	4.40	0.08	4.32
1969 (PRE-OPERATIONAL)	0.06	0.04	0.13	0.01	0.12

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Surface (Lake) Water Tritium pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	210.0	64.8	270	140	130
1986	373.0	157.0	550	250	300
1985	287.5	95.4	430	230	200
1984	205.0	21.2	220	190	30
1983	250.0	21.8	280	230	50
1982	165.0	94.7	307	112	195
1981	293.3	49.3	357	211	146
1980	257.3	38.5	290	211	79
1979	258.7	73.7	308	174	134
1978	303.8	127.5	490	215	275
1977	407.5	97.4	530	300	230
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	<MDL	---	---	---	---

INDICATOR					
Surface (Lake) Water Tritium pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	322.5	111.2	410	160	250
1986	380.0	118.0	500	260	240
1985	530.0	448.6	1200	250	950
1984	282.0	98.1	370	110	260
1983	317.0	116.9	560	190	370
1982	641.0	891.1	2780	194	2586
1981	258.3	76.9	388	183	205
1980	263.0	95.4	457	150	307
1979	234.0	40.7	286	176	110
1978	389.4	119.9	560	253	307
1977	450.0	67.2	530	380	150
1974	440.0	84.9	500	380	120
1969 (PRE-OPERATIONAL)	440.0	84.9	500	380	120

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Air Particulate Gross Beta pCi/m³	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	0.021	0.006	0.037	0.009	0.028
1986	0.039	0.049	0.272	0.008	0.264
1985	0.024	0.006	0.043	0.013	0.030
1984	0.026	0.007	0.051	0.013	0.039
1983	0.024	0.009	0.085	0.007	0.078
1982	0.033	0.012	0.078	0.011	0.067
1981	0.165	0.135	0.549	0.016	0.533
1980	0.056	0.04	0.291	0.009	0.282
1979	0.077	0.086	0.703	0.010	0.693
1978	0.14	0.13	0.66	0.01	0.650
1977	0.07	0.03	0.140	0.016	0.124
1974	0.121	0.104	0.808	0.001	0.807
1969 (PRE-OPERATIONAL)	0.334	0.097	0.540	0.130	0.410

INDICATOR					
Air Particulate Gross Beta pCi/m³	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	0.021	0.006	0.040	0.009	0.031
1986	0.039	0.050	0.289	0.007	0.282
1985	0.021	0.006	0.044	0.001	0.043
1984	0.025	0.008	0.058	0.000	0.058
1983	0.023	0.009	0.062	0.003	0.059
1982	0.031	0.012	0.113	0.001	0.112
1981	0.151	0.128	0.528	0.004	0.524
1980	0.045	0.03	0.207	0.002	0.205
1979	0.058	0.06	0.271	0.001	0.270
1978	0.10	0.09	0.34	0.01	0.33
1977	0.106	0.07	0.326	0.002	0.324
1974	0.111	0.114	0.855	0.003	0.852
1969 (PRE-OPERATIONAL)	0.320	0.090	0.520	0.130	0.390

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Environ. TLD's Quarterly Reading mrem/Standard Month	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	5.26	0.38	5.90	4.70	1.20
1986	6.40	0.68	7.60	5.50	2.10
1985	5.21	0.47	6.30	3.95	2.35
1984	5.87	1.00	8.20	3.90	4.30
1983	5.54	0.364	7.17	4.21	2.96
1982	5.12	0.691	6.95	3.79	3.16
1981	4.72	0.685	6.63	3.24	3.39
1980	4.57	0.614	6.06	3.12	2.94
1979	REPORTED	AS	MREM/QTR	PRIOR TO	1980
1978					
1977					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR					
Environ. TLD's Quarterly Reading mrem/Standard Month	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	5.62	1.43	14.50	3.50	11.00
1986	6.53	1.93	18.70	4.10	14.60
1985	5.65	0.79	7.35	4.45	2.90
1984	6.42	1.26	9.90	4.60	5.30
1983	6.23	0.91	8.97	5.03	3.94
1982	5.82	1.24	9.13	3.87	5.26
1981	5.24	0.73	7.45	4.09	3.36
1980	DATA	NOT	COMPARABLE	DUE TO	CHANGES
1979	IN TLD	LOCATIONS			
1978					
1977					
1974					
1969 (PRE-OPERATIONAL)					

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Milk Samples Cs-137 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	8.4	3.6	12.4	5.3	7.1
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	7.0	ONLY	ONE	DATA	POINT
1980	<LLD	---	---	---	---
1979	3.73	0.29	3.9	3.4	0.5
1978	5.83	1.98	7.8	2.4	5.4
1977	NO	CONTROL	DATA	PRIOR TO	1978
1974	---	---	---	---	---
1969 (PRE-OPERATIONAL)					

INDICATOR					
Milk Samples Cs-137 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	7.4	2.8	9.4	5.5	3.9
1986	8.6	1.7	11.1	6.1	5.0
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	5.10	ONLY	ONE	DATA	POINT
1982	6.26	4.41	18.0	3.1	14.9
1981	7.57	5.95	29.0	4.3	24.7
1980	9.7	4.9	21.0	4.0	17.0
1979	9.4	8.0	40.0	2.7	37.3
1978	9.9	7.1	33.0	3.4	29.6
1977	17.1	3.9	22.0	11.0	11.0
1974	26.1	10.5	61.0	13.0	48.0
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Milk Samples I-131 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	13.6	14.3	29.0	0.8	28.2
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	1.41	ONLY	ONE	DATA	POINT
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR					
Milk Samples I-131 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	5.2	7.5	30.0	0.3	29.7
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	4.9	4.23	8.80	0.40	8.40
1979	<LLD	---	---	---	---
1978	0.19	ONLY	ONE	DATA	POINT
1977	0.07	0.08	0.22	0.00	0.22
1974	1.23	0.44	2.00	0.70	1.30
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Human Food Crops Cs-137 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	<LLD	---	---	---	---
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR					
Human Food Crops Cs-137 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	<LLD	---	---	---	---
1985	0.047	ONLY	ONE	DATA	POINT
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	0.033	2.26	0.06	0.004	0.056
1979	<LLD	---	---	---	---
1978	0.01	ONLY	ONE	DATA	POINT
1977	<MDL	---	---	---	---
1974	0.142	0.09	0.34	0.04	0.30
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL					
Human Food Crops I-131 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	<LLD	---	---	---	---
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR					
Human Food Crops I-131 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1987	<LLD	---	---	---	---
1986	<LLD	---	---	---	---
1985	<LLD	---	---	---	---
1984	<LLD	---	---	---	---
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

VII FIGURES AND MAPS

1. DATA GRAPHS

This section includes graphic representation of selected sample results.

For graphic representation, results less than the MDL or LLD were considered to be at the MDL or LLD level of activity. MDL and LLD values were indicated where possible.

2. SAMPLE LOCATIONS

Sample locations referenced as letters and numbers on analysis results tables are plotted on maps.

