Vepco

VIRGINIA ELECTRIC AND POWER COMPANY, RICHMOND, VIRGINIA 23261

October 31, 1978

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. William H. Regan
Environmental Projects Branch No. 2
Division of Site Safety and
Environmental Analysis
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Serial No. 609
LQA/JEE:esh

Docket Nos. 50-338
50-339
50-404
50-405

Dear Mr. Denton:

We are submitting herewith 25 copies of the North Anna Power Station Environmental Radiological Monitoring Program - Quarterly Report covering the period of April 1, 1978 through June 30, 1978.

We have reviewed the enclosed reports and find the field monitoring and assay effort are adequate with respect to program objectives. We note no significant change in background levels of radioactivity in the vicinity of the North Anna Power Station.

Very truly yours,

E. A. Baum, Executive Manager
Licensing & Quality Assurance

Enclosures

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TELEDYNE ISOTOPES

IWL-6343-432

VIRGINIA ELECTRIC AND POWER COMPANY

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MINERAL, VIRGINIA 23117

NORTH ANNA POWER STATION

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM

1978

DESCRIPTION OF THE OPERATIONAL PROGRAM

AND

QUARTERLY REPORTS AND ANALYSIS

Prepared by

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TELEDYNE ISOTOPES

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INTRODUCTION

Outlined in this document is the description of the operational environmental radiological monitoring program conducted by Virginia Electric and Power Company for the North Anna Power Station, and a compilation of the data generated to satisfy the monitoring requirements. This program is based on the technical specifications requiring the collection and analysis of various sample media to provide information on the type and quantity of radioactivity in certain indicator organisms or critical pathways. The operational program became mandatory on April 5, 1978 upon granting of the operating license for the North Anna Power Station Unit 1.

Virginia Electric and Power Company is responsible for the collection of the samples required for the program and Teledyne Isotopes is responsible for the analysis of each sample and submission of the reports of analysis. Quarterly summaries of the data reported for each sample type will be appended to this document for the period of January 1, 1978 through December 31, 1978.

These quarterly data summaries will include a compilation of the radioactivities reported for each sample type and pathway and a summary of the mean, range, and detections/total for each sample type and radionuclide. From the data summaries, a radiological environmental monitoring program summary table as specified in Regulatory Guide 4.8 (Ref. 1) will be prepared and used as the basis for evaluating the radiation exposures resulting from the North Anna Power Station operations.

Baseline levels of radioactivity in the environs of the North Anna Power Station have been established during the preoperational phase conducted from July 1, 1974 through December 31, 1977 (Ref. 2-6). On April 5, 1978 the operating license for the North Anna Power Station - Unit 1 was granted requiring the transition from the preoperational to the operational phase of the radiological environmental monitoring program.

The operational phase of the program is described in Appendix B to the Operating License (Ref. 7) and the required analysis and specifications (Table 1) were phased into the program during the January 1 - March 31, 1978 quarter.

The overall objectives (Ref. 7) of the operational radiological environmental monitoring program are to identify changes of radioactivity in the vicinity of the North Anna Power Station and to provide information on the types and quantity of radiation in certain critical pathways and indicator organisms as a basis for evaluating radiation exposure from station operation.

DESCRIPTION OF THE OPERATIONAL PROGRAM

THE RADIOLOGICAL ENVIRONMENTAL PROGRAM

The description of the operational radiological environmental analysis program is presented in this section. Personnel of VEPCO collect the samples specified in Table 1 and ship them to Teledyne Isotopes for the analytical phase of the program. Interim data reports are submitted by Teledyne Isotopes as the analyses are completed, normally within 33 days of the date of receipt of samples (Ref. 9). Summary reports are issued quarterly by Teledyne Isotopes, usually within 45 days after the end of the quarter. The quarterly reports will be appended to this report and will contain (1) computer compilations of the analytical data from the interim data reports, (2) summaries of the environmental radiological analysis for each media listing the mean and range of detected radionuclides and the ratio of detected radionuclides to total measurements, (3) data interpretations for each media and analysis based on the summary table prepared in accordance with Regulatory Guide 4.8 (Ref. 1).

The radiological environmental program outlined in Table 1 contains the technical specification requirements for the North Anna Power Station (Ref. 7).

Sampling station identifications and relative positions to the effluent release point are listed in Table 2 (Ref. 8) and shown on Figure 1 and Figure 2 (maps indicating the environmental sampling stations).

The operational environmental radiological program requires measurements on the following media.

Airborne Particulates

Particulate filters are collected weekly from air sampling stations 1, 3, 5, 7, 21, 22, 23, 24 and analyzed for gross beta activity. Quarterly composites of these particulate air samples are analyzed for Sr-89, Sr-90 (second quarter only), and gamma-emitting nuclides by high resolution Ge(Li) gamma spectrometry. Air sampling stations are located on Figures 1 and 2 and listed in Table 1. Lapse time recorders are used to calculate actual air volumes.

Radiogas (Radioiodine)

Charcoal cartridges are collected from sampling stations 3, 21, 23, 24 weekly. The cartridges are analyzed for radioiodine by distillation and beta counting. Charcoal cartridge sampling locations are shown on Figures 1 and 2.

Direct Radiation

Environmental direct radiation levels are monitored by thermoluminescent dosimeters (TLD) using a multi-area, phosphor teflon $CaSO_4$:Dy dosimeter. Dosimeters are placed at each location and exchanges are made quarterly. TLDs are located at stations 1, 3, 4, 5, 6, 7, 21, 22, 23, and 24 (see Table 1 and Figures 1 and 2).

Milk

Milk samples are collected monthly from locations 12, 13, 14 and analyzed for I-131 by chemical separation and gamma isotopic emitters by high resolution Ge(Li) gamma spectrometry. Quarterly milk samples are analyzed for Sr-89, Sr-90. Milk sampling locations are listed in Table 1 and shown in Figures 1 and 2.

Well Water

Water samples are collected quarterly from the Environmental Laboratory well and analyzed for tritium and for gamma emitting nuclides by high resolution Ge(Li) gamma spectrometry. The second quarter samples are also analyzed for Sr-89, Sr-90.

Surface Water

A sample of surface water (North Anna River) is collected quarterly from Station 11 for tritium and gamma isotopic nuclides. Surface water samples are also collected monthly from Station 08 (Discharge) and Station 09 (Reservoir) and analyzed for tritium, iodine-131, and gamma isotopes. The second quarter surface water samples or composites are also analyzed for Sr-89, Sr-90.

Fish

Fish are collected annually near the beginning of the season from two locations and analyzed for gamma emitting nuclides by high resolution Ge(Li) gamma spectrometry. Fish sampling sites are at locations 8 and 9 on Figure 1.

Terrestrial Vegetation

Samples of green leafy vegetation (cultivated or weeds) are collected annually during the harvest from two locations, Stations 21 and 23. These samples are analyzed for gamma emitting nuclides by high resolution Ge(Li) gamma spectrometry.

Soil

Soil samples are collected from locations near the airborne stations every three years and analyzed for gamma emitting nuclides by high resolution Ge(Li) gamma spectrometry. The stations are 1, 3, 4, 5, 6, 7, 21, 22, 23, and 24. Stations 1, 21, 22, 23 and 24 are also analyzed for Sr-89, Sr-90.

Sediment/Silt

Silt samples from Stations 8, 9, and 11 along with a shoreline sample from the vicinity of Station 9 are collected semiannually and analyzed for gamma emitting nuclides by high resolution Ge(Li) gamma spectrometry. Sediment/silt samples are analyzed annually for Sr-89, Sr-90.

TABLE 1

NORTH ANNA POWER STATION
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATION AND/OR MAP NUMBER DESIGNATION	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
AIRBORNE			
Particulates	Site or site boundary: 1,21, 22, 23 Communities: 3,5,7 Control: 24	Continuous sampler (2/3 running time cycle), changes weekly	Weekly gross beta on each filter, quarterly gamma isotopic on each location composite, Sr-89-90 on second quarter composite, I-131 on radioiodine weekly.
Radioiodine	3,21,23,24		
Soil	1,3,4,5,6,7,21,22,23,24	Once per 3 years	Gamma isotopic on each, Sr 89-90 on 1,21,22, 23, 24 (on collection)
DIRECT	1,3,4,5,6,7,21,22,23,24	Quarterly	Gamma dose quarterly
WATERBORNE	Reservoir: 9 Discharge: 8	Monthly	Gamma isotopic radioiodine[e] H-3 quarterly composite, Sr 89-90 second quarter composite
	North Anna River: 11 Ground (well): 1A[d]	Quarterly	Gamma isotopic, H-3 on collection, Sr 89-90 second quarter sample

TABLE 1

NORTH ANNA POWER STATION
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATION AND/OR MAP NUMBER DESIGNATION	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
AQUATIC Sediment	Reservoir: 9 Discharge: 8 North Anna River: 11	Semiannually	Gamma isotopic on collection, Sr 89-90 annually
Shoreline	Vicinity of: 9		
INGESTION milk	Nearest Dairies: 12, 13, 14	Monthly[a]	Radioiodine[a,e], Gamma isotopic monthly, Sr 89-90 quarterly
	Non-dairy activity[b]	Calculated dose dependent[b]	Radioiodine[b,e], Gamma isotopic[b] Sr 89-90[b]
Fish (Bass, or sunfish or crappie and catfish)	Reservoir: 9 Discharge: 8	Annually, near beginning of season	Gamma isotopic
Green Leafy vegetation, cultivated or weeds. Naturally occurring	21, 23	Annually during harvest[c]	Gamma isotopic on collection

TABLE 1

NORTH ANNA POWER STATION
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATION AND/OR MAP NUMBER DESIGNATION	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS

a. Once each month 1 and 2 mrem thyroid isodose lines will be calculated using the previous month's release data based on the cow-milk-child pathway. Should a dairy be located within the 1 mrem isodose line the sampling and analysis frequency for radioiodine will be modified to semimonthly for the month following the month for which the calculation was made. A similar sampling program will be for the 2 mrem isodose line except on a weekly frequency.

b. Monthly updates of the current year's annual accumulated calculated thyroid 15 mrem isodose lines based on the goat-milk-child and the cow-milk-child pathway will be done. Should the isodose line extend beyond the site boundary, a survey to locate goats or cows within the isodose line will be carried out within 30 days. Should goats or cows be observed, efforts to obtain samples from the owners of the animals will be put forth. If samples are obtainable, a sampling program similar to "a" above will be initiated. If samples are unobtainable, the annual report will document such and include the calculated doses.

c. Monthly updates of an annual 15 mrem isodose line (using release data and maximum organ dose in each of the 16 sectors) based on the grass-cattle-beef-man pathway will be done. Should the isodose line extend beyond the site boundary, sampling and analyses will be modified to monthly for the current year.

d. Samples will be taken from the Environmental Laboratory well.

e. Radioiodine analyses will be done by chemical separation.

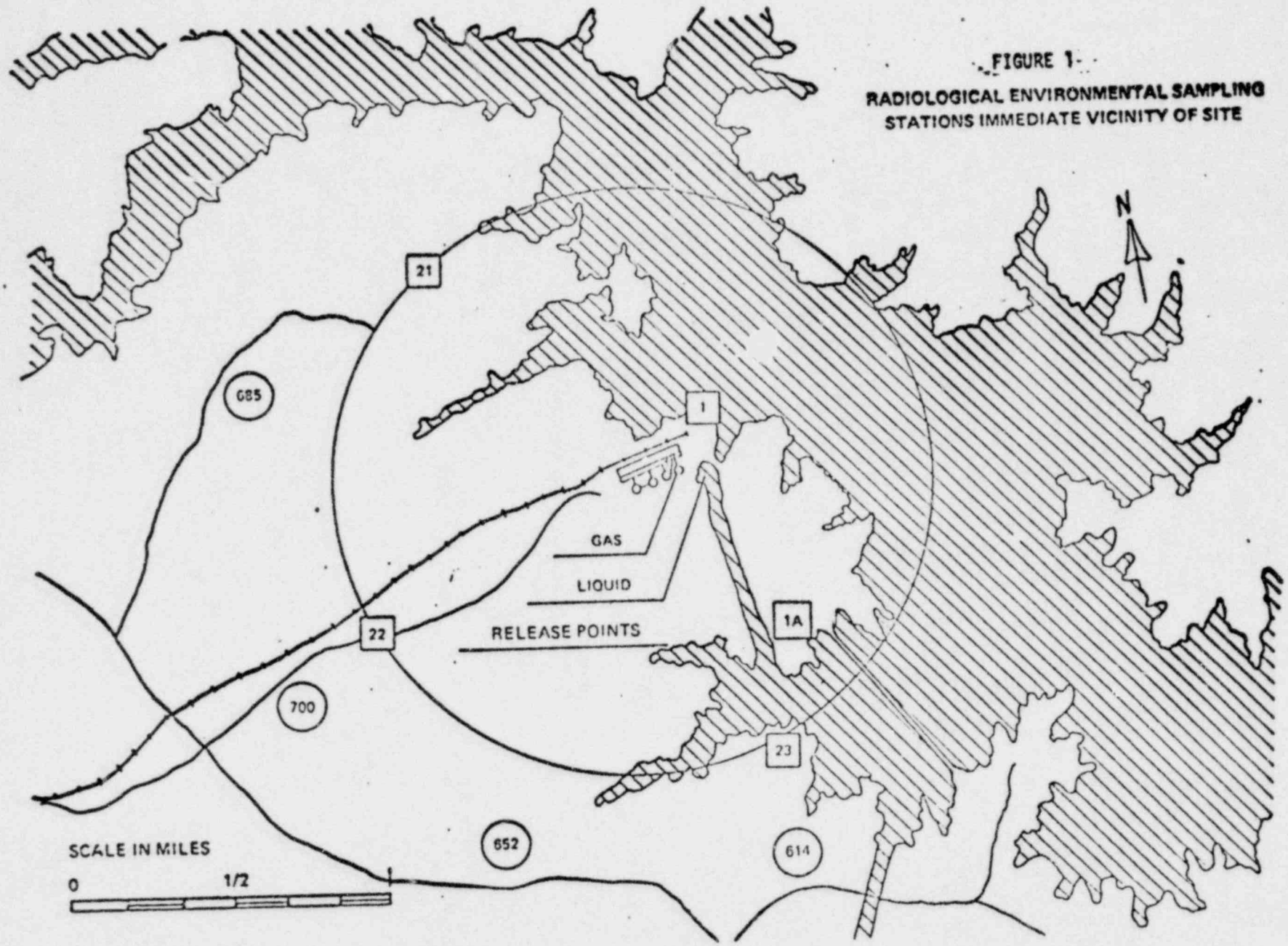
TABLE 2

SAMPLING STATION IDENTIFICATION AND RELATIVE POSITION TO EFFLUENT RELEASE POINT

STATION NUMBER	LOCATION	DISTANCE MILES	DEGREES AND COMPASS DIRECTION		REMARKS
1	On Site	0.2	42	NE	
3	Mineral	7.1	243	WSW	
4	Wares Crossroads	5.1	287	WNW	
5	Good Hope Church	4.2	20	NNE	
6	Levy	4.7	115	ESE	
7	Bumpass	7.3	167	SSE	
8	Discharge Lagoons	1.1	148	SSE	
9	Lake Anna, upstream	2.2	320	NW	Control
11	North Anna River, downstream	5.8	128	SSE	
12	Holladay Dairy	8.3	310	NW	
13	Fredericks Hall	5.6	205	SSW	
14	Trice Dairy	3.2	202	SSW	
21	Route 685	1.0	301	WNW	
22	Route 700	1.0	242	WSW	
23	Aspen Hills	0.9	158	SSE	
24	Orange	22.0	325	NW	Control