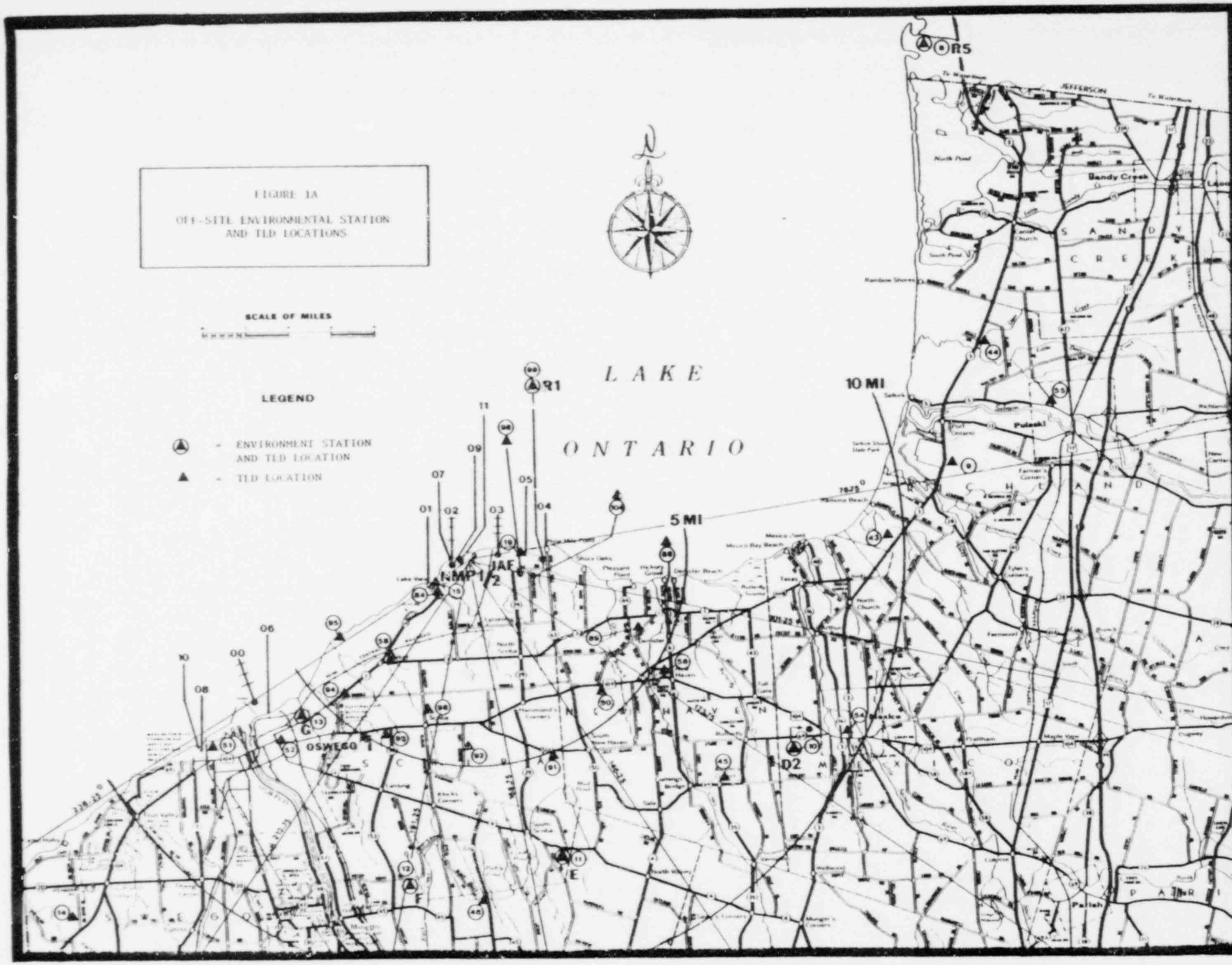


FIGURE 1A

OFF-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS

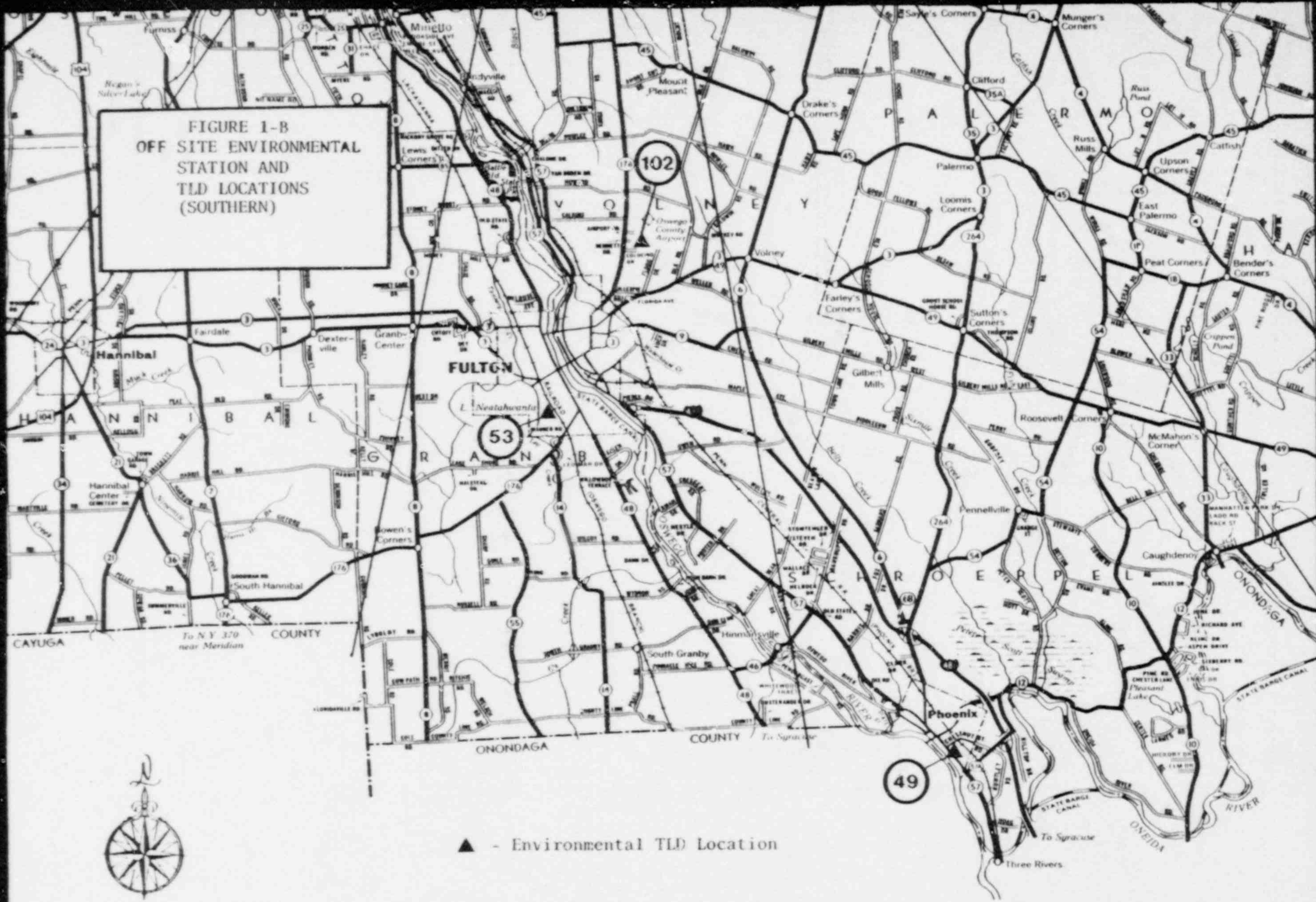


FIGURE 1-B
OFF SITE ENVIRONMENTAL
STATION AND
TLD LOCATIONS
(SOUTHERN)

▲ - Environmental TLD Location

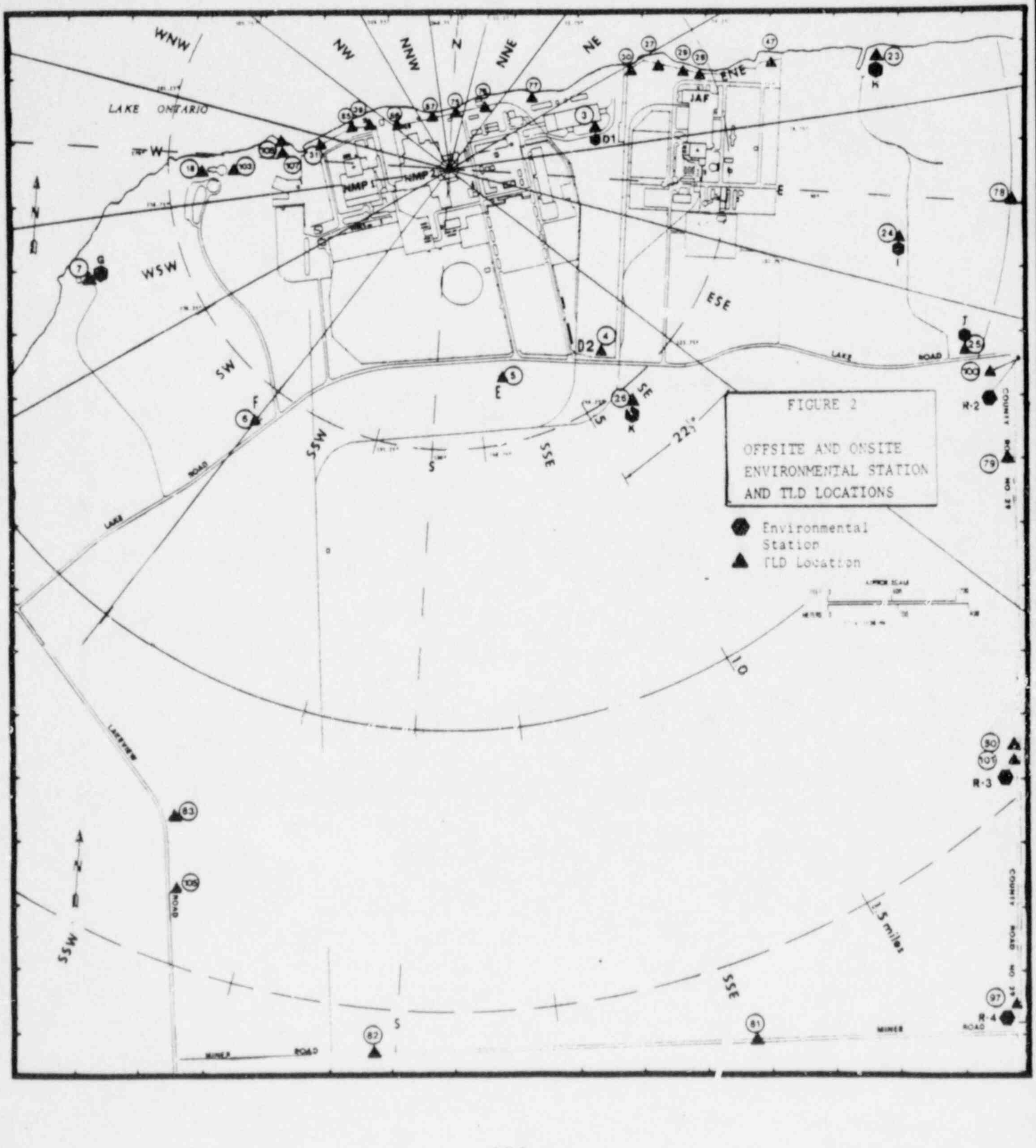


FIGURE 2

OFFSITE AND ONSITE ENVIRONMENTAL STATION AND TLD LOCATIONS

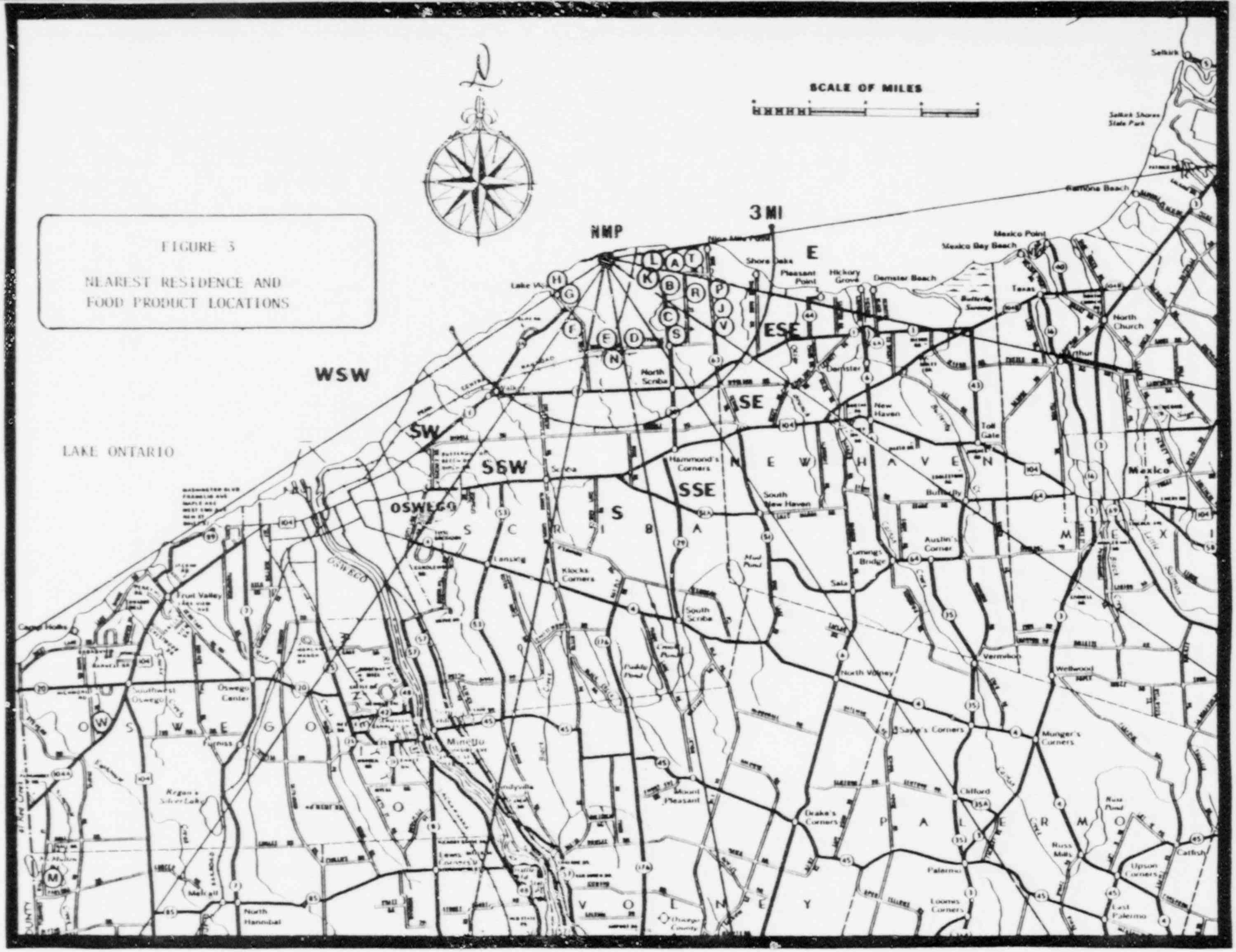


FIGURE 3

NEAREST RESIDENCE AND FOOD PRODUCT LOCATIONS

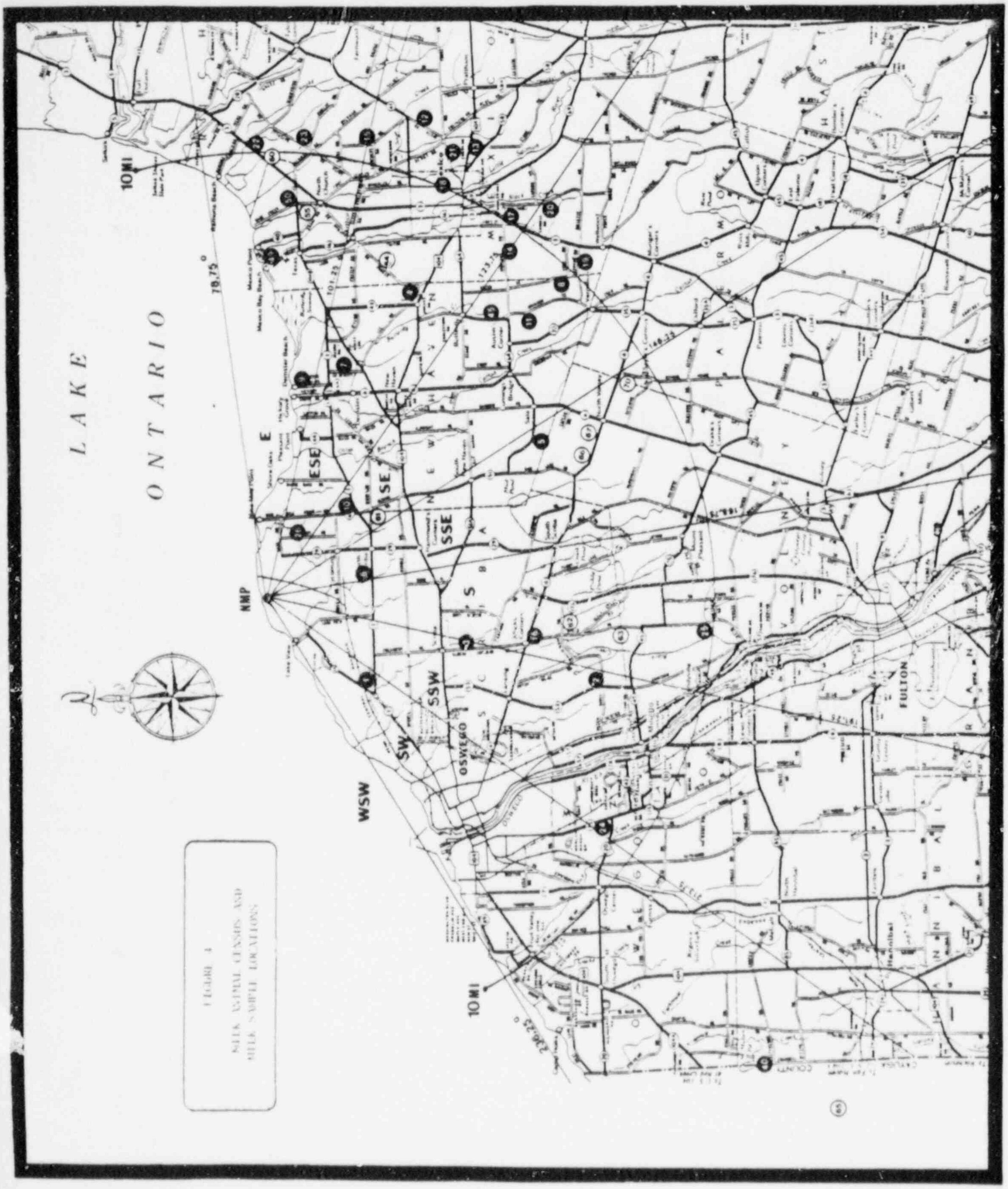


FIGURE 4
MILK ANIMAL CENSUS AND
MILK SAMPLE LOCATIONS

FIGURE 5
NEW YORK STATE MAP

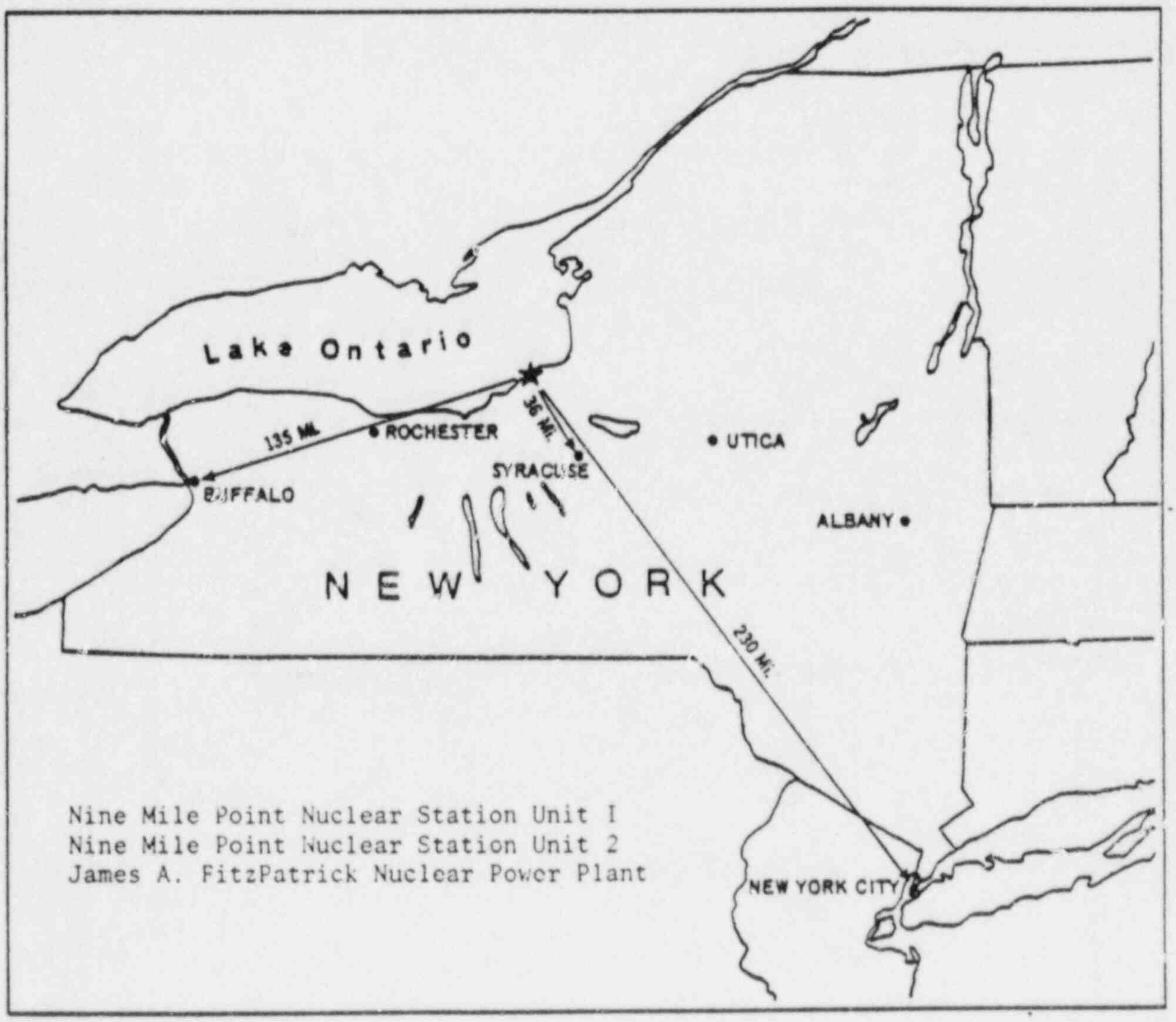
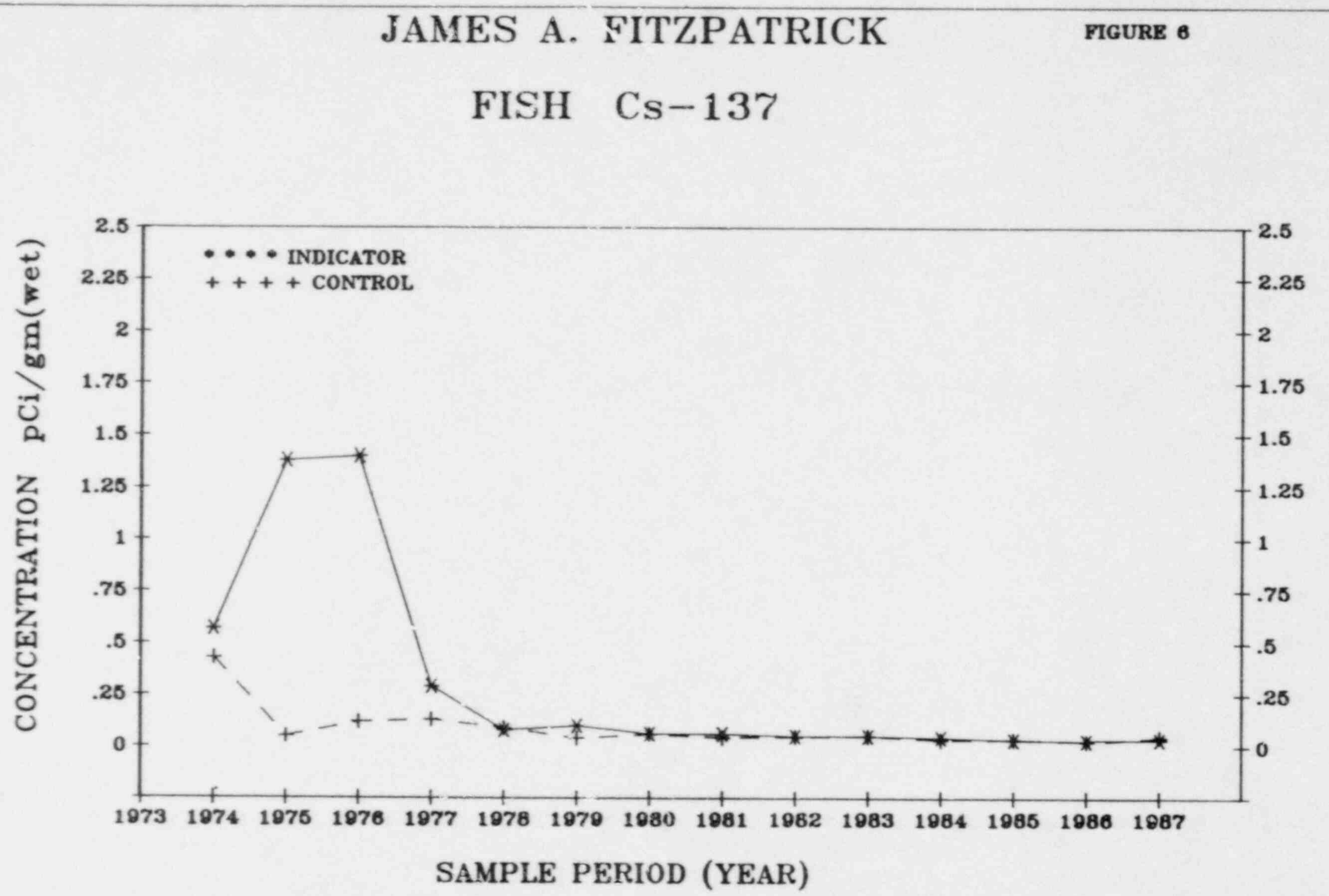