FIGURE 1

RADIOLOGICAL ENVIRONMENTAL SAMPLING
STATIONS IMMEDIATE VICINITY OF SITE



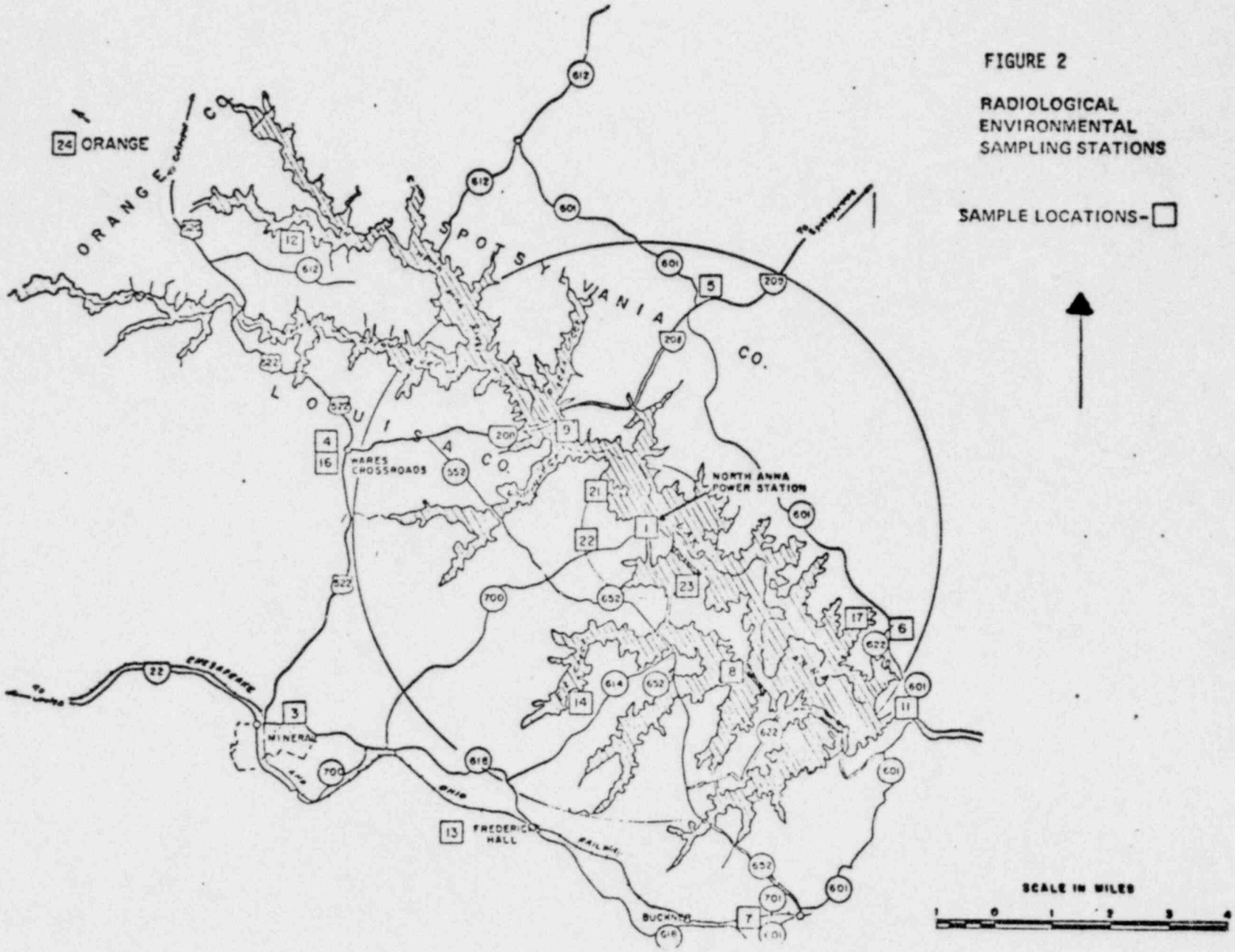


FIGURE 2

RADIOLOGICAL ENVIRONMENTAL SAMPLING STATIONS

SAMPLE LOCATIONS-□

ABSTRACTS OF THE ANALYTICAL PROCEDURES

The following are abstracts of the radionuclide separation, purification, and measurement techniques used by Teledyne Isotopes. These techniques have been developed to meet the detection sensitivities (Table 3) and associated accuracies required by the nuclear industry in compliance with technical specifications.

Air Particulates

Gross Beta

Transfer filter to a 2-inch diameter planchet and assay in a Beckman Sharp Wide Beta II automatic alpha/beta counter.

Gamma Isotopic Analysis

Composite station filters are combined quarterly and radioassayed on a high resolution, high efficiency Ge(Li) detector.

Radioiodine

Iodine-131

Two procedures are used for the analysis of charcoal cartridges for iodine-131.

METHOD 1. If the charcoal used is NOT impregnated with elemental iodine, iodide carrier is added and leached with NaOH. The stable iodide and I-131 is then stripped and extracted as iodine and precipitated as PdI_2, mounted on a nylon planchet, and assayed by low level beta counting.

METHOD 2. If the charcoal used in the filters is impregnated with iodine, the chemical yield of the distillation procedure cannot be determined and the samples are analyzed by high resolution gamma spectrometry (Ge(Li)) by integration of the I-131 photopeak.

Direct Radiation (TLD)

$CaSO_4$:Dy thermoluminescent dosimeter packets consisting of the four-area RadiGuard badge are placed at monitoring locations. At the end of the monitoring period, the dosimeters are returned to Teledyne Isotopes for readout. Results are reported in mR for the collection period or mR/collection time period.

Milk

Iodine-131

Stable iodide carrier is added to an aliquot of milk and the iodide and I-131 is removed by anion exchange resin. The iodine is stripped

with NaOH solution, treated with hydroxylamine hydrochloride and $NaNO_2$, and extracted into $CHCl_3$ as free iodine (I_2). It is then back extracted into $NaHSO_3$ solution and precipitated as PdI_2. The precipitate is mounted on a nylon planchet for low level beta counting.

Strontium-89/Strontium-90

To 1 liter of milk add strontium carrier and TCA solution. Stir solution and allow precipitation to settle overnight. Filter, wash, and discard precipitate. To the filtrate and oxalic acid, followed by NH_4OH until the solution is alkaline in order to precipitate calcium and strontium oxalates. This precipitate is filtered and ashed, and the ash is dissolved in nitric acid. $Fe(OH)_3$ scavenges are performed and stable yttrium carrier added, followed by a 5 to 7 day period for Y-90 ingrowth. The yttrium is precipitated as the hydroxide, redissolved and precipitated as the oxalate, and then mounted on a nylon planchet and counted in a low level beta counter. The strontium is precipitated from the sample as $SrCO_3$, mounted on a nylon planchet and counted in a low level beta counter for Sr-89 and/or the Y-90 ingrowth.

Gamma Isotopic Analysis

Transfer 1 liter of milk to a 1-liter wrap-around Marinelli counting beaker and radioassay on a high resolution Ge(Li) detector.

Well Water

Tritium

An aliquot of sample is converted to hydrogen gas by reduction in a hot zinc furnace, mixed with methane counting gas and radioassayed utilizing an internal low level gas proportional counter. Very low levels of activity can be detected due to the sophistication of the counting equipment, the electronics, and the shielding.

Gamma Isotopic Analysis

One liter of sample is transferred to a 1-liter Marinelli wrap-around counting beaker and counted on a Ge(Li) detector.

Surface Water

Tritium

An aliquot of sample is converted to hydrogen by gas reduction in a hot zinc furnace, mixed with methane counting gas and is radioassayed utilizing an internal low level gas proportional counter. Very low levels of activity can be detected due to the sophistication of the counting equipment, the electronics, and the shielding.

Gamma Isotopic Analysis

One liter of sample is transferred to a 1-liter Marinelli wrap-around counting beaker and counted on a Ge(Li) detector.

Fish

Gamma Isotopic Analysis

Remove the edible portions by filleting the fish and homogenizing in a high speed blender or dice into small pieces. Transfer the blended or diced portions to a 300 ml bottle, record the weight, and radioassay on a high resolution Ge(Li) detector.

Vegetation/Terrestrial (Green Leafy)

Gamma Isotopic Analysis

Completely fill a 300 ml bottle with a green leafy vegetation. Record sample weight and radioassay on a Ge(Li) detector. Calculate the observed gamma emitting nuclides in pCi/gm wet.

Soil and Sediment/Silt

Gamma Isotopic Analysis

Fill a 300 ml bottle with soil, record the sample weight, and radioassay on a high resolution Ge(Li) detector.

Strontium-89/Stronium-90

Weigh an aliquot of dry soil or sediment and transfer to a 1-liter beaker. Add strontium carrier and concentrated HNO_3; then heat the sample for 2 hours to leach strontium from the soil. Filter the resulting solution, wash the precipitation with hot water, and discard the residue. Evaporate the filtrate to a few milliliters and add NH_4OH until alkaline. Add saturated Na_2CO_3 solution to precipitate $SrCO_3$, and centrifuge and discard supernate. Dissolve precipitate in HNO_3 and evaporate to almost dryness. Proceed with Sr-89, Sr-90 purification procedures using fuming nitric acid, an $Fe(OH)_3$ scavenge, etc.

ABSTRACTS OF THE RADIOASSAY PROCEDURES

The lower limits of detection for radionuclides by the radioassay procedures are listed in Table 3.

Gross Beta

Evaporated or solid phase aliquots are transferred to a 2-inch diameter stainless steel planchet and counted in a low level gas flow thin window Geiger counter.

Ge(Li) Gamma Spectrometry

Based upon the specific media to be analyzed, samples are counted in 1-liter wrap-around Marinelli type containers, 300 ml bottles or 2-inch filter paper source geometries on 55 cc Ge(Li) detectors coupled to multi-channel spectrometers. All resultant spectra are maintained on magnetic tape for computer analysis and for future reference.

Strontium-89/Strontium-90

After decomposition and radiochemical separation and purfication, mounts of Sr-89 and Y-90 are counted in a low level gas flow thin window Geiger counter. Nuclide purity is established by counting over at least one half-life for Y-90 and by multiple counts for Sr-89.

Tritium

An aliquot of distilled sample is added to scintillation cocktail and counted in a liquid scintillation spectrometer, or converted to the gaseous phase and counted in an internal gas proportional counter depending on sensitivity requirements.

Iodine-131

Mounts are counted in a low level gas flow thin window Geiger counter. Nuclide purity is established by counting over at least one half-life. Positive detections of I-131 are also verified by counting on a beta-gamma coincidence spectrometer.

Rare Gases

Purified fractions are assayed in internal gas proportional counters.

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TABLE 3

LOWER LIMITS OF DETECTION

	Sample Analysis	***LLD & Reporting Units	Sampled Volume Required
1.	Airborne Particulate		
	Gross Alpha	2.5×10^{-3} pCi/m^3	125 m^3
	Gross Beta	7.6×10^{-3} pCi/m^3	
	Ge(Li) Gamma Isotopic	See Table 3.2	1625 m^3
2.	Airborne Iodine		
	Charcoal Cargridge I-131	**2.4×10^{-2} pCi/m^3	125 m^3
3.	Direct Radiation		
	TLD Environmental Badge	2 mR ± 2 mR	
4.	Milk		
	Sr-90	0.8 pCi/l	4 liters
	I-131 by Chemical Separation	0.5 pCi/l	
	Ge(Li) Gamma Isotopic (Cs-137)	See Table 3.2	
	Cs-137 Chemical Separation	3 pCi/l	
5.	Well Water		
	Gross Alpha	0.5 pCi/l	2 liters
	Gross Beta	0.5 pCi/l	
	Tritium (gas count)	100 pCi/l	
	Ge(Li) Gamma Isotopic	See Table 3.2	
6.	Surface Water		
	Gross Beta	0.5 pCi/l	2 liters
	Tritium (gas count)	100 pCi/l	
	Ge(Li) Gamma Isotopic	See Table 3.2	
7.	Fish: Flesh		
	Gross Beta pluc K-40	0.1 pCi/gm wet	(2) 1 Kg
	Ge(Li) Gamma Isotopic	See Table 3.2	
	Sr-89	*0.8 pCi/gm	
	Sr-90	*0.5 pCi/gm	
8.	Vegetation (corn, leaf, food, terrestrial, aquatic)		
	Ge(Li) Gamma Isotopic	See Table 3.2	(2) 1 Kg
	Sr-89	0.8 pCi/gm	
	Sr-90	0.5 pCi/gm	
9.	Soil		
	Ge(Li) Gamma Isotopic	See Table 3.2	1 Kg
10.	Silt		
	Ge(Li) Gamma Isotopic	See Table 3.2	(2) 1 Kg
	Sr-89	0.8 pCi/gm	
	Sr-90	0.5 pCi/gm	

TABLE 3.2

LOWER LIMITS OF DETECTION BY HIGH RESOLUTION

Ge(Li) GAMMA SPECTROSCOPY

ENVIRONMENTAL SAMPLES

Nuclide	Water (1 liter) pCi/l	Soil & Vegetation (400 gm) pCi/gm	Filters pCi/total filter
Be-7	8E+01	2E-01	2E+01
K-40	2E+02	5E-01	5E+01
Cr-51	8E+01	2E-01	8E+01
Mn-54	8	2E-02	2
Co-58	8	2E-02	2
Fe-59	1E+01	4E-02	3
Co-60	8	2E-02	2
Zr-95	1E+01	4E-02	3
Ru-103	8	2E-02	2
Ru-106	8E+01	2E-01	8E+01
I-131	10	3E-02	2
Cs-134	9	2E-02	2
Cs-137	9	2E-02	2
Ba-140	3E+01	8E-02	6
La-410	2E+01	4E-02	2E+01
Ce-141	2E+01	4E-02	3
Ce-144	8E+01	2E-01	2E+01
Ra-226	6E+01	1E-01	1E+01
Th-228	1E+01	2E-02	1E+01

TABLE 3

LOWER LIMITS OF DETECTION

* Detection in limits as stated are per gram of ashed material. The actual detection limits in pCi/gm (wet) will vary by a factor of 10-100, depending on the wet versus ash weight factor.

** Analysis by chemical separation and beta counting of PdI_2. The non-impregnated with elemental iodine charcoal cartridges must be used when chemical separation is required.

*** The LLD values listed in this table are at the mid-collection time. Samples must be counted within one half-life after collection for these LLD values to be applicable.

$$LLD = \frac{3.29\sqrt{\frac{2\beta}{\Delta t}}}{2.22\ (V)(\varepsilon)(DF)} = \frac{4.66\sqrt{\frac{\beta}{\Delta t}}}{2.22\ (V)(\varepsilon)(DF)(Y)} \qquad \text{(Ref. 10)}$$

where β = background = cpm

Δt = counting time = min.

2.22 = conversion factor = $\frac{dpm}{pCi}$

V = volume or weight of sample

ε = counter efficiency

DF = decay factor of the radionuclide from mid-collection to mid-count time

Y = chemical yield

LLD = lower limit of detection at the mid-collection time

QUALITY CONTROL OF ANALYSIS

Important elements of the Quality Control Program at Teledyne Isotopes are (1) Sample and Analysis Control and (2) Laboratory Procedure Control.

Details of these elements of the Quality Control Program are provided in separate documents and issued to our customers on a proprietary basis.

1. Sample and Analysis Control

All samples arriving at our laboratories are assigned a T.I. code number and are processed by the procedures described in our "Quality Control Manual" (Ref. 9). Copy No. 14, latest revision date of 01/15/78, of the manual has been issued to the Virginia Electric and Power Company.

The Quality Control Manual contains

(a) Specifications for the handling and processing of samples and the documentation required for calculating and reporting the results of the analysis.

(b) The organization chart of the Environmental Analysis Croup at Teledyne Isotopes and the resumes of supervisory personnel.

(c) References to the routine stability checks of backgrounds and standards required for the calibration of the counting instruments used for radioassaying of samples.

(d) References to the operational checks on blanks, spikes, splits, and cross checks of samples.

(e) A section on accuracy checks containing summaries of intercomparison data with EPA cross check programs

2. Laboratory Procedure Control

Approved laboratory procedures are followed at Teledyne Isotopes for the analysis of each samples media for specific radionuclides. Copies of the following procedures were issued to the Virginia Electric and Power Company: Determination of Radiostrontium, Determination of Radioiodine, Detection of Gross Alpha and/or Gross Beta, Determination of Gamma Spectra, Determination of Tritium.

TELEDYNE ISOTOPES

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

EXCEPTIONS AND SPECIAL EVENTS

(JANUARY 1, 1978 - MARCH 31, 1978)

EXCEPTIONS

The operational program for the North Anna Power Station requires the weekly analysis of I-131 in charcoal filters with air volumes of approximately 125 cubic meters and sensitivities of less than 0.024 pCi/Cu. M. (see Table 1 in the Description of the Program). During the preoperational program most of the charcoal filters were impregnated with elemental iodine necessitating the analysis for I-131 by high resolution gamma spectrometry. By this procedure the limits of detection were lower than the 0.025 pCi/Cu. M. However, the collection periods and the volumes were at least 10 times longer. In addition, the activities were calculated to the end of the collection time.

For the operational program, 125 cubic meters of air and calculation to mid-collection were specified to insure against exceeding the sensitivity of 0.025 pCi/Cu. M. This requires the chemical separation of iodine and low level beta counting of the sample --a procedure possible only with noniodine impregnated charcoal. By using nonimpregnated charcoal and processing by chemical separation, the limits of detection are lower than 0.01 pCi/Cu. M. for 125 cubic meters of air and calculation to mid-collection time and counting within 8 days after collection.

It is recommended that nonimpregnated with elemental iodine charcoal cartridges be used and chemical separation be employed to insure compliance with the L.T. 0.025 pCi/Cu. M. specification.