FIGURE 6



CONTROL DATA FOR 1975 IS MDL; 1981 IS LLD

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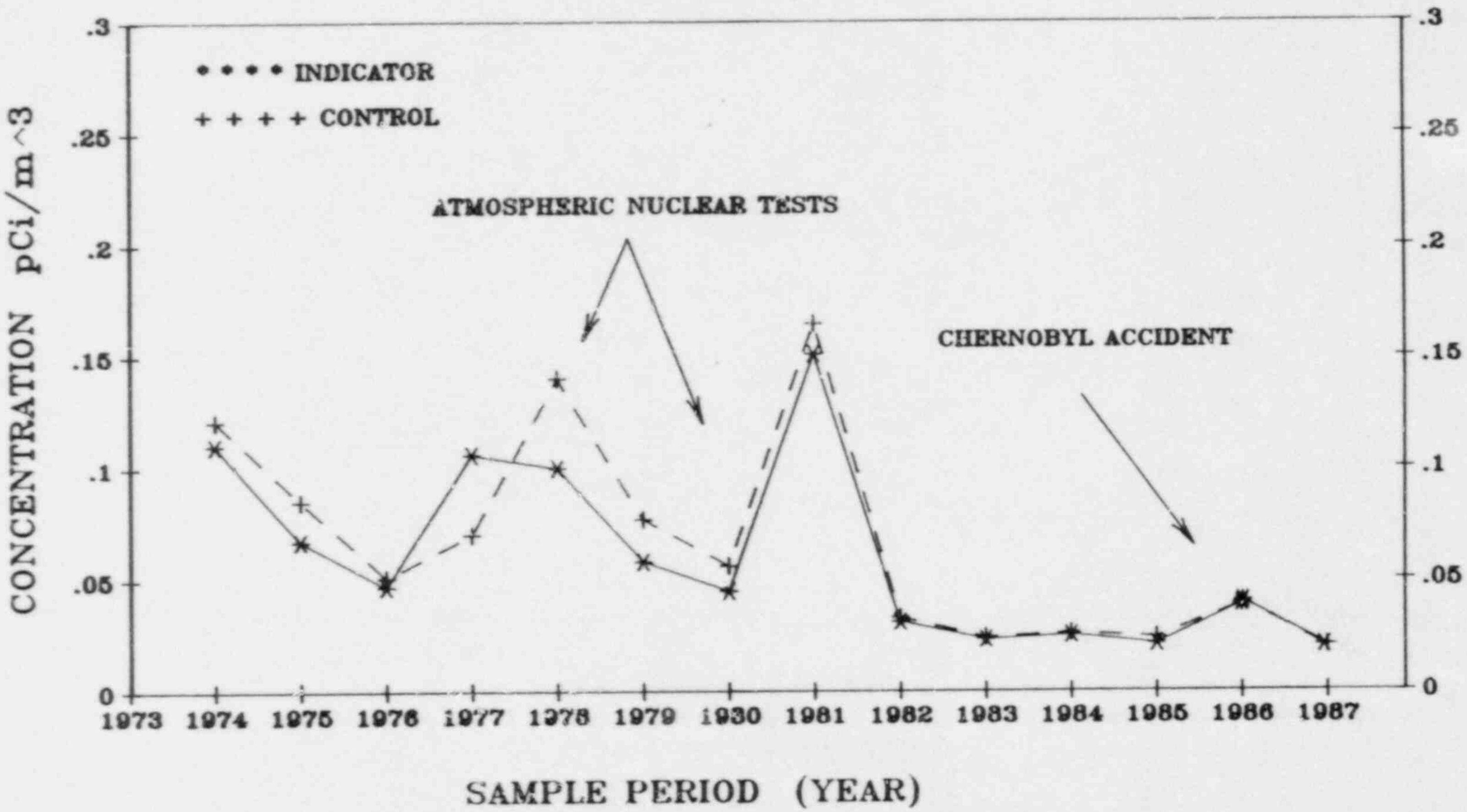
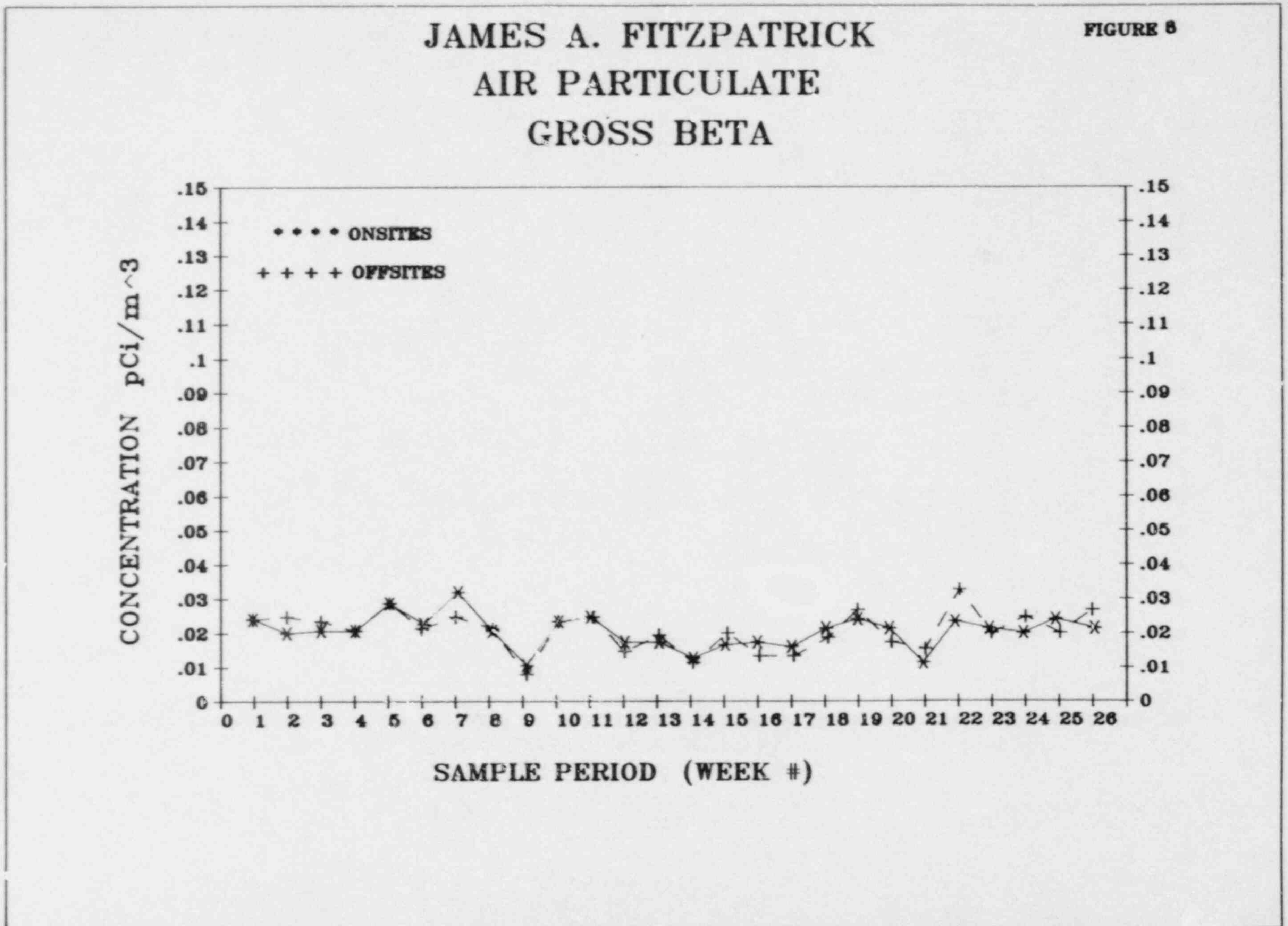
JAMES A. FITZPATRICK

FIGURE 7

AIR PARTICULATE GROSS BETA

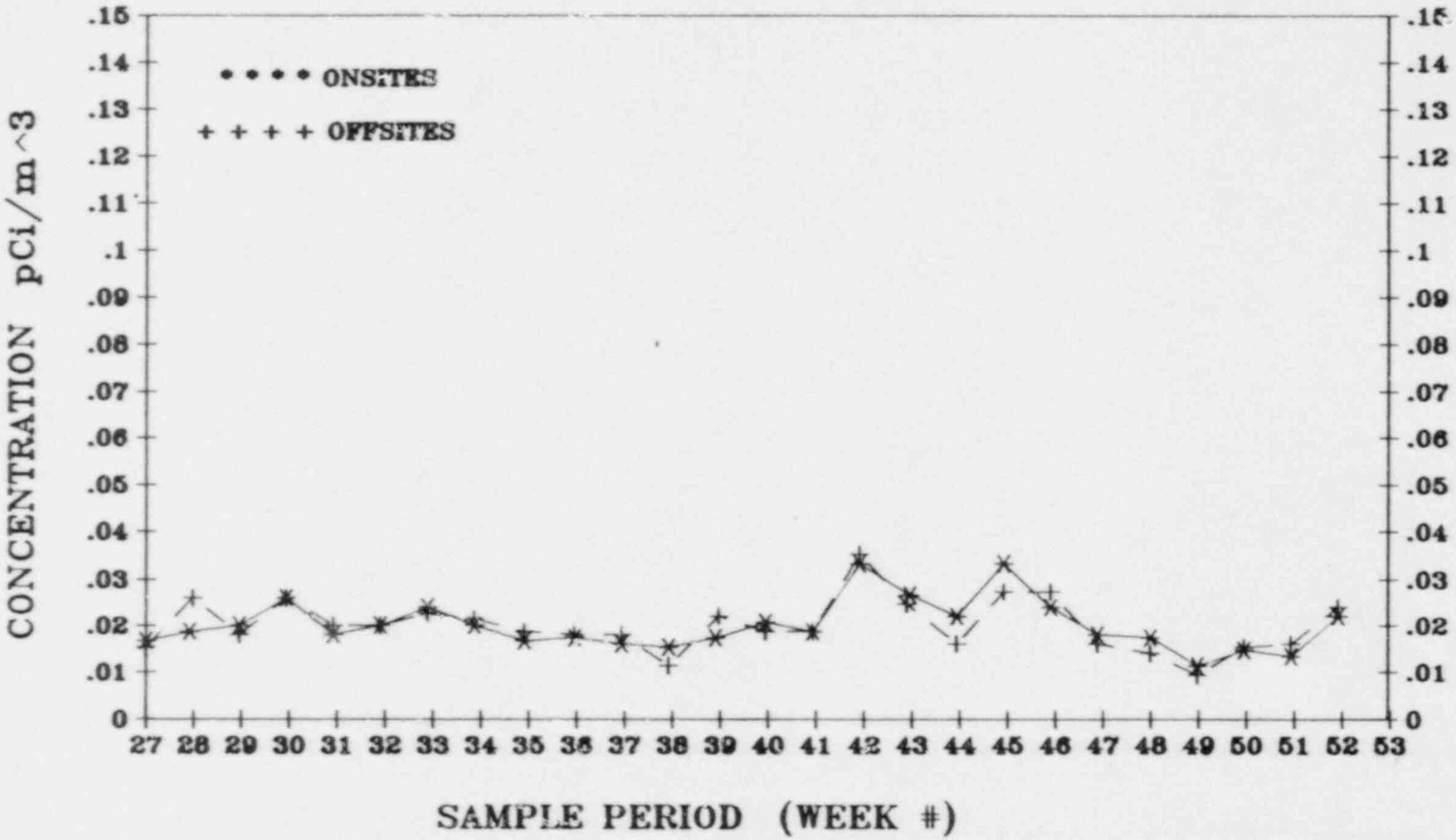




JAMES A. FITZPATRICK
AIR PARTICULATE
GROSS BETA
FIGURE 8
ONSITES
OFFSITES
CONCENTRATION pCi/m^3
SAMPLE PERIOD (WEEK #)
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