SPECIAL EVENTS

On March 14, 1978 the Peoples Republic of China detonated an atmospheric nuclear device at the Lop Nor atomic test site. The reported yield of this nuclear device was approximately 10 kilotons.

The operational program for the site was implemented in anticipation of initial criticality of Unit 2.

TELEDYNE ISOTOPES

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

EXCEPTIONS AND SPECIAL EVENTS

(APRIL 1, 1978 - JUNE 30, 1978)

EXCEPTIONS

The use of stable iodine impregnated charcoal filters continued during the second quarter of 1978 necessitating radioassay by high resolution gamma spectrometry for I-131. The lower sensitivity gamma spectrometry precludes its use and requires the higher sensitivity of chemical separation of iodine and the use of non-impregnated charcoal filters. Non-impregnated charcoal filters are on order by Vepco and will be used when received.

SPECIAL EVENTS

On April 5, 1978 the operating license for the North Anna Power Station Unit 1 was granted and the operating phase of the radiological environmental monitoring program is in effect.

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

AIRBORNE EXPOSURE PATHWAY

(JANUARY 1, 1978 - MARCH 31, 1978)

AIR PARTICULATE

Filters were collected weekly from stations 01, 03, 05, 07, 21, 22, 23 and 24 and analyzed as required in Table 1. In addition, samples from stations 02, 04 and 06 were collected and analyzed even though not required in the radiological monitoring program (Ref. 7)

Summarized in Table 4 are the radionuclides detected on the air particulate filters. Gross beta and Ce-144 activities are plotted on Figure 3. The gross beta activity increased sharply during the week of 03/21-03/28, the result of the atmospheric nuclear detonation on March 14, 1978 by the Peoples Republic of China. Gamma analysis of the quarterly composite of the air particulate filters from each station showed Zr-95, Ru-103, Cs-137, Ce-141 and Ce-144 at levels slightly higher than during the fourth quarter of 1977. The small increase of Ce-144 is shown on Figure 3. The radionuclides detected as air particulates are fission products attributed to fallout from the Chinese atmospheric nuclear tests during 1976, 1977 and on March 14, 1978.

AIR RADIOIODINE

Charcoal filters were collected from stations 03, 21, 23 and 24 as specified in Table 1. In addition charcoal filters were collected at stations 01, 02, 04, 05, 06, 07 and 22 providing additional analysis not required by the ERMP. As discussed under "Exceptions", the limits of detection for I-131 exceeded the MDL of 0.025 pCi/Cu. M. because of the use of elemental iodine impregnated charcoal. Recommendations have been made to correct this deficiency. Iodine-131 was detected in nine of the eleven charcoal filters exposed during the week of 03/21-03/28 at a mean level of 0.07 pCi/Cu. M. See the summary table for I-131 in charcoal filters in Appendix "A" for the compilation of data and see Table 4 in this section for an overall summary and comparison.

SOIL

Samples were not scheduled for analyses during this quarter. Analyses of soil samples are required once every three years at stations 01, 03, 04, 05, 06, 07, 21, 22, 23 and 24. These stations are also collection sites for air particulate samples with the exception of stations 04 and 06.

PRECIPITATION

Sample analysis are not required as a part of the environmental monitoring program for the North Anna Power Station environs. The analysis of precipitation samples for gross beta activity at Station 01 are additional analysis and provide information useful for interpreting pathways for airborne exposures to radionuclides.

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

AIRBORNE EXPOSURE PATHWAY

(APRIL 1, 1978 - JUNE 30, 1978)

AIR PARTICULATE

Filters were collected weekly from Stations 01 through 07 and 21 through 24 and analyzed as specified in Table 1. Summarized in Table 4 are the radionuclides detected on the air particulate filters (quarterly averages). Gross beta activity and the shorter-lived gamma isotopes (Ru-103, Zr-95, I-131) decreased from the levels monitored during the first quarter. The longer-lived radionuclides (Cs-137 and Ce-144) from the Chinese atmospheric nuclear tests of 1977 and March 14, 1978 were monitored at higher levels compared to the first quarter measurements. Plotted on Figure 3 are the gross beta activities and the Ce-144 activity monitored on air particulate filters.

AIR RADIOIODINE

Charcoal filters were collected weekly from Stations 01 through 07 and 21 through 24 and analyzed for I-131. No I-131 was detected during the second quarter of 1978 compared to nine positive readings during the first quarter (see Table 4).

PRECIPITATION

Rainfall samples were collected from Station 01 (Onsite) and are measured for inches of rainfall and then monitored for gross beta and tritium. The deposition of gross beta emitting was 1.4 nCi/sq.m. during the second quarter compared to 2.2 nCi/sq.m. during the first quarter.

FIGURE 3

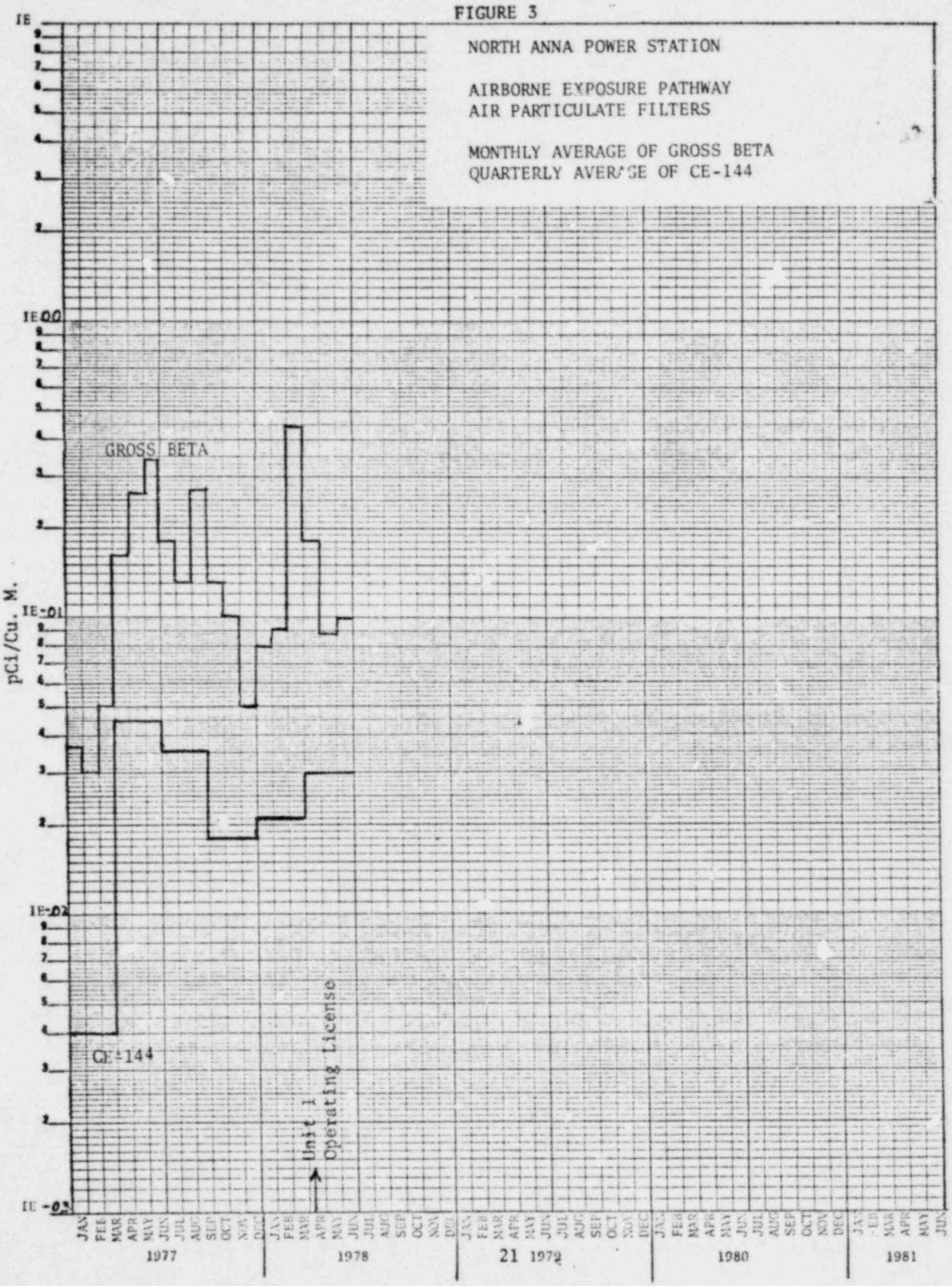
NORTH ANNA POWER STATION
AIRBORNE EXPOSURE PATHWAY
AIR PARTICULATE FILTERS
MONTHLY AVERAGE OF GROSS BETA
QUARTERLY AVERAGE OF CE-144
GROSS BETA
CE-144
Unit 1 Operating License
pCi/Cu. M.
1E
1E-01
1E-02
1E-03
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1977
1978
1979
1980
1981

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Air Particulates	Gross beta	143	0.0076	0.17	0.01-1.6	140/143	5, 7	0.22	0.04-1.6	26/26	0.10	0.03-0.13	11/13	12/27/77-03/28/78
		143		0.13	0.01-0.31	143/143	6, 23	0.16	0.07-0.3	26/26	0.14	0.06-0.27	13/13	03/28/78-06/27/78
pCi/cu.m.														
nominal air volume= 125 cu.m.	Gross beta		0.0076											12/27/77-
pCi/cu.m. nominal air volume = 1625cu.m.	Sr-89	11	0.003											2nd quarter only 03/28/78-06/27/78
	Sr-90	11	0.0005											2nd quarter only 03/28/78-06/27/78
pCi/cu.m.	Gamma Isotopic	11	-		-									
	Be-7	-	0.012	0.06	0.02-0.09	10/11	23	0.09	-	1/1	0.07	-	1/1	12/27/77-03/28/78
				0.11	0.07-0.15	10/11	22	0.15	-	1/1	0.11	-	1/1	03/28/78-06/27/78
nominal air volume = 1625cu.m.														
	Be-7		0.012											12/27/77-
	Zr-95	-	0.0018	0.006	0.004-0.01	9/11	23	0.010	-	1/1	0.006	-	1/1	12/27/77-03/28/78
				0.005	0.003-0.006	5/11	22	0.006	-	1/1	<0.003	-	0/1	03/28/78-06/27/78
		1												
	Zr-95		0.0018											12/27/77-

Station 24 is the control location

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Air Parti-	Ru-103	-	0.0012	0.014	0.01-0.02	9/11	02	0.021	-	1/1	LLD	-	0/1	12/27/77-03/28/78
culates				LLD	-	0/11	-	-	-	-	LLD	-	0/1	03/28/78-06/27/78
(cont.)														
pCi/cu.m.														
	Ru-103		0.0012											12/27/77-
	Ru-106		0.049	0.019	0.016-0.023	2/11	23	0.023	-	1/1	LLD	-	0/1	12/27/77-03/28/78
				0.016	0.013-0.018	4/11	06	0.018	-	1/1	LLD	-	0/1	03/28/78-06/27/78
	Ru-106		0.049											12/27/77
	I-131	-	0.002**	0.035	0.03-0.04	3/11	06	0.039	-	1/1	LLD	-	0/1	12/27/77-03/28/78
				LLD	-	0/11	-	-	-	1/1	LLD	-	0/1	03/28/78-06/27/78
	I-131		0.002**											12/27/77-
	Cs-137	-	0.0012	0.0024	0.002-0.004	7/11	23	0.0037	-	1/1	0.0023	-	1/1	12/27/77-03/28/78
				0.0032	0.003-0.004	10/11	01	0.004	-	1/1	0.003	-	1/1	03/28/78-06/27/78
	Cs-137		0.0012											12/27/77-

Station 24 is the control location

** At the end of the collection period for a quarterly composite

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION	REPORTING PERIOD
Air Parti-	Ba-140		0.008**	0.030	0.02-0.04	5/11	07	0.037	-	1/1	LLD	-	0/1	12/27/77-03/28/78
culate				LLD	-	0/11	-	-	-	-	LLD	-	0/1	03/28/78-06/27/78
(cont.)														
pCi/cu.m.														
	Ba-140		0.008**											12/27/77-
	Ce-141		0.0018	0.012	0.01-0.02	8/11	03	0.016	-	1/1	LLD	-	0/1	12/27/77-03/28/78
				LLD	-	0/11	-	-	-	-	LLD	-	0/1	03/28/78-06/27/78
	Ce-141		0.0018											12/27/77-
	Ce-144		0.012	0.021	0.01-0.03	11/11	23	0.029	-	1/1	0.021	-	1/1	12/27/77-03/28/78
				0.030	0.02-0.04	10/11	03	0.038	-	1/1	0.027	-	1/1	03/28/78-06/27/78
	Ce-144		0.012											12/27/77-

** At the end of the collection period for a quarterly composite

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Air	I-131	143	0.025*	0.070	0.04-0.12	9/143	23	0.12	-	1/13	EM	-	-	12/27/77-03/28/78
Radio-		143	0.3*	LLD	-	0/143	-	-	-	-	LLD	-	-	03/28/78-06/27/78
iodine pCi/cu.m. nominal air volume = 125 cu.m.														
	I-131													12/27/77-

EM-equipment malfunction

*Charcoal filters counted on Ge(Li) gamma spectrometer and calculated from the end of collection period.

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION	REPORTING PERIOD
Soil *	Sr-89		0.8											
pCi/gm.dry														
	Sr-90		0.5											
	Gamma Isotopic		-											
	K-40	-	0.2											
	Cs-137	-	0.02											
	Ra-226	-	0.1											
	Th-228	-	0.02											

* Soil samples are analyzed once every three years.

No analysis scheduled during Jan. 1-March 31, 1978 quarter.

No analysis scheduled during April 1 - June 30, 1978 quarter.

TABLE 4

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Airborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
**Precipitation pCi/liter	-	3												
	Gross beta	-	0.08	25	15-37	3/3	* Single collection station							01/01/78-03/31/78
inches of rainfall	-	-	-	3.03	0.2-5.5	3/3								
nCi/sq.m.	Gross beta	-	-	2.2	0.08-3.2	3/3								
pCi/liter	Gross beta			14	12-18	3/3	* Single collection station							04/01/78-06/30/78
inches of rainfall				4.1	2.9-5.0	-								
nCi/sq.m.	Gross beta			1.4	1.3-1.5									
pCi/liter	H-3		100	110	-	1/1	Semiannual composite							01/01/78-06/30/78

* Samples collected from station 01

** Not required for the operational program

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

DIRECT EXPOSURE PATHWAY

(JANUARY 1, 1978 - MARCH 31, 1978)

ENVIRONMENTAL GAMMA DOSE

Environmental Gamma Dose levels were monitored by TLD at stations 01, 03, 04, 05, 06, 07, 21, 22, 23 and 24 in accordance with the program in Table 1 (see Reference 7). In addition TLD measurements were obtained at station 02.

Summarized in Table 5 and on Figure 4 are the average gamma exposure dose levels at the collection stations. No change in the average gamma dose has been observed from the previous three quarters - see the comparison with the previous three quarters tables in Appendix "A".

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

DIRECT EXPOSURE PATHWAY

(APRIL 1, 1978 - JUNE 30, 1978)

ENVIRONMENTAL GAMMA DOSE

Environmental gamma dose levels were monitored with TLD badges at Stations 01 through 07 and 21 through 24 as outlined in Table 1. The average gamma dose during the second quarter is 0.30 mR/day and is summarized in Table 5 and plotted on Figure 4.

The average gamma dose for the nine month period 09/20/77-06/27/78 is 0.25 mR/day. The average of the fourth quarter 1977 and the first and second quarter of 1978 gamma dose is 0.22 mR/day compared to the corresponding 0.25 mR/day for the nine month period.

The high environmental dose during the second quarter 1978 could result from washdown and ground deposition of fission radionuclides from the March 14, 1978 atmospheric nuclear test by the Peoples Republic of China.

FIGURE 4

NORTH ANNA POWER STATION

DIRECT EXPOSURE PATHWAY
ENVIRONMENTAL RADIATION - TLD

QUARTERLY AVERAGE OF GAMMA EXPOSURE

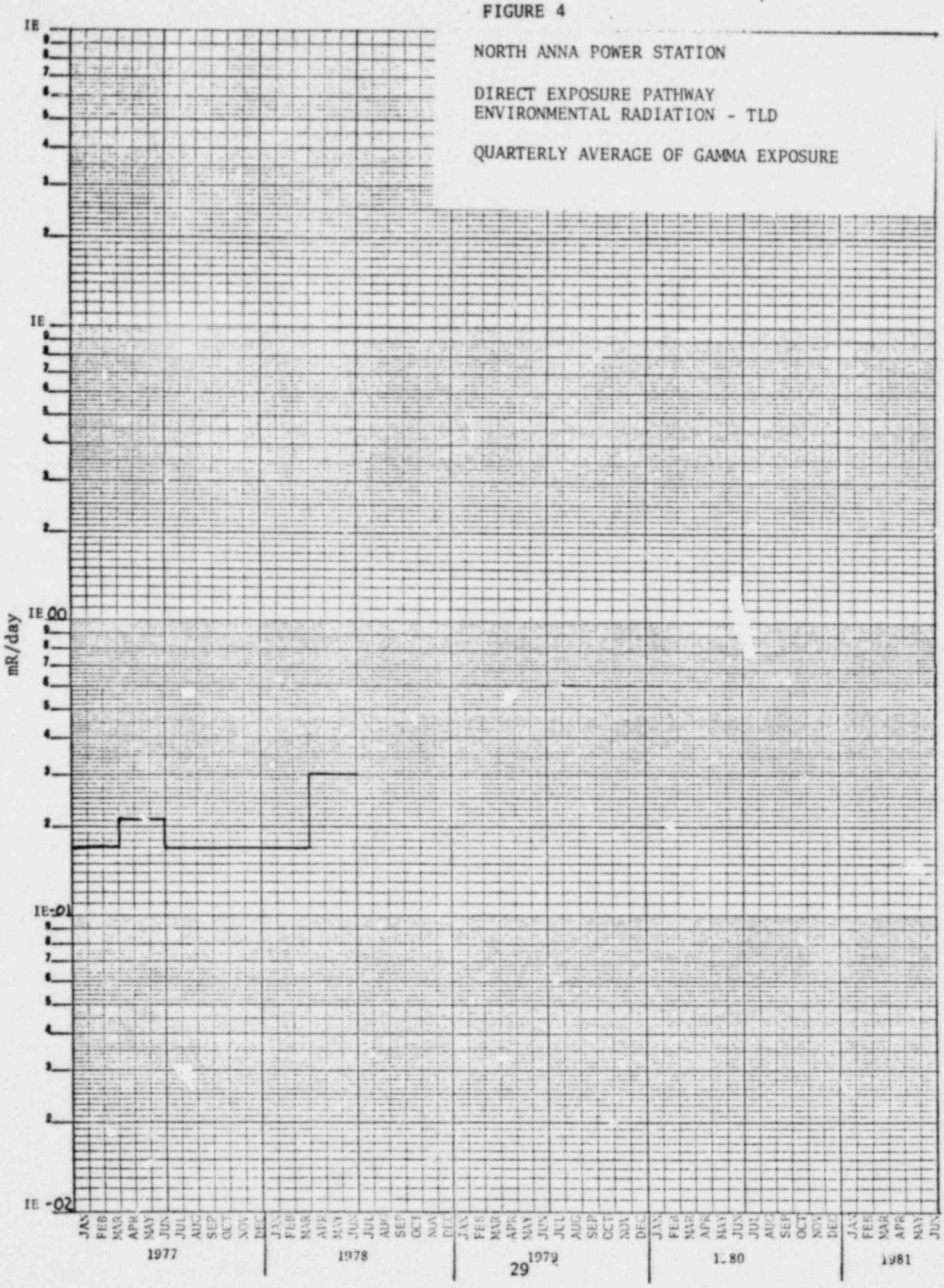

TABLE 5

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Direct Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
TLD mR/day	Gamma Dose	11	2mr±2mr	0.18	0.14-0.22	11/11	23	0.22	-	1/1	0.14	-	1/1	12/27/77-03/28/78
		11		0.30	0.24-0.39	11/11	22	0.39	-	1/1	0.24	-	1/1	03/28/78-06/27/78
	Gamma Dose		2mr±2mr											12/27/77
TLD mR/day	Gamma Dose	11		0.25	0.19-0.32	11/11	06	0.32	-	1/1	0.19	-	1/1	09/20/77-06/27/78

Station 24 is the control location.

TELEDYNE ISOTOPES

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

WATERBORNE EXPOSURE PATHWAY

(JANUARY 1, 1978 - MARCH 31, 1978)

SURFACE WATER

Samples were collected from station 09, reservoir; from station 08, discharge cooling; and from station 11, North Anna River. These three samples were analyzed as outlined in Table 1 and the results are summarized in Table 6. Presented on Figure 5 is the tritium activity from station 08, the discharge cooling water. The tritium activity of 110 pCi/liter is consistent with preoperational measurements (see References 2 through 6).

GROUND WATER

Ground water (well water) samples were collected at station 1A, the Environmental Laboratory Well and analyzed for tritium and gamma emitting nuclides. All activities in ground water were below the limits of detection and the results are summarized in Table 6.

AQUATIC SEDIMENT AND SHORELINE SOIL

Samples were collected from station 08, near the discharge cooling water for the NAPS, from station 09 at the reservoir and from station 11, the North Anna River. In addition, a soil sample was collected in the vicinity of station 09, the reservoir.

Sediment and shoreline soils were analyzed for gamma emitting radionuclides and the results are tabulated in Appendix "A" and summarized in Table 6. Usual gamma emitting radionuclides in sediments are K-40, Cs-137, Ra-226 and Th-228, and the levels of activity are of the same magnitude as monitored during the preoperational program.

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

WATERBORNE EXPOSURE PATHWAY

(APRIL 1, 1978 - JUNE 30, 1978)

SURFACE WATER

Samples collected from the reservoir (Station 09), the discharge cooling (Station 08), and the North Anna River (Station 11) were analyzed for H-3, gamma isotopic, I-131, Sr-89, and Sr-90. The program summary for these radionuclides is presented in Table 6 and the H-3 level in the discharge cooling is plotted on Figure 5. All radionuclides are at or below the environmental preoperational levels.

GROUND WATER

Samples were collected at the Environmental Laboratory Well (Station 1A) and analyzed for H-3, gamma isotopic, Sr-89 and Sr-90. All radionuclides in these samples remained at or below the limits of detection and the results are summarized in Table 6.

FIGURE 5

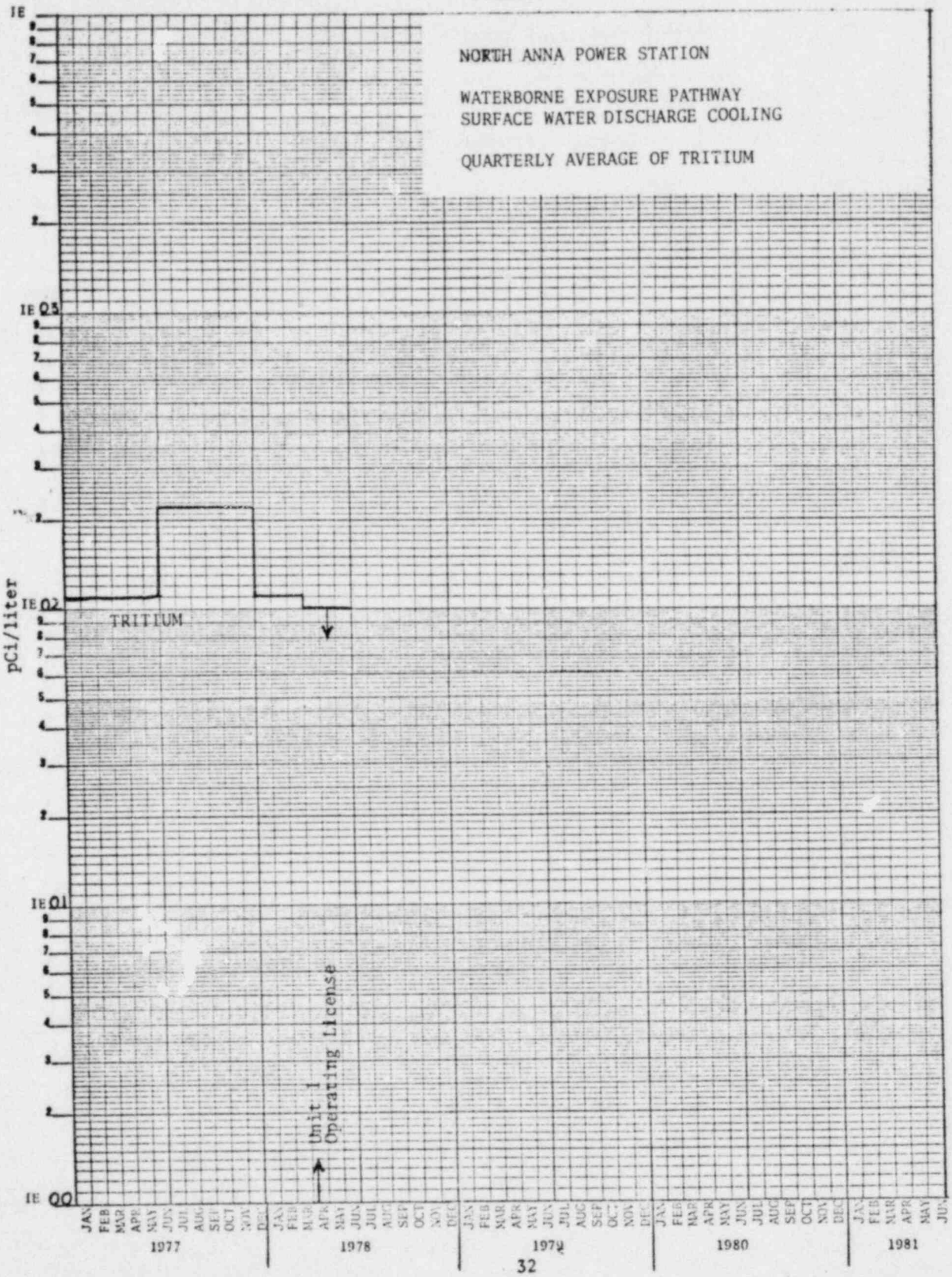
NORTH ANNA POWER STATION
WATERBORNE EXPOSURE PATHWAY
SURFACE WATER DISCHARGE COOLING
QUARTERLY AVERAGE OF TRITIUM
pCi/liter
TRITIUM
Unit 1 Operating License
1977
1978
1979
1980
1981

TABLE 6

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Waterborne Exposure Pathway
Surface Water

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Discharge Cooling Station 08	I-131	3	0.5	LLD	-	0/3	Single Station							01/01/78-03/31/78
		3		LLD	-	0/3								04/01/78-06/30/78
pCi/liter	I-131		0.5											01/01/78
	H-3	1	100	110	-	1/1	Single Station							01/01/78-03/31/78
		1	100	LLD	-	0/1								04/01/78-06/30/78
	H-3		100											01/01/78
	Gamma Isotopic	3	Table 3	LLD	-	0/3	Single Station							01/01/78-03/31/78
		3	Table 3	LLD	-	0/3								04/01/78-06/30/78
	Gamma Isotopic		Table 3											01/01/78
Reservoir Station 09	I-131	3	0.5	LLD	-	0/3	Single Station							01/01/78-03/31/78
		3		LLD	-	0/3								04/01/78-06/30/78
pCi/liter	I-131		0.5											01/01/78
	H-3	1	100	LLD	-	0/1	Single Station							01/01/78-03/31/78
			100	380	-	1/1								04/01/78-06/30/78
	H-3		100											01/01/78

TABLE 6

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Waterborne Exposure Pathway
Surface Water

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Reservoir Station 09	Gamma Isotopic	3	Table 3	LLD	-	0/3	Single Station							01/01/78-03/31/78
		3		LLD	-	0/3								04/01/78-06/30/78
pCi/liter	Gamma Isotopic		Table 3											01/01/78
North Anna River Station 11	H-3	1	100	LLD	-	0/1	Single Station							01/01/78-03/31/78
		1		100	-	1/1								04/01/78-06/30/78
pCi/liter	H-3		100											01/01/78-
	Gamma Isotopic	1	Table 3	LLD	-	0/1	Single Station							01/01/78-03/31/78
		1	Table 3	LLD	-	0/1								04/01/78-06/30/78
	Gamma Isotopic		Table 3											01/01/78-
Surface Water pCi/liter	Sr-89*	2	5	LLD	-	0/2	Station 08 and 09				LLD		0/2	04/01/78-06/30/78
	Sr-90*	2	1	LLD	-	0/2								

*Required only on the second quarter composite of Stations 08 and 09.

TABLE 6

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Aquatic Exposure Pathway
Station 01 A

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION	REPORTING PERIOD
Well Water	H-3	1	100	LLD	-	0/1	Single Station							03/78
pCi/liter														
	H-3		100											
	Gamma Isotopic	1	Table 3	LLD	-	0/1	Single Station							03/78
				LLD	-	0/1								06/78
	Gamma Isotopic		Table 3											
	Sr-89[a]	1	5	LLD	-	0/1	Single Station							06/78
	Sr-90[a]	1	1	LLD	-	1/1	Single Station							06/78

(a) Second quarter only.

TABLE 6

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Waterborne Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	ANALYSIS NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	ALL INDICATOR SAMPLES RANGE	ALL INDICATOR SAMPLES FRACTION	LOCATION WITH HIGHEST MEAN STATION	LOCATION WITH HIGHEST MEAN MEAN	LOCATION WITH HIGHEST MEAN RANGE	LOCATION WITH HIGHEST MEAN FRACTION	CONTROL LOCATIONS MEAN	CONTROL LOCATIONS RANGE	CONTROL LOCATIONS FRACTION	REPORTING PERIOD
Sediment/ Silt	Gamma Isotopic	3	-											-
pCi/gm. dry														
	K-40	-	0.5	17	6-44	2/3	08	44	-	1/1	5.7	-	1/1	03/78
	K-40													
	Cs-137	-	0.02	0.08	0.05-0.12	2/3	11	0.12	-	1/1	0.05	-	1/1	03/78
	Cs-137													
	Ra-226	-	0.1	1.0	0.7-1.4	2/3	08	1.4	-	1/1	0.65	-	1/1	03/78
	Ra-226													
	Th-228	-	0.02	0.74	0.53-0.90	3/3	08	0.90	-	1/1	0.53	-	1/1	03/78
	Th-228													

Station 09 is the control location.

Semiannual analysis.

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION	REPORTING PERIOD
Soil from Shoreline pCi/gm.dry	Gamma Isotopic	1	-	-										-
	K-40	-	0.5	7.3	-	1/1	Single location - Station 09							03/78
	K-40													
	Cs-137	-	0.02	LLD	-	0/1	Single location - Station 09							03/78
	Cs-137													
	Ra-226	-	0.1	LLD	-	0/1	Single location - Station 09							03/78
	Ra-226													
	Th-228	-	0.02	0.26	-	1/1	Single location - Station 09							03/78
	Th-228													

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

INGESTION EXPOSURE PATHWAY

(JANUARY 1, 1978 - MARCH 31, 1978

MILK

Samples were collected from stations 12, 13 and 14 and monitored for low levels of I-131 (0.5 pCi/liter) for gamma emitting radionuclides, and for Sr-89, Sr-90. The levels of activity of detected radionuclides are tabulated in Appendix "A" and summarized in Table 7. Presented on Figure 6 is the Sr-90 activity in milk at levels consistent with preoperational values.

FISH

Samples were not scheduled for analysis during this quarter. Analysis is required annually at the beginning of the season for gamma isotopes.

GREEN LEAFY VEGETATION

Samples were not scheduled for analysis during this quarter. The specifications require analysis annually during harvest.

SUMMARY OF QUARTERLY RESULTS AND DISCUSSION

INGESTION EXPOSURE PATHWAY

(APRIL 1, 1978 - JUNE 30, 1978)

MILK

Milk samples are collected from Stations 12, 13, and 14 and monitored for low levels of I-131 (0.5 pCi/liter) for gamma isotopes and for Sr-89/Sr-90. Summarized in Table 7 are the average activities required under the program summary. No changes in the levels of activity were monitored during the second quarter of 1978 compared to the first quarter of 1978.

FISH

Fish samples are analyzed annually for gamma isotopes at the beginning of the fishing season on samples from Stations 09 and 10. A single detection of Cs-137 at 0.05 pCi/gm wet was made on one fish sample. No other gamma emitters were monitored in fish samples from the North Anna Power Station environs.