JAMES A. FITZPATRICK
AIR PARTICULATE
GROSS BETA

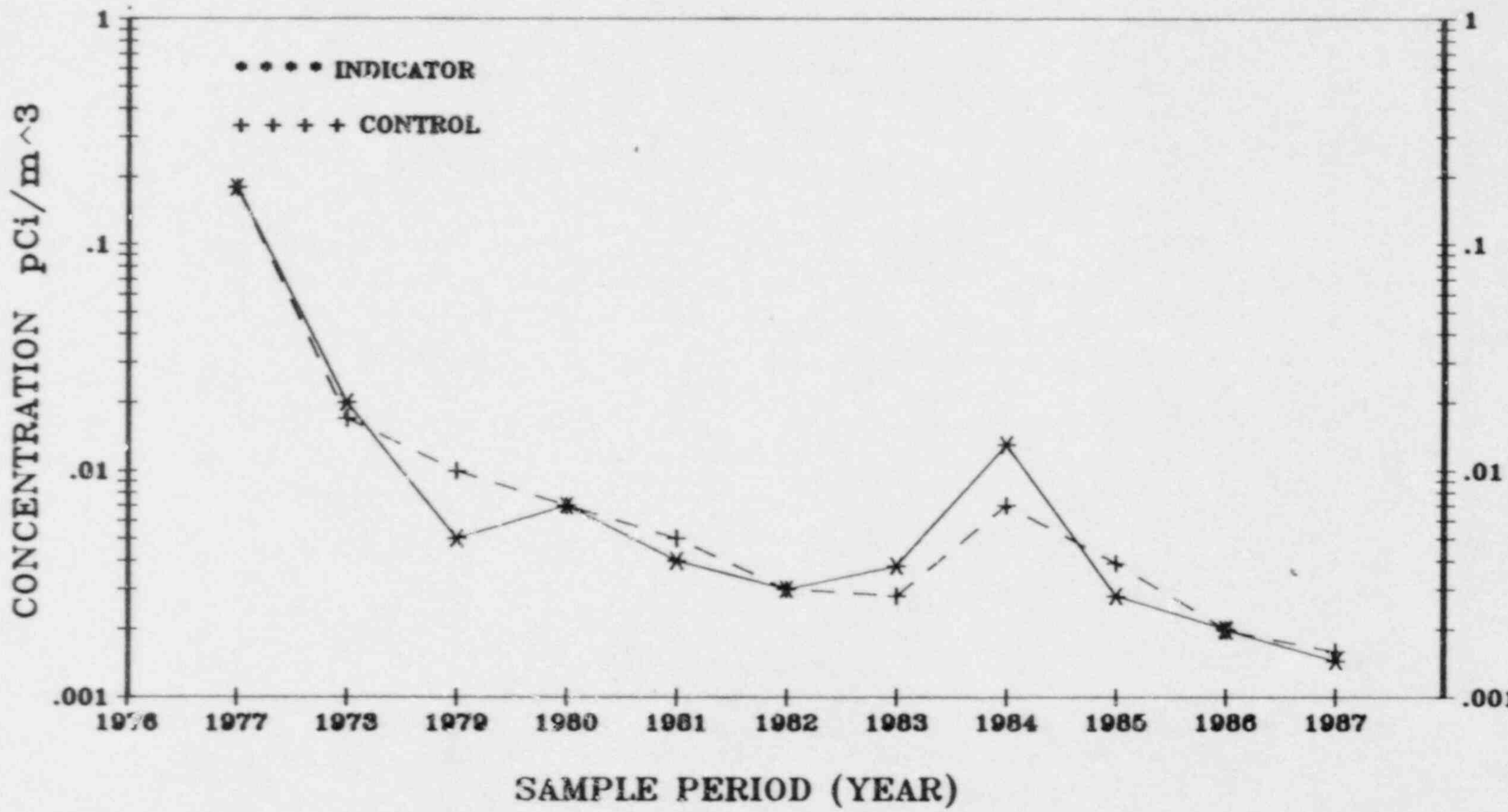
FIGURE 9



JAMES A. FITZPATRICK

FIGURE 10

AIR PART. COMPOSITE Co-60



CONTROL AND INDICATOR FOR 1986,87 ARE LLD'S

NO DATA FOR YEARS PRIOR TO 1977

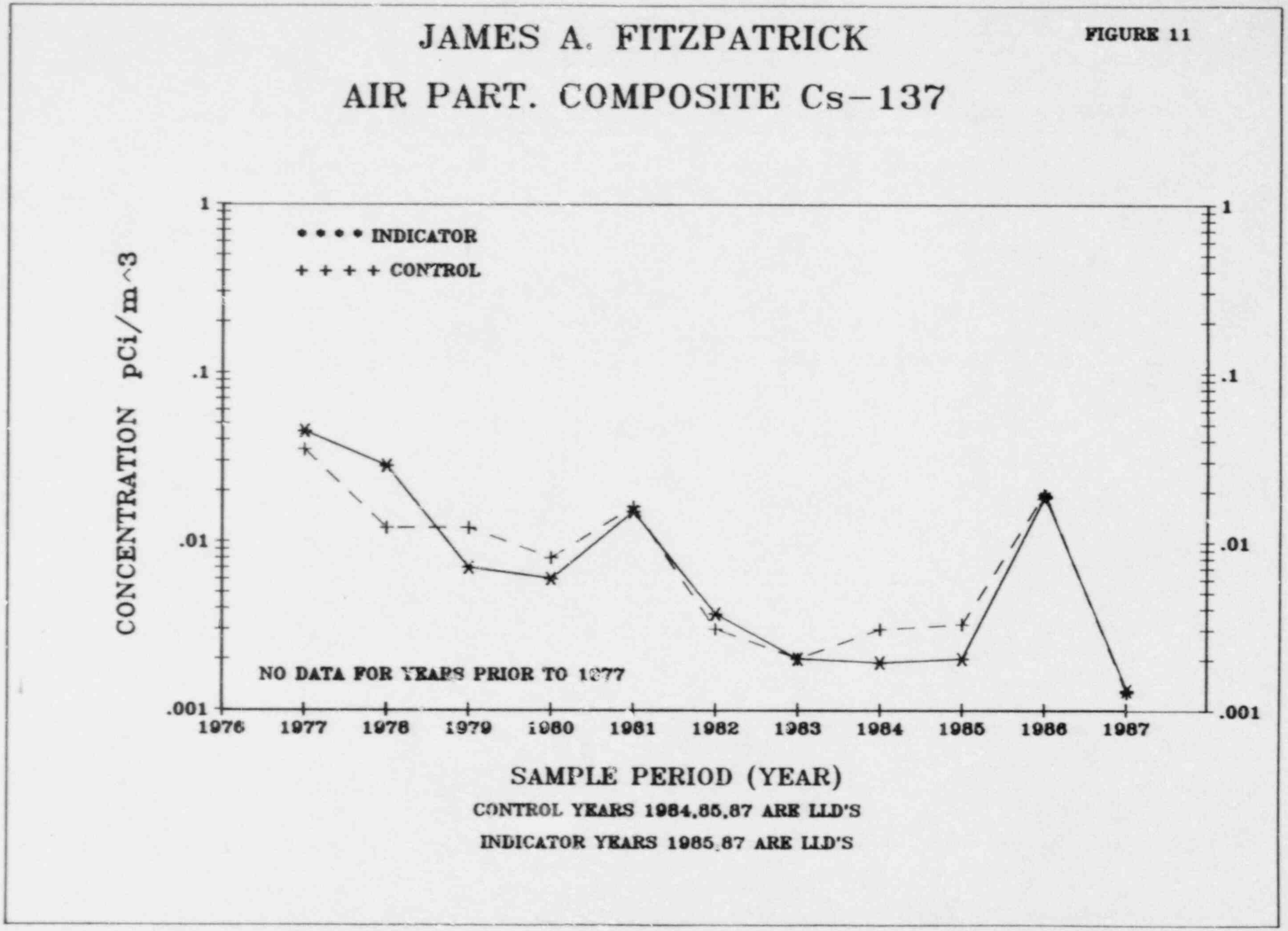

JAMES A. FITZPATRICK
FIGURE 11
AIR PART. COMPOSITE Cs−137
CONCENTRATION pCi/m^3
• • • • INDICATOR
+ + + + CONTROL
NO DATA FOR YEARS PRIOR TO 1977
1
.1
.01
.001
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
SAMPLE PERIOD (YEAR)
CONTROL YEARS 1984,85,87 ARE LLD'S
INDICATOR YEARS 1985,87 ARE LLD'S

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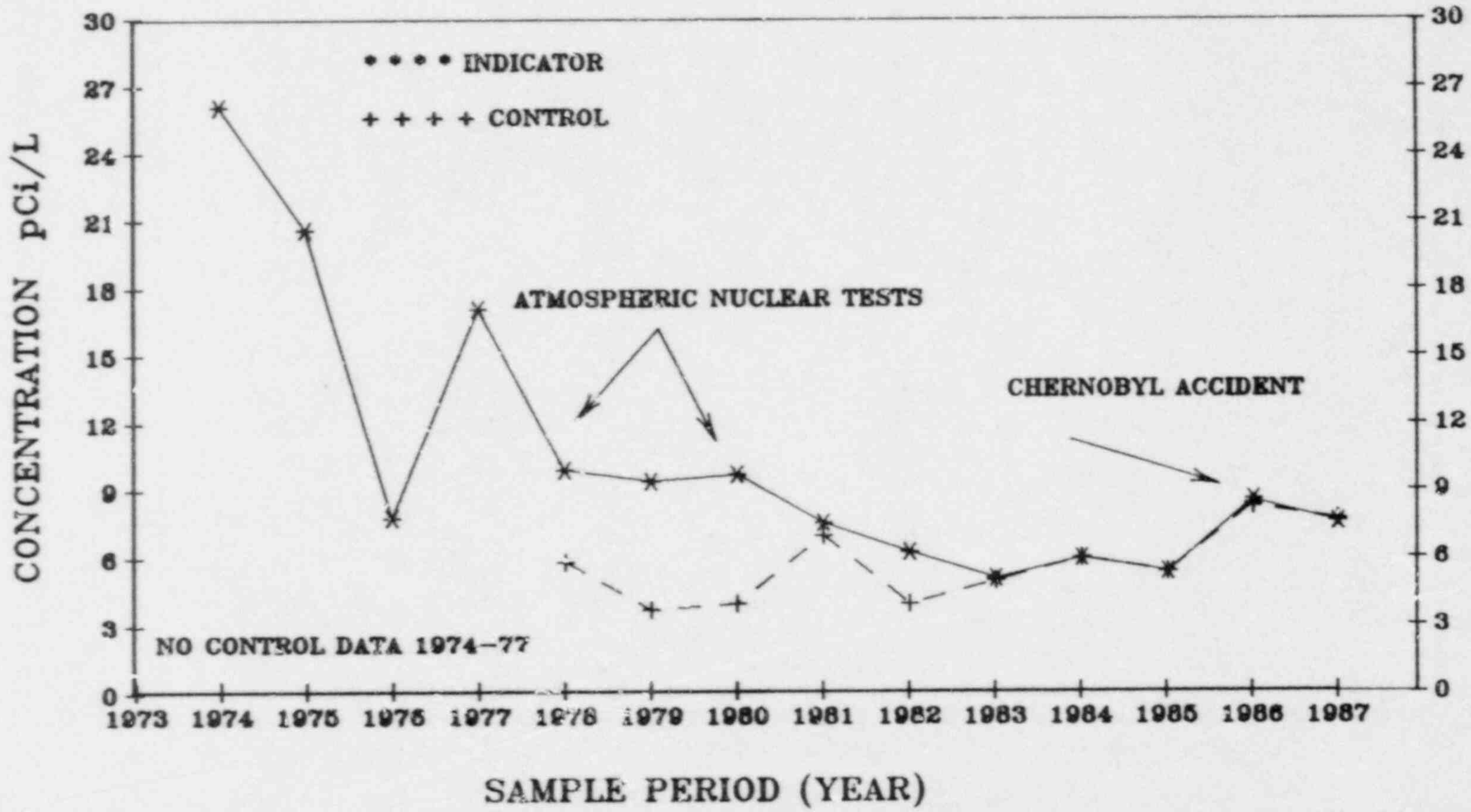
FIGURE 12