FIGURE 6

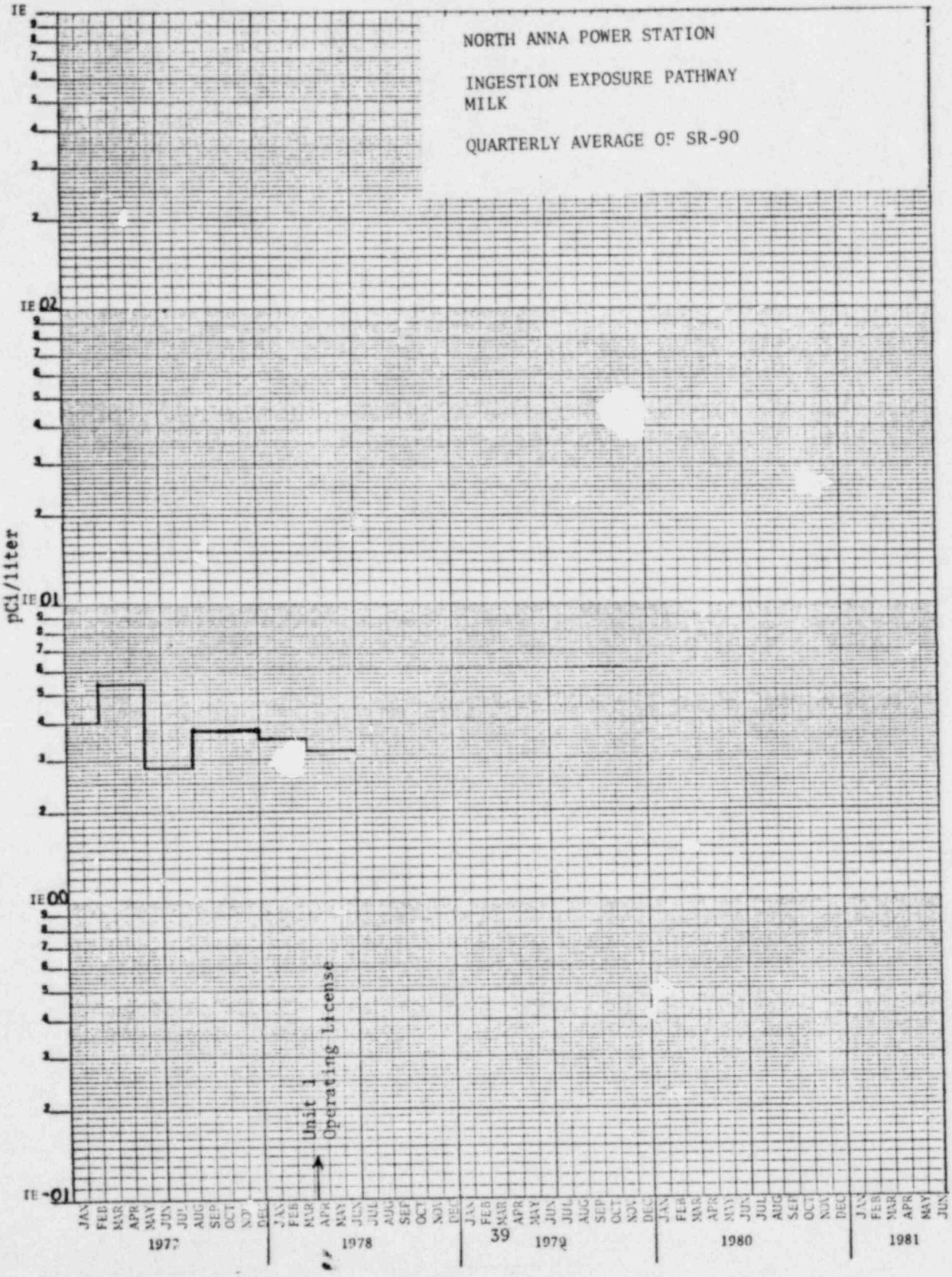
NORTH ANNA POWER STATION
INGESTION EXPOSURE PATHWAY
MILK
QUARTERLY AVERAGE OF SR-90
pCi/liter
1E
1E 02
1E 01
1E 00
1E -01
Unit 1
Operating License
1977
1978
1979
1980
1981

TABLE 7

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Ingestion Exposure Pathway

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION*	REPORTING PERIOD
Milk	I-131	9	0.5	LLD	-	0/9	-	LLD	-		LLD	-	0/9	Jan.,Feb.,Mar.'78
		9	0.5	LLD	-	0/9	-	LLD	-		LLD	-	0/9	April-June 1978
pCi/liter														
	I-131													
	Sr-89	3	8	LLD		0/3	-	LLD	-	-	LLD	-	0/3	March 1978
		3	-	LLD		0/3	-	LLD	-	-	LLD	-	0/3	June 1978
	Sr-89													
	Sr-90	3	0.8	3.6	2.6-4.4	3/3	14	4.4	-	1/1	3.4	-	9/9	March 1978
		3	-	3.2	2.7-3.9	3/3	13	3.9	-	1/1	3.0	-	9/9	June 1978
	Sr-90													
	K-40	9	200	1176	1070-1300	8/9	14	1247	1210-1300	3/3	1146	1127-1180	9/9	Jan.-Mar. 1978
	Gamma	9	-	1087	843-1240	9/9	12	1220	1180-1240	3/3	1203	1152-1242	9/9	April-June 1978
	K-40													
	Cs-137	9	9	10.7	9.2-12.3	2/9	14	10.7	9.2-12.3	2/3	6.6	5.1-8.5	9/9	Jan.-Mar. 1978
	Gamma	9	-	11	7.7-16	4/9	14	16	-	1/3	8.5	6.6-9.6	8/15	April-June 1978
	Cs-137													

* Previous three quarters

TELEDYNE ISOTOPES

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
MINERAL, VIRGINIA 23117

PATHWAY OR SAMPLE	ANALYSIS TYPE	NO.	DETECTION LOWER LIMIT	ALL INDICATOR SAMPLES MEAN	RANGE	FRACTION	LOCATION WITH HIGHEST MEAN STATION	MEAN	RANGE	FRACTION	CONTROL LOCATIONS MEAN	RANGE	FRACTION	REPORTING PERIOD
Fish	Gamma	2												April 1978
pCi/gm wet	K-40	-	0.5	LLD	-	0/2	-	-	-	-	LLD	-	0/1	
	Cs-137	-	0.02	0.05	-	1/2	-	-	-	-	0.05	-	1/1	

Control location is Station 09.

CONCLUSIONS

(January 1, 1978-March 31, 1978)

For the first quarter (January 1 - March 31, 1978) the analysis performed to satisfy the provisions of the Environmental Radiological Monitoring Program (ERMP) in the vicinity of the North Anna Power Station (NAPS) are presented in this report. The activity levels of the detected radionuclides remained within ranges measured during the preoperational program (see Ref. 6). Thus, the radioactivities measured during this first quarter are the baseline environmental levels and no radionuclides were measured that could by generated by the NAPS.

Possible sources of environmental radioactivity and exposure at NAPS are: (1) environmental natural activity, (2) releases from the nuclear power station, (3) worldwide fallout from atmospheric nuclear devices, and (4) exposures and released from medical and industrial sources.

The ERMP at NAPS is structured to permit evaluation of and assignment to each of these sources of any measured dose or radioactivity. Thus, the detection of iodine-131 during the week of 03/21/78 - 03/28/78 was assigned to worldwide fallout from the March 14, 1978 atmospheric nuclear detonation by the Peoples Republic of China at Lop Nor, Central Asia. The uniform and widespread distribution of the iodine-131 in nine of the ten operating collection stations supports this conclusion. In addition, iodine-131 fallout was reported by most investigators throughout the United States during this period.

During this quarter iodine-131 was detected in the airborne exposure pathway (charcoal filters) and not in the waterborne or ingestion pathways. If detected levels of radioactivity were measured in water or milk, the dose to the maximum exposed individual (infants) can be calculated from Regulatory Guide 1.109 (Ref. 12).

Thus the correlation of radioactivity with dose level is available in the literature in compilations such as the EPA - Radiological Quality of the Environment in the United States (Ref. 11). Dose levels from natural and artificial sources are listed in Table 8 and taken from Ref. 11. The average ambient external gamma dose in Virginia is listed as 55 mrem/year in Table 8. The ambient external gamma dose measured in the environs of NAPS was 0.18 (365) = 66 mr/year.

Note: The dose equivalent in mrems is numerically equal to the absorbed dose in mr (mrads) multiplied by the quality factor (Q) and the product of any other modifying factors (N) at the point of interest in tissue. ICRP has presently assigned a value of 1 for irradiations by external sources.

CONCLUSIONS

(April 1, 1978-June 30, 1978)

Presented in this report are the analyses performed during the second quarter (April 1 - June 30, 1978) to satisfy the provisions of the Environmental Radiological Monitoring Program (ERMP) in the vicinity of the North Anna Power Station (NAPS). Comparing the data for this quarter with that from the preoperational program justifies the conclusion that the levels of radioactivities have remained the same. No radionuclides were measured that could be attributed to operations of NAPS. All radionuclides detected in the environs of NAPS are at the baseline environmental levels and duplicate results obtained for the preoperational program. Also detected were fission products from the atmospheric nuclear tests by the Peoples Republic of China in 1977 and on March 14, 1978 and detected in the atmospheric pathway.

Possible sources of environmental radioactivity and exposure of the population are (1) environmental natural radioactivity, (2) releases from nuclear power stations, (3) worldwide fallout from atmospheric nuclear devices, and (4) exposures and releases from medical and/or industrial sources. The ERMP at NAPS is structured to permit evaluation and assignment to these sources of measured doses or radioactivities. Average radiation doses to the individual from natural and artificial sources are listed in Table 8.

TABLE 8

RADIATION DOSE TO THE INDIVIDUAL FROM NATURAL AND ARTIFICIAL SOURCES

(FROM REF. 11)

Natural and Artificial Exposure Source	Annual per Capita Whole Body Dose	Source In Ref. 11
Ambient external gamma (Virginia)	55 mRem/year	Page 36, Table 2-13
Medical - bone marrow dose to the adult population 1970	103 mRad/year	Page 213, Table 8-3
K-40 - internal constitutent of body for beta, and gamma whole body	17 mRem/year	Page 29, Table 2-9
Global fallout - total annual per capita body dose, est. 1980	4.4 mRem/year	Page 131, Table 4-10

REFERENCES

1. United States Nuclear Regulatory Commission, Regulatory Guide 4.8 "Environmental Technical Specifications for Nuclear Power Plants," December 1975.

2. Quarterly reports on the Environmental Radiological Monitoring Program (ERMP) at the North Anna Power Station prepared by Teledyne Isotopes (IWL-0268-345 and 359 July-December 1974).

3. Quarterly reports on the ERMP at the North Anna Power Station prepared by Teledyne Isotopes (IWL-0268-364, 367, 371, 375, and 376 January-December 1975).

4. Quarterly reports on the ERMP at the North Anna Power Station prepared by Teledyne Isotopes (IWL-0268-387, 394, and 395 January-December 1976).

5. Quarterly reports on the ERMP at the North Anna Power Station prepared by Teledyne Isotopes (IWL-5343-406, 407, 413, 423, and 429 January-December, 1977).

6. Teledyne Isotopes "Environmental Monitoring Summary - Preoperational Program - July 1, 1974 - September 30, 1977 IWL-5343-426. Prepared for Virginia Electric and Power Company (NAPS).

7. Appendix B to Operating License, Environmental Technical Specifications for North Anna Power Station, Units 1 and 2, Virginia Electric and Power Company, Docket Nos. 50-338 and 50-336.

8. Virginia Electric and Power Company, Radiological Environmental Monitoring Manual, June 1977.

9. Teledyne Isotopes, "Environmental Radiation Analysis Quality Control Manual," IWL-0032-361, 1975, Copy No. 14 issued to Virginia Electric and Power Company.

10. Energy Research and Development Administration, HASL Procedures Manual, (HASL-300, D-08).

11. United States Environmental Protection Agency. "Radiological Quality of the Environment in the United States, 1977" EPA 520/1-77-009, September 1977.

12. United States Nuclear Regulatory Commission. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I," October 1977.

TELEDYNE ISOTOPES

APPENDIX B

TABLE OF CONTENTS

APRIL 1 - JUNE 30, 1978

EXPOSURE PATHWAY	SAMPLE	ANALYSIS	ANALYTICAL DATE	SUMMARY TABLES	PREVIOUS THREE QUARTERS TABLES
Airborne	Air Particulate	Gross Beta	(even) B-2:B-22	B-24:B-25	B-26
		Gamma Isotopic	(odd) B-3:B-23	B-27	B-28:B-36
	Air Radioiodine	I-131	(even) B-2:B-22	B-37:B-38	B-39
	Precipitation	Gross Beta	B-40	-	-
		H-3	B-40	-	-
		Gamma Isotopic	B-40	-	-
Direct	TLD	Gamma Dose	B-41	B-41	B-42
Waterborne	Discharge Water (8)	I-131	B-43	B-46	B-47
		Gamma Isotopic	B-43	B-46	B-47
		H-3	B-43:B-48	B-46	B-47
		Sr-89,Sr-90	B-48	B-46	-
	Reservoir Water (9)	I-131	B-44	B-46	B-47
		Gamma Isotopic	B-44	B-46	B-47
		H-3	B-44:B-48	B-46	B-47
		Sr-89,Sr-90	B-48	B-46	-
	North Anna River (11)	Gamma Isotopic	B-45	B-46	B-47
		H-3	B-45:B-48	B-46	B-47
		Sr-89,Sr-90	B-45:B-48	B-46	B-47
	Well Water (10)	Sr-89,Sr-90	B-49	-	B-50
		Gamma Isotopic	B-49	-	B-50
		H-3	B-49	-	B-50
Ingestion	Milk	I-131	B-51:B-53	B-55	B-56
		Gamma Isotopic	B-51:B-53	B-55	B-56
		Sr-89, Sr-90	B-54	B-55	B-56
	Fish	Gamma Isotopic	B-57:B-58	B-59	B-60

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 01

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.38E 02	CU. M.	04/13	2.1 +-0.1 E-01	04/11	L.T. 7. E-02
04/04	04/11	1.37E 02	CU. M.	04/19	2.7 +-0.1 E-01	04/18	L.T. 8. E-02
04/11	04/18	1.39E 02	CU. M.	04/26	2.2 +-0.1 E-01	04/25	L.T. 7. E-02
04/18	04/25	1.36E 02	CU. M.	05/05	1.4 +-0.1 E-01	05/02	L.T. 7. E-02
04/25	05/02	1.39E 02	CU. M.	05/12	2.4 +-0.1 E-01	05/08	L.T. 1. E-01
05/02	05/09	1.37E 02	CU. M.	05/18	3.6 +-0.6 E-02	05/13	L.T. 7. E-02
05/09	05/16	1.73E 02	CU. M.	05/25	5.0 +-0.6 E-02	05/23	L.T. 6. E-02
05/16	05/23	1.38E 02	CU. M.	05/29	1.0 +-0.1 E-01	05/31	L.T. 1. E-01
05/23	05/30	1.38E 02	CU. M.	06/10	9.5 +-0.9 E-02	06/06	L.T. 7. E-02
05/30	06/06	1.36E 02	CU. M.	06/21	8.8 +-0.9 E-02	06/15	L.T. 8. E-02
06/06	06/13	1.33E 02	CU. M.	06/27	3.9 +-0.7 E-02	06/16	L.T. 6. E-02
06/13	06/20	1.37E 02	CU. M.	06/30	4.1 +-0.7 E-02	06/27	L.T. 7. E-02
06/20	06/27	1.38E 02	CU. M.	07/13	4.3 +-0.7 E-02	07/12	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 01

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	7.85+-2.24E-02	9.64+-2.70E-02
K-40	L.T. 5. E-02	L.T. 3. E-02
MN-54	L.T. 2. E-03	L.T. 1. E-03
CO-58	L.T. 3. E-03	L.T. 2. E-03
FE-59	L.T. 8. E-03	L.T. 8. E-03
CO-60	L.T. 2. E-03	L.T. 1. E-03
ZN-65	L.T. 5. E-03	L.T. 3. E-03
ZR-95	2.15+-2.21E-03	L.T. 4. E-03
RU-103	4.35+-2.64E-03	L.T. 5. E-03
RU-106	L.T. 2. E-02	L.T. 2. E-02
I-131	L.T. 7. E-02	L.T. 2. E 00
CS-134	L.T. 2. E-03	L.T. 1. E-03
CS-137	L.T. 2. E-03	4.09+-1.23E-03
BA-140	L.T. 2. E-02	L.T. 1. E-01
CE-141	L.T. 7. E-03	L.T. 8. E-03
CE-144	2.50+-1.17E-02	3.60+-0.72E-02
RA-226	L.T. 3. E-02	L.T. 2. E-02
TH-228	L.T. 3. E-03	L.T. 2. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 02