JAMES A. FITZPATRICK
MILK Cs−137

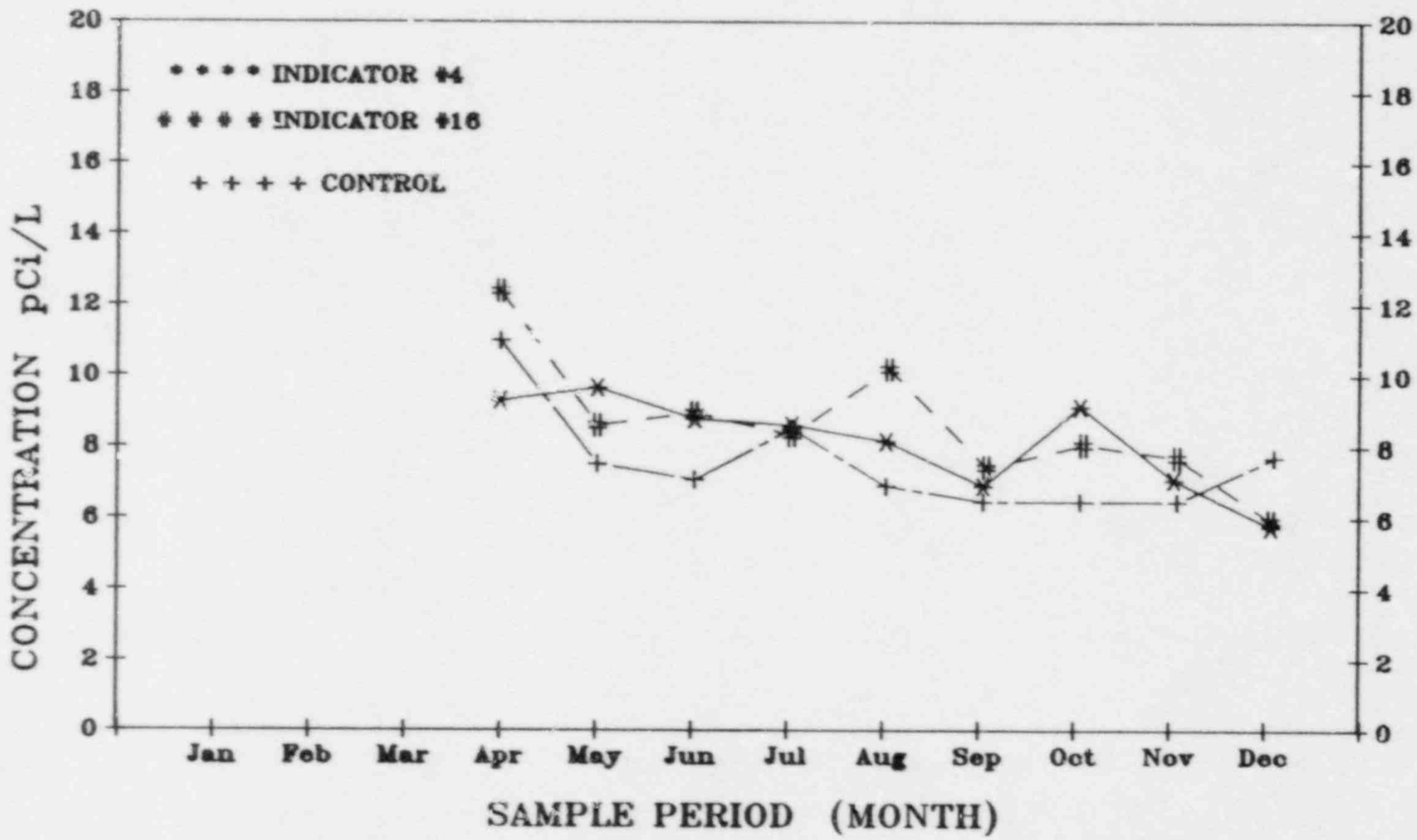


CONTROL DATA FOR 1980,82−85,87 ARE LLD'S

INDICATOR DATA FOR 1984,85,87 ARE LLD'S

FIGURE 13

JAMES A. FITZPATRICK
MILK Cs-137

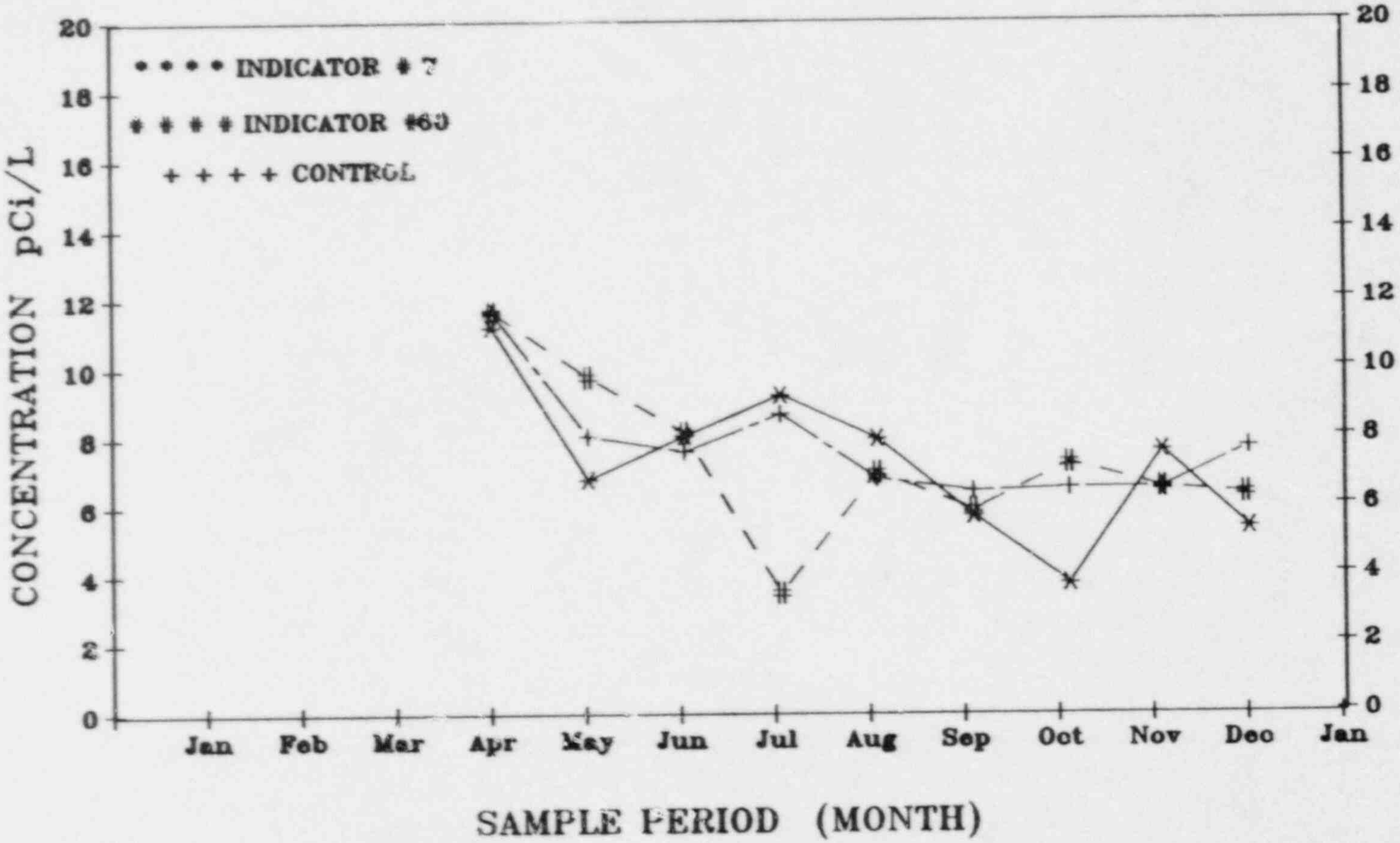


REFER TO TABLE #12 FOR EXACT DATA VALUES AND LLD OCCURRENCES

JAMES A. FITZPATRICK

FIGURE 14

MILK Cs−137

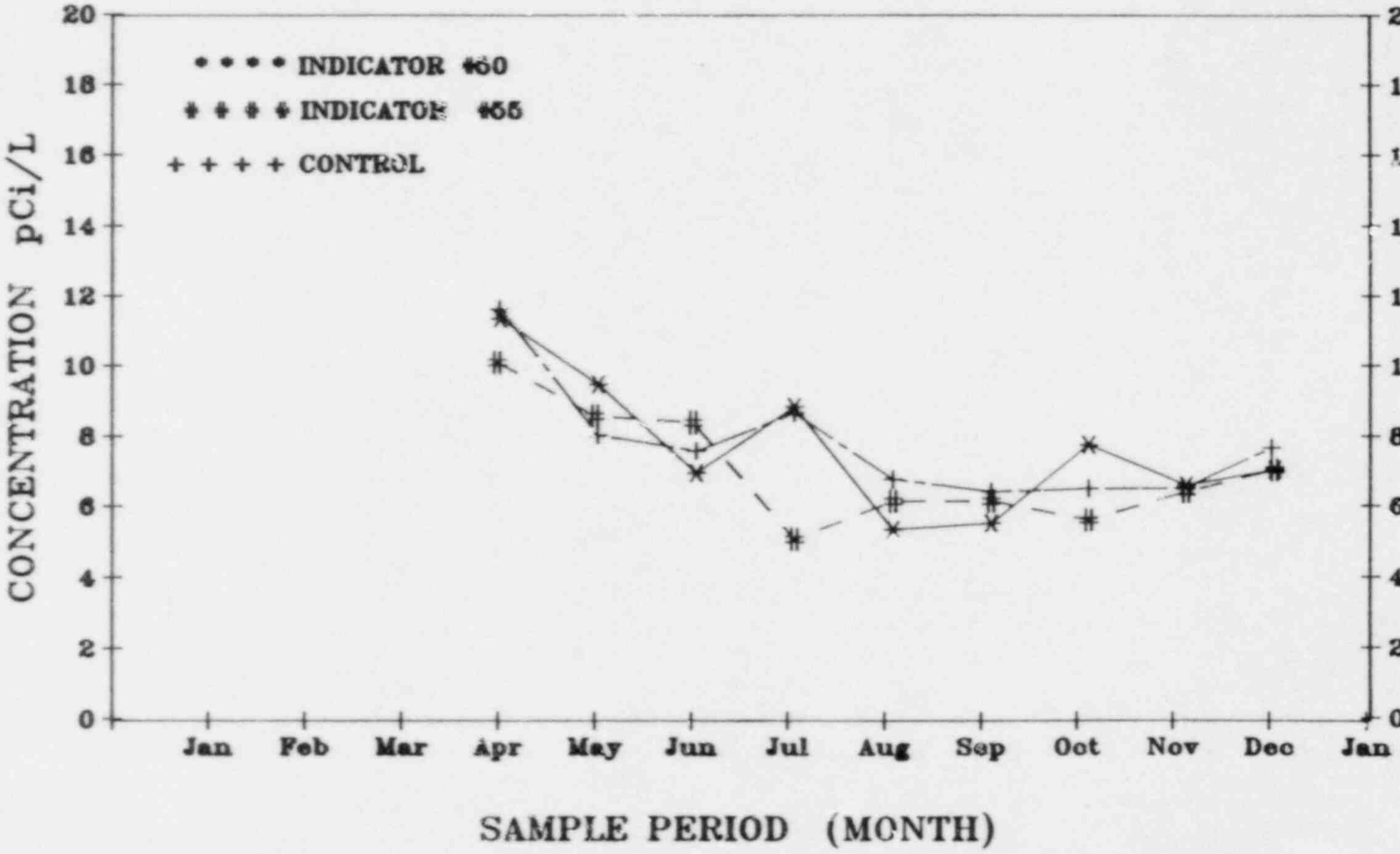


REFER TO TABLE #12 FOR EXACT DATA VALUES AND LLD OCCURRENCES

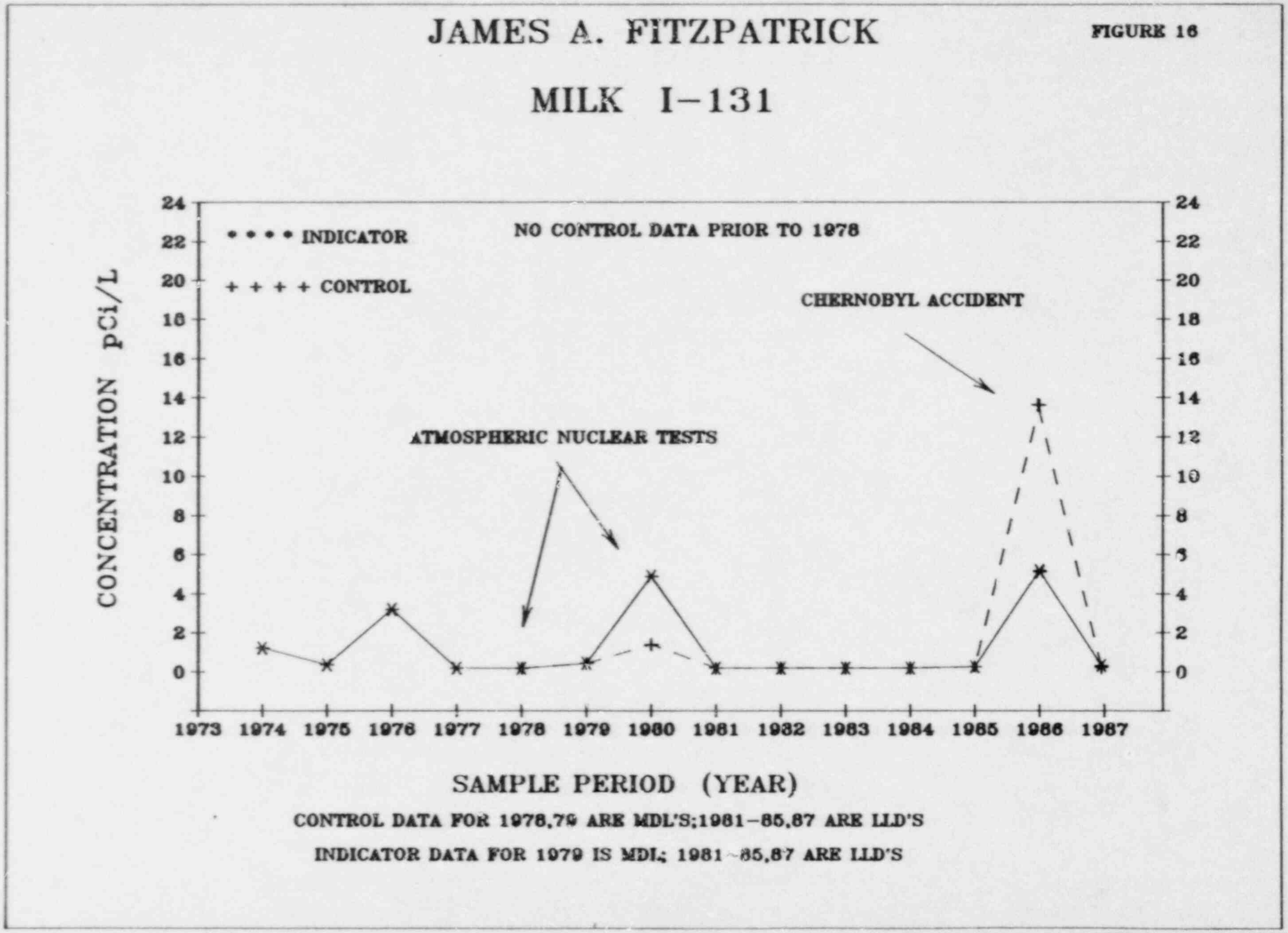
JAMES A. FITZPATRICK

FIGURE 15

MILK Cs-137



REFER TO TABLE #12 FOR EXACT DATA VALUES AND LLD OCCURRENCES


JAMES A. FITZPATRICK
FIGURE 16
MILK I-131
NO CONTROL DATA PRIOR TO 1978
* * * * INDICATOR
+ + + + CONTROL
CHERNOBYL ACCIDENT
ATMOSPHERIC NUCLEAR TESTS
CONCENTRATION pCi/L
SAMPLE PERIOD (YEAR)
CONTROL DATA FOR 1978,79 ARE MDL'S;1981-85,87 ARE LLD'S
INDICATOR DATA FOR 1979 IS MDL; 1981-85,87 ARE LLD'S

VIII SUMMARY OF USEPA

ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDIES PROGRAM RESULTS

This section includes results of JAF analyses compared to reference samples originating from the United States Environmental Protection Agency (USEPA). As required by the Technical Specifications, participation in this program includes media for which environmental samples are routinely collected.

All intercomparison data is summarized in table form. The tables are titled "USEPA Environmental Radioactivity Laboratory Intercomparison Study Program".

TABLE VIII-1

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

Gross Beta Analysis of Air Particulate Filters (pCi/filter)

Gross Beta Analysis of Water (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANAYLSIS	JAF RESULT (1)	EPA RESULT (2)
04/87	QA87-35	APF	BETA	54±4 (3)	43±5
				54±4	
				55±4	
04/87	QA87-36	WATER	BETA	58±2 (3)	66±5
				58±2	
				65±3	
08/87	QA87-96	APF	BETA	36±3 (3)	30±5
				36±3	
				36±3	
10/87	QA87-118	WATER	BETA	80±3 (3)	72±5
				78±3	
				79±3	

TABLE VIII-2

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY
INTERCOMPARISON STUDY PROGRAM

Tritium Analysis of Water (pCi/L)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
02/87	QA87-14	WATER	H-3	4000±200 (4)	4209±421
				3800±100	
				4000±100	
06/87	QA87-68	WATER	H-3	2800±100 (4)	2895±357
				2700±200	
				3000±200	
10/87	QA87-117	WATER	H-3	4700±100 (4)	4492±449
				4500±100	
				4800±100	

TABLE VIII-3

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY
INTERCOMPARISON STUDY PROGRAM

Iodine Analysis of Water (pCi/L) and Milk (pCi/L)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
02/87	QA87-20	MILK	I-131	10±1 (3)	9±1
				9±1	
				10±1	
02/87	QA87-20	MILK	I-131	9±1 (4)	9±1
				9±1	
				9±1	
04/87	QA87-28	WATER	I-131	8±2 (3)	7±1
				8±2	
				8±2	
08/87	QA87-88	WATER	I-131	46±9 (3)	48±6
				52±12	
				45±12	
12/87	QA87-160	WATER	I-131	30±2 (3)	26±6
				30±2	
				30±3	

TABLE VIII-4

USEPA ENVIRONMENTAL RADIOACTIVITY
LABORATORY INTERCOMPARISON STUDY PROGRAM

Gamma Analysis of Milk, Water (pCi/L)
Air Particulate Filters (pCi/filter) and Food Products (pCi/kg)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
01/87	QA87-06	FOOD	I-131	72±3 (4) 76±3 75±2	78±8
			Cs-137	88±9 96±10 97±10	84±5
			K*	775±78 768±77 870±87	980±49
02/87	QA87-12	WATER	Co-60	62±15 (3) 51±13 50±16	50±5
			Zn-65	97±24 103±37 112±29	91±5
			Ru-106	136±77 137±83 137±71	100±5
			Cs-134	51±12 52±14 53±12	59±5
			Cs-137	75±14 77±19 79±14	87±5
04/87	QA87-35	APF	Cs-137	11±4 (3) 11±4 12±4	8±5

TABLE VIII-4
(CONTINUED)
USEPA ENVIRONMENTAL RADIOACTIVITY
LABORATORY INTERCOMPARISON STUDY PROGRAM

Gamma Analysis of Milk, Water (pCi/L)
Air Particulate Filters (pCi/filter) and Food Products (pCi/kg)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
04/87	QA87-36	WATER (BLIND)	Co-60	10±5 (3) 10±5 10±5	8±5
			Cs-134	18±8 20±6 20±6	20±5
			Cs-137	12±5 12±5 13±6	15±5
06/87	QA87-71	MILK	I-131	55±2 (4) 58±2 51±2	59±6
			Cs-137	82±8 82±8 81±8	74±5
			K*	1538±154 1593±159 1443±144	1525±76
06/87	QA87-61	WATER	Cr-51	35±19 (3) 50±19 49±19	41±5
			Co-60	60±4 64±4 68±4	64±5
			Zn-65	7±5 12±5 16±5	10±5
			Ru-106	76±6 77±6 87±6	75±5

TABLE VIII-4
(CONTINUED)
USEPA ENVIRONMENTAL RADIOACTIVITY
LABORATORY INTERCOMPARISON STUDY PROGRAM

Gamma Analysis of Milk, Water (pCi/L)
Air Particulate Filters (pCi/filter) and Food Products (pCi/kg)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
6/87	QA87-61 (Con't)	WATER	Cs-134	36±3 40±3 41±3	40±5
			Cs-137	72±4 76±4 79±4	80±5
07/87	QA87-82	FOOD	I-131	89±13 (4) 83±14 100±15	80±8
			Cs-137	55±6 56±6 57±6	50±5
			K*	1610±160 1630±160 1410±140	1680±84
08/87	QA87-96	APF	Cs-137	12±5 (3) 12±4 11±4	10±5
10/87	QA87-116	WATER	Cr-51	197±75 (3) 84±44	70±5
			Co-60	18±3 15±5 16±5	15±5
			Zn-65	41±6 50±13 48±13	46±5
			Ru-106	52±16 46±30 57±32	61±5

TABLE VIII-4
(CONTINUED)
USEPA ENVIRONMENTAL RADIOACTIVITY
LABORATORY INTERCOMPARISON STUDY PROGRAM

Gamma Analysis of Milk, Water (pCi/L)
Air Particulate Filters (pCi/filter) and Food Products (pCi/kg)

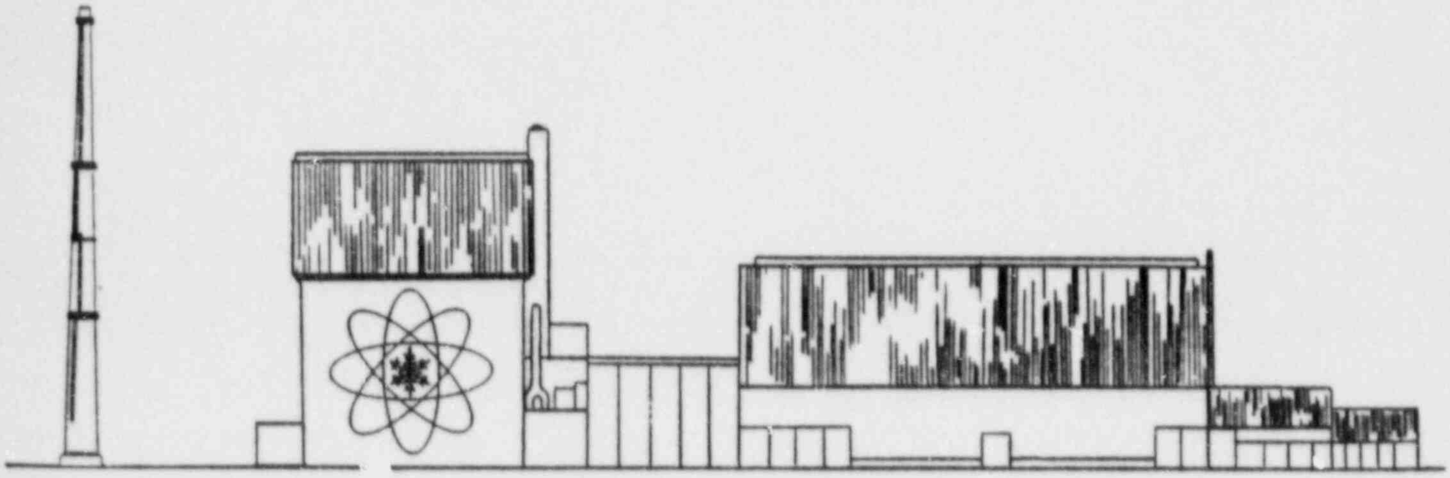
DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)
10/87	QA87-116 (Con't)	WATER	Cs-134	27±3 27±5 29±6	25±5
			Cs-137	46±3 42±6 48±7	51±5
10/87	QA87-118	WATER	Co-60	14±5 (3) 16±2 16±2	16±5
			Cs-134	20±6 17±3 19±3	16±5
			Cs-137	26±5 24±2 23±5	24±5

* - K-40 results reported as mg per unit of total potassium for EPA results only.
(1) - Results reported as activity ± the standard deviaton of the error.
(2) - Results reported as activity ± the error (2 sigma).
(3) - Analyzed at the site environmental laboratory.
(4) - Analyzed at a vendor laboratory.

1987

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

JANUARY 1, 1987 through DECEMBER 31, 1987



JAMES A. FITZPATRICK NUCLEAR POWER PLANT

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