COLLECTION START DATE	DATE STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.47E 02	CU. M.	04/13	1.8 +-0.1 E-01	04/11	L.T. 7. E-02
04/04	04/11	1.35E 02	CU. M.	04/19	2.5 +-0.1 E-01	04/18	L.T. 8. E-02
04/11	04/18	1.37E 02	CU. M.	04/26	1.4 +-0.1 E-01	04/24	L.T. 7. E-02
04/18	04/25	1.33E 02	CU. M.	05/05	1.3 +-0.5 E-02	05/02	L.T. 7. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	2.0 +-0.1 E-01	05/08	L.T. 1. E-01
05/02	05/09	1.35E 02	CU. M.	05/18	7.6 +-0.8 E-02	05/13	L.T. 7. E-02
05/09	05/16	1.33E 02	CU. M.	05/25	1.2 +-0.1 E-01	05/23	L.T. 6. E-02
05/16	05/23	1.38E 02	CU. M.	05/29	9.7 +-0.9 E-02	05/31	L.T. 1. E-01
05/23	05/30	1.37E 02	CU. M.	06/10	9.7 +-0.9 E-02	06/06	L.T. 7. E-02
05/30	06/06	1.37E 02	CU. M.	06/21	1.2 +-0.1 E-01	06/14	L.T. 8. E-02
06/06	06/13	1.33E 02	CU. M.	06/27	1.2 +-0.1 E-01	06/16	L.T. 6. E-02
06/13	06/20	1.38E 02	CU. M.	06/30	1.6 +-0.1 E-01	06/27	L.T. 7. E-02
06/20	06/27	1.37E 02	CU. M.	07/13	1.5 +-0.5 E-02	07/12	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 02

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	L.T. 4. E-02	7.67+-1.94E-02
K-40	L.T. 5. E-02	L.T. 2. E-02
MN-54	L.T. 2. E-03	L.T. 1. E-03
CO-58	L.T. 3. E-03	L.T. 2. E-03
FE-59	L.T. 7. E-03	L.T. 7. E-03
CO-60	L.T. 2. E-03	L.T. 1. E-03
ZN-65	L.T. 5. E-03	L.T. 3. E-03
ZR-95	5.41+-2.53E-03	L.T. 3. E-03
RU-103	2.09+-0.36E-02	L.T. 4. E-03
RU-106	L.T. 2. E-02	1.44+-0.69E-02
I-131	L.T. 8. E-02	L.T. 1. E 00
CS-134	L.T. 2. E-03	L.T. 1. E-03
CS-137	L.T. 2. E-03	2.95+-0.65E-03
BA-140	2.86+-1.34E-02	L.T. 2. E-01
CE-141	1.43+-0.60E-02	L.T. 5. E-03
CE-144	2.12+-1.26E-02	2.46+-0.37E-02
RA-226	L.T. 3. E-02	L.T. 9. E-03
TH-228	L.T. 3. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 03

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.04E 02	CU. M.	04/13	1.8 +-0.1 E-01	04/11	L.T. 1. E-01
04/04	04/11	1.33E 02	CU. M.	04/19	2.7 +-0.1 E-01	04/18	L.T. 8. E-02
04/11	04/18	1.44E 02	CU. M.	04/26	2.2 +-0.1 E-01	04/24	L.T. 6. E-02
04/18	04/25	1.44E 02	CU. M.	05/05	1.4 +-0.1 E-01	05/02	L.T. 7. E-02
04/25	05/02	1.46E 02	CU. M.	05/12	2.4 +-0.1 E-01	05/08	L.T. 1. E-01
05/02	05/09	1.42E 02	CU. M.	05/18	8.8 +-0.9 E-02	05/13	L.T. 6. E-02
05/09	05/16	1.44E 02	CU. M.	05/25	1.5 +-0.1 E-01	05/23	L.T. 7. E-02
05/16	05/23	1.27E 02	CU. M.	05/29	1.2 +-0.1 E-01	05/31	L.T. 1. E-01
05/23	05/30	1.20E 02	CU. M.	06/10	8.7 +-1.0 E-02	06/06	L.T. 9. E-02
05/30	06/06	1.04E 02	CU. M.	06/21	1.0 +-0.1 E-01	06/14	L.T. 1. E-01
06/06	06/13	1.36E 02	CU. M.	06/27	6.3 +-0.8 E-02	06/16	L.T. 6. E-02
06/13	06/20	1.42E 02	CU. M.	06/30	8.9 +-0.9 E-02	06/27	L.T. 7. E-02
06/20	06/27	1.36E 02	CU. M.	07/13	7.3 +-0.9 E-02	07/13	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 03

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	4.85+-2.45E-02	9.50+-3.05E-02
K-40	L.T. 6. E-02	L.T. 4. E-02
MN-54	L.T. 2. E-03	L.T. 2. E-03
CO-58	L.T. 3. E-03	L.T. 3. E-03
FE-59	L.T. 9. E-03	L.T. 1. E-02
CO-60	L.T. 3. E-03	L.T. 2. E-03
ZN-65	L.T. 6. E-03	L.T. 4. E-03
ZR-95	4.54+-2.27E-03	L.T. 5. E-03
RU-103	1.52+-0.48E-02	L.T. 6. E-03
RU-106	L.T. 3. E-02	L.T. 2. E-02
I-131	L.T. 1. E-01	L.T. 2. E 00
CS-134	L.T. 3. E-03	L.T. 2. E-03
CS-137	L.T. 3. E-03	3.49+-1.11E-03
BA-140	L.T. 3. E-02	L.T. 2. E-01
CE-141	1.63+-0.55E-02	L.T. 1. E-02
CE-144	2.21+-1.36E-02	3.77+-0.80E-02
RA-226	L.T. 4. E-02	L.T. 2. E-02
TH-228	L.T. 4. E-03	L.T. 2. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 04

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.20E 02	CU. M.	04/13	5.9 +-0.8 E-02	04/11	L.T. 8. E-02
04/04	04/11	1.37E 02	CU. M.	04/19	9.7 +-0.9 E-02	04/18	L.T. 8. E-02
04/11	04/18	1.37E 02	CU. M.	04/26	1.7 +-0.5 E-02	04/24	L.T. 7. E-02
04/18	04/25	1.36E 02	CU. M.	05/05	2.7 +-0.6 E-02	05/02	L.T. 7. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	4.3 +-0.7 E-02	05/08	L.T. 1. E-01
05/02	05/09	1.35E 02	CU. M.	05/18	1.5 +-0.5 E-02	05/13	L.T. 7. E-02
05/09	05/16	1.34E 02	CU. M.	05/25	2.7 +-0.6 E-02	05/23	L.T. 7. E-02
05/16	05/23	1.37E 02	CU. M.	05/29	2.9 +-0.6 E-02	05/31	L.T. 1. E-01
05/23	05/30	1.36E 02	CU. M.	06/10	6.5 +-0.8 E-02	06/06	L.T. 8. E-02
05/30	06/06	1.39E 02	CU. M.	06/21	6.3 +-0.8 E-02	06/14	L.T. 8. E-02
06/06	06/13	1.34E 02	CU. M.	06/27	4.1 +-0.7 E-02	06/16	L.T. 6. E-02
06/13	06/20	1.41E 02	CU. M.	06/30	8.7 +-0.9 E-02	06/27	L.T. 7. E-02
06/20	06/27	1.36E 02	CU. M.	07/13	2.5 +-0.6 E-02	07/12	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 04

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	2.31+-1.00E-02	L.T. 3. E-02
K-40	L.T. 3. E-02	L.T. 3. E-02
MN-54	L.T. 1. E-03	L.T. 1. E-03
CO-58	L.T. 2. E-03	L.T. 2. E-03
FE-59	L.T. 4. E-03	L.T. 9. E-03
CO-60	L.T. 1. E-03	L.T. 1. E-03
ZN-65	L.T. 3. E-03	L.T. 3. E-03
ZR-95	L.T. 2. E-03	L.T. 3. E-03
RU-103	L.T. 2. E-03	L.T. 5. E-03
RU-106	L.T. 1. E-02	L.T. 1. E-02
I-131	L.T. 3. E-02	L.T. 2. E 00
CS-134	L.T. 1. E-03	L.T. 1. E-03
CS-137	L.T. 1. E-03	L.T. 1. E-03
BA-140	L.T. 1. E-02	L.T. 1. E-01
CE-141	L.T. 2. E-03	L.T. 9. E-03
CE-144	8.57+-4.06E-03	L.T. 9. E-03
RA-226	L.T. 1. E-02	L.T. 2. E-02
TH-228	L.T. 1. E-03	L.T. 2. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 05

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04, 9	1.35E 02	CU. M.	04/13	2.2 +-0.1 E-01	04/11	L.T. 8. E-02
04/04	04/11	1.36E 02	CU. M.	04/19	2.3 +-0.1 E-01	04/18	L.T. 8. E-02
04/11	04/18	1.34E 02	CU. M.	04/26	1.8 +-0.1 E-01	04/24	L.T. 7. E-02
04/18	04/25	1.35E 02	CU. M.	05/05	1.3 +-0.1 E-01	05/02	L.T. 7. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	1.9 +-0.1 E-01	05/08	L.T. 1. E-01
05/02	05/09	1.35E 02	CU. M.	05/18	7.6 +-0.8 E-02	05/13	L.T. 7. E-02
05/09	05/16	1.34E 02	CU. M.	05/25	7.4 +-0.8 E-02	05/23	L.T. 7. E-02
05/16	05/23	1.37E 02	CU. M.	05/29	1.0 +-0.1 E-01	05/31	L.T. 1. E-01
05/23	05/30	1.34E 02	CU. M.	06/10	1.1 +-0.1 E-01	06/06	L.T. 8. E-02
05/30	06/06	1.38E 02	CU. M.	06/21	1.1 +-0.1 E-01	06/14	L.T. 8. E-02
06/06	06/13	1.34E 02	CU. M.	06/27	1.1 +-0.1 E-01	06/16	L.T. 6. E-02
06/13	06/20	1.40E 02	CU. M.	06/30	1.8 +-0.1 E-01	06/27	L.T. 6. E-02
06/20	06/27	1.36E 02	CU. M.	07/13	1.3 +-0.1 E-01	07/12	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 05

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	6.05+-2.04E-02	1.22+-0.27E-01
K-40	L.T. 4. E-02	L.T. 2. E-02
MN-54	L.T. 2. E-03	L.T. 2. E-03
CO-58	L.T. 2. E-03	L.T. 3. E-03
FE-59	L.T. 6. E-03	L.T. 9. E-03
CO-60	L.T. 2. E-03	L.T. 2. E-03
ZN-65	L.T. 4. E-03	L.T. 4. E-03
ZR-95	L.T. 3. E-03	5.17+-2.37E-03
RU-103	1.83+-0.33E-02	L.T. 5. E-03
RU-106	L.T. 2. E-02	L.T. 2. E-02
I-131	L.T. 5. E-02	L.T. 2. E 00
CS-134	L.T. 2. E-03	L.T. 1. E-03
CS-137	2.74+-1.37E-03	3.28+-0.83E-03
BA-140	2.78+-1.56E-02	L.T. 2. E-01
CE-141	1.09+-0.46E-02	L.T. 7. E-03
CE-144	2.82+-0.96E-02	3.44+-0.54E-02
RA-226	L.T. 2. E-02	L.T. 1. E-02
TH-228	L.T. 3. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 06

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.38E 02	CU. M.	04/13	2.6 +-0.1 E-01	04/12	L.T. 8. E-02
04/04	04/11	1.36E 02	CU. M.	04/19	2.8 +-0.1 E-01	04/18	L.T. 8. E-02
04/11	04/18	1.38E 02	CU. M.	04/26	1.8 +-0.1 E-01	04/24	L.T. 7. E-02
04/18	04/25	1.35E 02	CU. M.	05/05	1.6 +-0.1 E-01	05/02	L.T. 7. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	2.3 +-0.1 E-01	05/08	L.T. 1. E-01
05/02	05/09	1.40E 02	CU. M.	05/18	6.9 +-0.8 E-02	05/13	L.T. 6. E-02
05/09	05/16	1.36E 02	CU. M.	05/25	1.1 +-0.1 E-01	05/23	L.T. 7. E-02
05/16	05/23	1.20E 02	CU. M.	05/29	1.4 +-0.1 E-01	05/31	L.T. 1. E-01
05/23	05/30	1.37E 02	CU. M.	06/10	1.2 +-0.1 E-01	06/06	L.T. 7. E-02
05/30	06/06	1.36E 02	CU. M.	06/21	1.1 +-0.1 E-01	06/14	L.T. 8. E-02
06/06	06/13	1.33E 02	CU. M.	06/27	1.1 +-0.1 E-01	06/16	L.T. 6. E-02
06/13	06/20	1.38E 02	CU. M.	06/30	1.5 +-0.1 E-01	06/27	L.T. 7. E-02
06/20	06/27	1.36E 02	CU. M.	07/13	9.8 +-0.9 E-02	07/12	L.T. 3. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 06

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	6.35+-1.40E-02	1.13+-0.22E-01
K-40	L.T. 2. E-02	L.T. 4. E-02
MN-54	L.T. 1. E-03	L.T. 4. E-03
CO-58	L.T. 1. E-03	L.T. 7. E-03
FE-59	L.T. 5. E-03	L.T. 3. E-02
CO-60	L.T. 2. E-03	L.T. 3. E-03
ZN-65	L.T. 3. E-03	L.T. 1. E-02
ZR-95	6.54+-1.64E-03	3.73+-0.37E-02
RU-103	9.37+-1.91E-03	L.T. 4. E-03
RU-106	L.T. 1. E-02	1.77+-0.87E-02
I-131	3.91+-2.20E-02	L.T. 1. E 00
CS-134	L.T. 1. E-03	L.T. 1. E-03
CS-137	1.93+-0.65E-03	3.63+-0.90E-03
BA-140	L.T. 2. E-02	L.T. 1. E-01
CE-141	1.18+-0.17E-02	L.T. 6. E-03
CE-144	2.36+-0.38E-02	2.48+-0.41E-02
RA-226	L.T. 1. E-02	L.T. 1. E-02
TH-228	L.T. 1. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 07

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.53E 02	CU. M.	04/13	2.4 +-0.1 E-01	04/12	L.T. 7. E-02
04/04	04/11	1.52E 02	CU. M.	04/19	2.6 +-0.1 E-01	04/19	L.T. 8. E-02
04/11	04/18	1.52E 02	CU. M.	04/26	9.4 +-4.1 E-03	04/25	L.T. 7. E-02
04/18	04/25	1.52E 02	CU. M.	05/05	9.3 +-0.8 E-02	05/03	L.T. 7. E-02
04/25	05/02	1.55E 02	CU. M.	05/12	2.0 +-0.1 E-01	05/09	L.T. 6. E-02
05/02	05/09	1.39E 02	CU. M.	05/18	8.2 +-0.9 E-02	05/14	L.T. 7. E-02
05/09	05/16	1.53E 02	CU. M.	05/25	1.1 +-0.1 E-01	05/24	L.T. 7. E-02
05/16	05/23	1.34E 02	CU. M.	05/29	1.1 +-0.1 E-01	05/31	L.T. 8. E-02
05/23	05/30	1.41E 02	CU. M.	06/10	1.0 +-0.1 E-01	06/07	L.T. 7. E-02
05/30	06/06	1.36E 02	CU. M.	06/21	1.4 +-0.1 E-01	06/15	L.T. 9. E-02
06/06	06/13	1.40E 02	CU. M.	06/27	1.3 +-0.1 E-01	06/17	L.T. 7. E-02
06/13	06/20	1.38E 02	CU. M.	06/30	1.7 +-0.1 E-01	06/28	L.T. 8. E-02
06/20	06/27	1.34E 02	CU. M.	07/13	6.6 +-0.8 E-02	07/13	L.T. 1. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 07

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	6.44+-1.31E-02	1.24+-0.25E-01
K-40	L.T. 2. E-02	L.T. 2. E-02
MN-54	L.T. 1. E-03	L.T. 1. E-03
CO-58	L.T. 1. E-03	L.T. 2. E-03
FE-59	L.T. 4. E-03	L.T. 8. E-03
CO-60	L.T. 1. E-03	L.T. 2. E-03
ZN-65	L.T. 3. E-03	L.T. 3. E-03
ZR-95	6.02+-1.33E-03	5.86+-2.23E-03
RU-103	1.89+-0.21E-02	L.T. 5. E-03
RU-106	L.T. 1. E-02	1.74+-0.95E-02
I-131	3.50+-2.16E-02	L.T. 1. E 00
CS-134	L.T. 1. E-03	L.T. 1. E-03
CS-137	2.42+-0.60E-03	3.07+-0.75E-03
BA-140	3.67+-1.26E-02	L.T. 1. E-01
CE-141	1.14+-0.18E-02	L.T. 6. E-03
CE-144	2.13+-0.34E-02	3.32+-0.50E-02
RA-226	L.T. 9. E-03	L.T. 1. E-02
TH-228	L.T. 1. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 21

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.38E 02	CU. M.	04/13	2.1 +-0.1 E-01	04/12	L.T. 8. E-02
04/04	04/11	1.38E 02	CU. M.	04/19	2.2 +-0.1 E-01	04/19	L.T. 8. E-02
04/11	04/18	1.38E 02	CU. M.	04/26	1.5 +-0.1 E-01	04/25	L.T. 7. E-02
04/18	04/25	1.37E 02	CU. M.	05/05	1.4 +-0.1 E-01	05/03	L.T. 6. E-02
04/25	05/02	1.37E 02	CU. M.	05/12	2.3 +-0.1 E-01	05/09	L.T. 7. E-02
05/02	05/09	1.34E 02	CU. M.	05/18	5.5 +-0.7 E-02	05/14	L.T. 7. E-02
05/09	05/16	1.38E 02	CU. M.	05/25	1.0 +-0.1 E-01	05/24	L.T. 8. E-02
05/16	05/23	1.38E 02	CU. M.	05/29	1.0 +-0.1 E-01	05/31	L.T. 8. E-02
05/23	05/30	1.38E 02	CU. M.	06/10	8.5 +-0.9 E-02	06/07	L.T. 7. E-02
05/30	06/06	1.39E 02	CU. M.	06/21	1.1 +-0.1 E-01	06/15	L.T. 9. E-02
06/06	06/13	1.32E 02	CU. M.	06/27	8.0 +-0.9 E-02	06/17	L.T. 7. E-02
06/13	06/20	1.41E 02	CU. M.	06/30	5.0 +-0.7 E-02	06/28	L.T. 8. E-02
06/20	06/27	1.37E 02	CU. M.	07/13	5.7 +-0.8 E-02	07/12	L.T. 1. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 21

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	6.24+-1.08E-02	7.39+-2.83E-02
K-40	L.T. 2. E-02	L.T. 4. E-02
MN-54	L.T. 1. E-03	L.T. 5. E-03
CO-58	L.T. 1. E-03	L.T. 1. E-02
FE-59	L.T. 4. E-03	L.T. 3. E-02
CO-60	L.T. 1. E-03	L.T. 6. E-03
ZN-65	L.T. 3. E-03	L.T. 1. E-02
ZR-95	5.78+-1.33E-03	L.T. 1. E-02
RU-103	1.69+-0.19E-02	L.T. 6. E-03
RU-106	L.T. 1. E-02	L.T. 2. E-02
I-131	L.T. 3. E-02	L.T. 2. E 00
CS-134	L.T. 1. E-03	L.T. 2. E-03
CS-137	1.93+-0.55E-03	2.69+-1.06E-03
BA-140	2.15+-0.98E-02	L.T. 2. E-01
CE-141	1.07+-0.15E-02	L.T. 9. E-03
CE-144	1.94+-0.31E-02	2.45+-0.76E-02
RA-226	L.T. 9. E-03	L.T. 2. E-02
TH-228	L.T. 1. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 22

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.37E 02	CU. M.	04/13	2.3 +-0.1 E-01	04/12	L.T. 8. E-02
04/04	04/11	1.36E 02	CU. M.	04/19	2.6 +-0.1 E-01	04/19	L.T. 9. E-02
04/11	04/18	1.37E 02	CU. M.	04/26	1.6 +-0.1 E-01	04/25	L.T. 7. E-02
04/18	04/25	1.36E 02	CU. M.	05/05	1.0 +-0.1 E-01	05/03	L.T. 8. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	9.9 +-0.9 E-02	05/09	L.T. 7. E-02
05/02	05/09	1.33E 02	CU. M.	05/18	3.4 +-0.6 E-02	05/14	L.T. 7. E-02
05/09	05/16	1.36E 02	CU. M.	05/25	1.1 +-0.1 E-01	05/24	L.T. 8. E-02
05/16	05/23	1.37E 02	CU. M.	05/29	1.3 +-0.1 E-01	05/31	L.T. 8. E-02
05/23	05/30	1.36E 02	CU. M.	06/10	9.7 +-0.9 E-02	06/07	L.T. 8. E-02
05/30	06/06	1.38E 02	CU. M.	06/21	1.4 +-0.1 E-01	06/15	L.T. 9. E-02
06/06	06/13	1.35E 02	CU. M.	06/27	1.2 +-0.1 E-01	06/17	L.T. 7. E-02
06/13	06/20	1.39E 02	CU. M.	06/30	1.5 +-0.1 E-01	06/28	L.T. 8. E-02
06/20	06/27	1.36E 02	CU. M.	07/13	1.1 +-0.1 E-01	07/13	L.T. 1. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 22

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	4.62+-1.33E-02	1.47+-0.41E-01
K-40	L.T. 3. E-02	L.T. 5. E-02
MN-54	L.T. 1. E-03	L.T. 2. E-03
CO-58	L.T. 1. E-03	L.T. 4. E-03
FE-59	L.T. 3. E-03	L.T. 1. E-02
CO-60	L.T. 1. E-03	L.T. 2. E-03
ZN-65	L.T. 3. E-03	L.T. 6. E-03
ZR-95	6.72+-1.40E-03	6.44+-3.80E-03
RU-103	1.63+-0.21E-02	L.T. 1. E-02
RU-106	1.59+-0.79E-02	L.T. 2. E-02
I-131	3.12+-2.37E-02	L.T. 4. E 00
CS-134	L.T. 1. E-03	L.T. 2. E-03
CS-137	1.98+-0.86E-03	2.86+-1.52E-03
BA-140	3.36+-1.07E-02	L.T. 2. E-01
CE-141	1.12+-0.22E-02	L.T. 2. E-02
CE-144	1.47+-0.41E-02	3.64+-1.06E-02
RA-226	L.T. 1. E-02	L.T. 3. E-02
TH-228	L.T. 1. E-03	L.T. 3. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 23

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.35E 02	CU. M.	04/13	2.9 +-0.2 E-01	04/10	L.T. 6. E-02
04/04	04/11	1.38E 02	CU. M.	04/19	3.1 +-0.1 E-01	04/19	L.T. 8. E-02
04/11	04/18	1.37E 02	CU. M.	04/26	2.3 +-0.1 E-01	04/25	L.T. 7. E-02
04/18	04/25	1.35E 02	CU. M.	05/05	1.5 +-0.1 E-01	05/03	L.T. 8. E-02
04/25	05/02	1.38E 02	CU. M.	05/12	2.5 +-0.1 E-01	05/09	L.T. 7. E-02
05/02	05/09	1.37E 02	CU. M.	05/18	6.9 +-0.8 E-02	05/14	L.T. 7. E-02
05/09	05/16	1.38E 02	CU. M.	05/25	8.2 +-0.9 E-02	05/23	L.T. 8. E-02
05/16	05/23	1.38E 02	CU. M.	05/29	8.7 +-0.9 E-02	05/31	L.T. 8. E-02
05/23	05/30	1.37E 02	CU. M.	06/10	1.2 +-0.1 E-01	06/07	L.T. 8. E-02
05/30	06/06	1.37E 02	CU. M.	06/21	1.2 +-0.1 E-01	06/15	L.T. 9. E-02
06/06	06/13	1.16E 02	CU. M.	06/27	1.2 +-0.1 E-01	06/17	L.T. 7. E-02
06/13	06/20	1.42E 02	CU. M.	06/30	9.7 +-0.9 E-02	06/28	L.T. 8. E-02
06/20	06/27	1.37E 02	CU. M.	07/13	1.2 +-0.1 E-01	07/12	L.T. 1. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 23

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	8.46+-2.03E-02	1.09+-0.23E-01
K-40	L.T. 4. E-02	L.T. 2. E-02
MN-54	L.T. 2. E-03	L.T. 1. E-03
CO-58	L.T. 2. E-03	L.T. 2. E-03
FE-59	L.T. 5. E-03	L.T. 8. E-03
CO-60	L.T. 2. E-03	L.T. 1. E-03
ZN-65	L.T. 3. E-03	L.T. 3. E-03
ZR-95	1.04+-0.36E-02	3.12+-1.71E-03
RU-103	9.01+-2.70E-03	L.T. 5. E-03
RU-106	2.29+-1.24E-02	1.27+-0.63E-02
I-131	L.T. 5. E-02	L.T. 1. E 00
CS-134	L.T. 1. E-03	L.T. 1. E-03
CS-137	2.74+-1.35E-03	2.62+-0.64E-03
BA-140	L.T. 2. E-02	L.T. 2. E-01
CE-141	1.13+-0.38E-02	L.T. 5. E-03
CE-144	2.92+-0.82E-02	2.36+-0.37E-02
RA-226	L.T. 2. E-02	L.T. 9. E-03
TH-228	L.T. 2. E-03	L.T. 1. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

A. AIR PARTICULATE & CHARCOAL FILTERS

STATION NUMBER 24

COLLECTION DATE START DATE	STOP DATE	VOLUME	UNITS	MID COUNT TIME DATE	AP FILTER GROSS BETA (pCi/Cu. M.)	MID COUNT TIME DATE	CHARCOAL FILTER I-131 (pCi/Cu. M.)
03/28/78	04/04/78	1.28E 02	CU. M.	04/13	2.4 +-0.1 E-01	04/10	L.T. 7. E-02
04/04	04/11	1.30E 02	CU. M.	04/19	2.7 +-0.1 E-01	04/19	L.T. 9. E-02
04/11	04/18	1.30E 02	CU. M.	04/26	1.7 +-0.1 E-01	04/25	L.T. 8. E-02
04/18	04/25	1.27E 02	CU. M.	05/05	1.3 +-0.1 E-01	05/03	L.T. 9. E-02
04/25	05/02	1.29E 02	CU. M.	05/12	1.9 +-0.1 E-01	05/09	L.T. 8. E-02
05/02	05/09	1.29E 02	CU. M.	05/18	7.8 +-0.9 E-02	05/14	L.T. 7. E-02
05/09	05/16	1.27E 02	CU. M.	05/25	8.3 +-0.9 E-02	05/24	L.T. 8. E-02
05/16	05/23	1.30E 02	CU. M.	05/29	1.2 +-0.1 E-01	05/31	L.T. 8. E-02
05/23	05/30	1.27E 02	CU. M.	06/10	9.3 +-0.9 E-02	06/07	L.T. 8. E-02
05/30	06/06	1.34E 02	CU. M.	06/21	1.2 +-0.1 E-01	06/15	L.T. 9. E-02
06/06	06/13	1.16E 02	CU. M.	06/27	6.3 +-0.1 E-02	06/17	L.T. 8. E-02
06/13	06/20	1.18E 02	CU. M.	06/30	1.4 +-0.1 E-01	06/28	L.T. 1. E-01
06/20	06/27	1.15E 02	CU. M.	07/13	7.3 +-0.9 E-02	07/12	L.T. 2. E-01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF AIR PARTICULATES

(pCi/Cu. M.)

STATION NUMBER 24

DATE COLLECTED:	FIRST QUARTER	SECOND QUARTER
GAMMA SPECTRUM ANALYSIS:		
BE-7	6.85+-1.22E-02	1.08+-0.26E-01
K-40	L.T. 2. E-02	L.T. 3. E-02
MN-54	L.T. 1. E-03	L.T. 1. E-03
CO-58	L.T. 1. E-03	L.T. 2. E-03
FE-59	L.T. 4. E-03	L.T. 8. E-03
CO-60	L.T. 1. E-03	L.T. 1. E-03
ZN-65	L.T. 3. E-03	L.T. 4. E-03
ZR-95	5.47+-1.32E-03	L.T. 3. E-03
RU-103	L.T. 2. E-03	L.T. 5. E-03
RU-106	L.T. 1. E-02	L.T. 1. E-02
I-131	L.T. 4. E-02	L.T. 2. E 00
CS-134	L.T. 1. E-03	L.T. 1. E-03
CS-137	2.27+-0.54E-03	3.16+-1.20E-03
BA-140	L.T. 2. E-02	L.T. 1. E-01
CE-141	L.T. 2. E-03	L.T. 9. E-03
CE-144	2.07+-0.29E-02	2.67+-0.80E-02
RA-226	L.T. 8. E-03	L.T. 2. E-02
TH-228	L.T. 9. E-04	L.T. 2. E-03

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF GROSS BETA IN AIR PARTICULATE FILTERS

pCi/Cu. M.

MARCH 28, 1978 - JUNE 27, 1978

STATION	03/28/78-04/04/78	04/04/78-04/11/78	04/11/78-04/18/78	04/18/78-04/25/78	04/25/78-05/02/78	05/02/78-05/09/78	05/09/78-05/16/78	05/16/78-05/23/78
01	0.21	0.27	0.22	0.14	0.24	0.036	0.050	0.10
02	0.18	0.25	0.14	0.013 (b)	0.20	0.076	0.12	0.097
03	0.18	0.27	0.22	0.14	0.24	0.088	0.15	0.12
04	0.059	0.097	0.017 (a)	0.027	0.43	0.015	0.027	0.029
05	0.22	0.23	0.18	0.13	0.19	0.076	0.074	0.10
06	0.26	0.28	0.19	0.16	0.23	0.069	0.11	0.14
07	0.24	0.26	0.0094 (a)	0.093	0.20	0.082	0.11	0.11
21	0.21	0.22	0.15	0.14	0.23	0.055	0.10	0.10
22	0.23	0.26	0.16	0.10	0.099	0.034	0.11	0.13
23	0.29	0.31	0.23	0.15	0.25	0.069	0.082	0.087
*24	0.24	0.27	0.17	0.13	0.19	0.078	0.083	0.12
MEAN	0.21	0.25	0.16	0.11	0.19	0.062	0.092	0.10
RANGE	(0.059-0.29)	(0.097-0.31)	(0.0094-0.23)	(0.027-0.15)	(0.043-0.25)	(0.015-0.088)	(0.027-0.15)	(0.029-0.14)
DETECTION/ TOTAL	11/11	11/11	11/11	11/11	11/11	11/11	11/11	11/11
PLOTTED	←		0.18		→	←	0.08	→

*Control station.

(a) No visible deposit on filters.
(b) Request check of air supplies.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF GROSS BETA IN AIR PARTICULATE FILTERS

pCi/Cu. M.

MARCH 28, 1978 - JUNE 27, 1978

STATION	05/23/78-05/30/78	05/30/78-06/06/78	06/06/78-06/13/78	06/13/78-06/20/78	06/20/78-06/27/78	MEAN 03/28/78-06/27/78	RANGE	DETECTION/TOTAL
01	0.095	0.088	0.039	0.041	0.043	0.12	0.036-0.27	13/13
02	0.097	0.12	0.12	0.16	0.015 (a)	0.12	0.013-0.25	13/13
03	0.087	0.10	0.063	0.089	0.073	0.14	0.073-0.27	13/13
04	0.065	0.063	0.041	0.087	0.025 (b)	0.046	0.015-0.097	13/13
05	0.11	0.11	0.11	0.18	0.13	0.14	0.074-0.23	13/13
06	0.12	0.11	0.11	0.15	0.098	0.16	0.069-0.28	13/13
07	0.10	0.14	0.13	0.17	0.066	0.13	0.0094-0.26	13/13
21	0.085	0.11	0.080	0.050	0.057	0.12	0.050-0.22	13/13
22	0.097	0.14	0.12	0.15	0.11	0.13	0.097-0.26	13/13
23	0.12	0.12	0.12	0.097	0.12	0.16	0.069-0.31	13/13
*24	0.093	0.12	0.063	0.14	0.073	0.14	0.063-0.027	13/13
MEAN	0.097	0.11	0.091	0.12	0.074	0.13	-	-
RANGE	(0.065-0.12)	(0.063-0.14)	(0.039-0.12)	(0.041-0.18)	(0.015-0.13)	-	0.0094-0.31	-
DETECTION/TOTAL	11/11	11/11	11/11	11/11	11/11	-	-	143/143
PLOTTED	———	0.099	———	———	———	→		

*Control station.

(a) Center missing from filter.
(b) Deposit very light.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cumm.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Gross beta	0.12	13/13	0.126	27/28	
02	Gross beta	0.12	13/13	0.141	26/28	
03	Gross beta	0.14	13/13	0.166	27/28	
04	Gross beta	0.046	13/13	0.089	26/28	
05	Gross beta	0.14	13/13	0.097	26/28	
06	Gross beta	0.16	13/13	0.174	27/28	
07	Gross beta	0.13	13/13	0.177	27/28	
21	Gross beta	0.12	13/13	0.194	27/28	
22	Gross beta	0.13	13/13	0.157	25/28	
23	Gross beta	0.16	13/13	0.129	27/28	
*24	Gross beta	0.14	13/13	0.102	25/28	
01-07 21-24	Gross beta	0.13	143/143	0.14	290/308	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF GAMMA EMITTERS IN AIR PARTICULATE FILTERS

pCi/Cu. M.

MARCH 28, 1978 - JUNE 27, 1978

STATION	Be-7	K-40	Zr-95	Ru-103	Ru-106	I-131	Cs-137	Ba-140	Ce-141	Ce-144
01	0.096	<0.03	<0.004	<0.003	<0.02	<2	0.00409	<0.1	<0.003	0.036
02	0.077	<0.02	<0.003	<0.004	0.014	<1	0.00295	<0.2	<0.003	0.025
03	0.095	<0.02	<0.005	<0.006	<0.02	<2	0.0035	<0.2	<0.01	0.038
04	<0.03	<0.03	<0.003	<0.005	<0.01	<2	<0.001	<0.1	<0.009	<0.09
05	0.122	<0.02	0.0052	<0.005	<0.02	<2	0.0033	<0.2	<0.007	0.034
06	0.113	<0.04	0.0037	<0.004	0.018	<1	0.0036	<0.1	<0.006	0.025
07	0.124	<0.02	0.0059	<0.005	0.017	<1	0.0031	<0.1	<0.006	0.033
21	0.074	<0.04	<0.01	<0.006	<0.02	<2	0.0027	<0.2	<0.009	0.025
22	0.147	<0.05	0.0064	<0.01	<0.02	<4	0.0029	<0.2	<0.002	0.036
23	0.109	<0.02	0.0031	<0.005	0.013	<1	0.0026	<0.2	<0.005	0.024
*24	0.108	<0.03	<0.003	<0.005	<0.01	<2	0.0032	<0.1	<0.009	0.027
MEAN	0.107	LLD	0.0049	LLD	0.016	LLD	0.0032	LLD	LLD	0.030
RANGE	0.074-0.147	-	0.0031-0.0064	-	0.013-0.018	-	0.0026-0.0041	-	-	0.024-0.038
DETECTION/ TOTAL	10/11	0/11	5/11	0/11	4/11	0/11	10/11	0/11	0/11	10/11

*Control station.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Be-7	0.096	1/1	0.077	3/3	
02	Be-7	0.077	1/1	0.094	1/3	
03	Be-7	0.095	1/1	0.067	3/3	
04	Be-7	L.T. 0.03	1/1	0.072	3/3	
05	Be-7	0.122	1/1	0.072	3/3	
06	Be-7	0.113	1/1	0.089	3/3	
07	Be-7	0.124	1/1	0.079	3/3	
21	Be-7	0.074	1/1	0.107	3/3	
22	Be-7	0.147	1/1	0.076	3/3	
23	Be-7	0.109	1/1	0.100	3/3	
*24	Be-7	0.108	1/1	0.083	3/3	
01-07 21-24	Be-7	0.107	10/11	0.083	31/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Zr-95	L.T. 0.004	0/1	0.0090	2/3	
02	Zr-95	L.T. 0.003	0/1	0.0120	2/3	
03	Zr-95	L.T. 0.005	0/1	0.0116	2/3	
04	Zr-95	L.T. 0.003	0/1	0.0182	1/3	
05	Zr-95	0.0052	1/1	0.0140	2/3	
06	Zr-95	0.0037	1/1	0.0115	2/3	
07	Zr-95	0.0059	1/1	0.0129	2/3	
21	Zr-95	L.T. 0.01	0/1	0.0181	2/3	
22	Zr-95	0.0064	1/1	0.0119	2/3	
23	Zr-95	0.0031	1/1	0.0165	3/3	
*24	Zr-95	L.T. 0.003	0/1	0.0137	3/3	
01-07 21-24	Zr-95	0.0049	5/11	0.0136	23/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Ru-103	L.T. 0.003	0/1	0.0101	2/3	
02	Ru-103	L.T. 0.004	0/1	0.0156	2/3	
03	Ru-103	L.T. 0.006	0/1	0.0194	2/3	
04	Ru-103	L.T. 0.005	0/1	0.0290	1/3	
05	Ru-103	L.T. 0.005	0/1	0.0189	2/3	
06	Ru-103	L.T. 0.004	0/1	0.0151	2/3	
07	Ru-107	L.T. 0.005	0/1	0.0189	2/3	
21	Ru-103	L.T. 0.006	0/1	0.0198	2/3	
22	Ru-103	L.T. 0.01	0/1	0.0224	2/3	
23	Ru-103	L.T. 0.005	0/1	0.0161	3/3	
*24	Ru-103	L.T. 0.005	0/1	0.0186	1/3	
01-07 21-24	Ru-103	MDL	0/11	0.0179	21/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Ru-106	L.T. 0.02	0/1	LLD	0/3	
02	Ru-106	0.014	1/1	LLD	0/3	
03	Ru-106	L.T. 0.02	0/1	LLD	0/3	
04	Ru-206	L.T. 0.01	0/1	0.0182	1/3	
05	Ru-106	L.T. 0.02	0/1	0.0210	1/3	
06	Ru-106	0.018	1/1	LLD	0/3	
07	Ru-106	0.017	1/1	LLD	0/3	
21	Ru-106	L.T. 0.02	0/1	0.0185	1/3	
22	Ru-106	L.T. 0.02	0/1	0.0260	2/3	
23	Ru-206	0.013	1/1	0.0229	1/3	
*24	Ru-106	L.T. 0.01	0/1	LLD	0/3	
01-07 21-24	Ru-106	0.016	4/11	0.0221	6/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	I-131	L.T. 2	0/1	LLD	0/3	
02	I-131	L.T. 1	0/1	LLD	0/3	
03	I-131	L.T. 2	0/1	LLD	0/3	
04	I-131	L.T. 2	0/1	LLD	0/3	
05	I-131	L.T. 2	0/1	LLD	0/3	
06	I-131	L.T. 1	0/1	0.0391	1/3	
07	I-131	L.T. 1	0/1	0.0350	1/3	
21	I-131	L.T. 2	0/1	LLD	0/3	
22	I-131	L.T. 4	0/1	0.0312	1/3	
23	I-131	L.T. 1	0/1	LLD	0/3	
*24	I-131	L.T. 2	0/1	LLD	0/3	
01-07 21-24	I-131	LLD	0/11	0.0351	3/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Cs-137	0.00409	1/1	LLD	0/3	
02	Cs-137	0.00295	1/1	0.00307	1/3	
03	Cs-137	0.0035	1/1	0.00191	2/3	
04	Cs-137	L.T. 0.001	0/1	0.00217	1/3	
05	Cs-137	0.0033	1/1	0.00242	3/3	
06	Cs-137	0.0036	1/1	0.00222	2/3	
07	Cs-137	0.0031	1/1	0.00273	2/3	
21	Cs-137	0.0027	1/1	0.00193	1/3	
22	Cs-137	0.0029	1/1	0.00198	1/3	
23	Cs-137	0.0026	1/1	0.00382	2/3	
*24	Cs-137	0.0032	1/1	0.00229	2/3	
01-07 21-24	Cs-137	0.0032	10/11	0.00249	17/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Ba-140	L.T. 0.1	0/1	LLD	0/3	
02	Ba-140	L.T. 0.2	0/1	0.0286	1/3	
03	Ba-140	L.T. 0.2	0/1	LLD	0/3	
04	Ba-140	L.T. 0.1	0/1	LLD	0/3	
05	Ba-140	L.T. 0.2	0/1	0.0278	1/3	
06	Ba-140	L.T. 0.1	0/1	LLD	0/3	
07	Ba-140	L.T. 0.1	0/1	0.0367	1/3	
21	Ba-140	L.T. 0.2	0/1	0.0215	1/3	
22	Ba-140	L.T. 0.2	0/1	0.0336	1/3	
23	Ba-140	L.T. 0.2	0/1	LLD	0/3	
*24	Ba-140	L.T. 0.1	0/1	LLD	0/3	
01-07 21-24	Ba-140	LLD	0/11	0.0298	5/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Ce-141	L.T. 0.003	0/1	0.0283	1/3	
02	Ce-141	L.T. 0.003	0/1	0.0113	2/3	
03	Ce-141	L.T. 0.01	0/1	0.0230	2/3	
04	Ce-141	L.T. 0.009	0/1	0.0269	1/3	
05	Ce-141	L.T. 0.007	0/1	0.0174	2/3	
06	Ce-141	L.T. 0.006	0/1	0.0214	2/3	
07	Ce-141	L.T. 0.006	0/1	0.0160	2/3	
21	Ce-141	L.T. 0.009	0/1	0.0216	2/3	
22	Ce-141	L.T. 0.002	0/1	0.0292	2/3	
23	Ce-141	L.T. 0.005	0/1	0.0279	2/3	
*24	Ce-141	L.T. 0.009	0/1	0.0229	1/3	
01-07 21-24	Ce-141	LLD	0/11	0.0218	19/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Air Particulate Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	Ce-144	0.036	1/1	0.0223	3/3	
02	Ce-144	0.025	1/1	0.0287	2/3	
03	Ce-144	0.038	1/1	0.0255	3/3	
04	Ce-144	L.T. 0.09	0/1	0.0174	3/3	
05	Ce-144	0.034	1/1	0.0236	3/3	
06	Ce-144	0.025	1/1	0.0283	3/3	
07	Ce-144	0.033	1/1	0.0255	3/3	
21	Ce-144	0.025	1/1	0.0316	3/3	
22	Ce-144	0.036	1/1	0.0134	2/3	
23	Ce-144	0.024	1/1	0.0304	3/3	
*24	Ce-144	0.027	1/1	0.0306	2/3	
01-07 21-24	Ce-144	0.030	10/11	0.0254	30/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF I-131 IN CHARCOAL FILTERS (AIRBORNE RADIOIODINE)

pCi/Cu. M.

MARCH 28, 1978 - JUNE 27, 1978

STATION	03/28/78-04/04/78	04/04/78-04/11/78	04/11/78-04/18/78	04/18/78-04/25/78	04/25/78-05/02/78	05/02/78-05/09/78	05/09/78-05/16/78	05/16/78-05/23/78
01	<0.07	<0.08	<0.07	<0.07	<0.1	<0.07	<0.06	<0.1
02	<0.07	<0.08	<0.07	<0.07	<0.1	<0.07	<0.06	<0.1
03	<0.1	<0.08	<0.06	<0.07	<0.1	<0.06	<0.07	<0.1
04	<0.08	<0.08	<0.07	<0.07	<0.1	<0.07	<0.07	<0.1
05	<0.08	<0.08	<0.07	<0.07	<0.1	<0.07	<0.07	<0.1
06	<0.08	<0.08	<0.07	<0.07	<0.1	<0.06	<0.07	<0.1
07	<0.07	<0.08	<0.07	<0.07	<0.[illegible]	<0.07	<0.07	<0.08
21	<0.08	<0.08	<0.07	<0.06	<0.07	<0.07	<0.08	<0.08
22	<0.08	<0.09	<0.07	<0.08	<0.07	<0.07	<0.08	<0.08
23	<0.06	<0.08	<0.07	<0.08	<0.07	<0.07	<0.08	<0.08
*24	<0.07	<0.09	<0.08	<0.09	<0.08	<0.07	<0.08	<0.08
MEAN	<0.1	<0.09	<0.08	<0.09	<0.1	<0.07	<0.08	<0.1
RANGE	-	-	-	-	-	-	-	-
DETECTION/ TOTAL	0/11	0/11	0/11	0/11	0/11	0/11	0/11	0/11

*Control Station

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF I-131 IN CHARCOAL FILTERS (AIRBORNE RADIOIODINE)

pC/Cu. M.

MARCH 28 1978 - JUNE 27, 1978

STATION	05/23/78-05/30/78	05/30/78-06/06/78	06/06/78-06/13/78	06/13/78-06/20/78	06/20/78-06/27/78	03/28/78-06/27/78	RANGE	DETECTION/TOTAL
01	<0.07	<0.08	<0.06	<0.07	<0.3	<0.3	-	0/13
02	<0.07	<0.08	<0.06	<0.07	<0.3	<0.3	-	0/13
03	<0.09	<0.1	<0.06	<0.07	<0.3	<0.3	-	0/13
04	<0.08	<0.08	<0.06	<0.07	<0.3	<0.3	-	0/13
05	<0.08	<0.08	<0.06	<0.06	<0.3	<0.3	-	0/13
06	<0.07	<0.08	<0.06	<0.07	<0.3	<0.3	-	0/13
07	<0.07	<0.09	<0.07	<0.08	<0.1	<0.1	-	0/13
21	<0.07	<0.09	<0.07	<0.08	<0.1	<0.1	-	0/13
22	<0.08	<0.09	<0.07	<0.08	<0.1	<0.1	-	0/13
23	<0.08	<0.09	<0.07	<0.08	<0.1	<0.1	-	0/13
*24	<0.08	<0.09	<0.08	<0.1	<0.2	<0.2	-	0/13
MEAN	<0.09	<0.1	<0.08	<0.1	<0.3	<0.3	-	-
RANGE	-	-	-	-	-	-	-	-
DETECTION/TOTAL	0/11	0/11	0/11	0/11	0/11	-	-	0/143

*Control station.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Charcoal Filters COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS pCi/cu.m.

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	I-131	LLD	0/13	0.0459	1/19	
02	I-131	LLD	0/13	0.0970	1/19	
03	I-131	LLD	0/13	0.0416	1/19	
04	I-131	LLD	0/13	0.0765	1/19	
05	I-131	LLD	0/13	0.0367	1/19	
06	I-131	LLD	0/13	0.105	1/19	
07	I-131	LLD	0/13	0.0585	1/19	
21	I-131	LLD	0/13	0.0486	1/19	
22	I-131	LLD	0/13	LLD	0/19	
23	I-131	LLD	0/13	0.121	1/19	
*24	I-131	LLD	0/13	0.121	1/19	
01-07 21-24	I-131	LLD	0/143	0.0701	9/209	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

WATER - PRECIPITATION

STATION NUMBER 01

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
GR-B	1.2 +-0.1 E 01 pCi/liter	1.8 +-0.1 E 01 pCi/liter	1.1 +-0.1 E 01 pCi/liter
GR-B	1.5 +-0.1 E 00 nCi/sq. m.	1.3 +-0.1 E 00 nCi/sq. m.	1.3 +-0.1 E 00 nCi/sq. m.
Inches of rain	4.98 inches	2.87 inches	4.51 inches
TRITIUM ANALYSIS:			
H-3 (QUARTERLY COMPOSITE)		SECOND QUARTER COMPOSITE 1.1 +-0.7 E 02	
GAMMA ISOTOPIC ANALYSIS:			
(QUARTERLY COMPOSITE)		SECOND QUARTER COMPOSITE LLD (See Table 3.2)	

MEAN = 14 pCi/liter = 1.4 nCi/sq.m.

RANGE = 12-18 pCi/liter = 1.3-1.5 nCi/sq.m.

DETECTION/TOTAL = 3/3

AVERAGE RAINFALL = 4.12 inches

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

DIRECT EXPOSURE TLD

NET EXPOSURE

STATION	FIRST QUARTER 12/27/77-03/28/78 mR	mR/day	SECOND QUARTER 03/28/78-06/27/78 mR	mR/day	THIRD QUARTER	FOURTH QUARTER	9.2 MONTHS 09/20/77-06/27/78 mR	mR/day
01	18.7	0.205	29.8	0.33			78.4	0.28
02	13.8	0.152	24.8	0.27			58.4	0.21
03	12.9	0.142	26.4	0.29			61.3	0.22
04	14.3	0.157	26.3	0.29			60.7	0.22
05	13.9	0.153	28.7	0.32			61.6	0.22
06	19.9	0.219	33.4	0.37			89.5	0.32
07	15.3	0.168	28.5	0.31			62.7	0.22
21	14.8	0.164	23.4	0.26			62.7	0.22
22	19.5	0.214	35.3	0.39			80.6	0.29
23	20.3	0.223	25.4	0.28			86.4	0.31
*24	12.3	0.135	21.5	0.24			54.1	0.19
MEAN	16	0.18	27.6	0.30			68.8	0.25
(RANGE)	12-20	0.14-0.22	-	0.24-0.39			-	0.19-0.32
DETECTION/ TOTAL	11/11	11/11	-	11/11			-	11/11

The radiation dose is calculated as net mR/day and is the average daily exposure of the dosimeters at the stations in North Anna. The dosimeters were annealed at the North Anna Power Station of the Virginia Electric and Power Company prior to exposure in the field thus cancelling an in-transit dose. After exposure and collection of the field dosimeters and prior to shipment to Teledyne Isotopes, the control dosimeters only were annealed and shipped with the field dosimeters to TI providing a measure of the return in-transit dose. The net mR/day is the gross mR/day of the field dosimeters minus the return in-transit dose of the control dosimeters.

*Control location.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Direct Exposure - TLD COLLECTION PERIOD March 28, 1978 TO June 27, 1978

UNITS mR/dry

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01	TLD	0.33±0.02	1/1	0.210	3/3	
02	TLD	0.27±0.03	1/1	0.153	3/3	
03	TLD	0.29±0.02	1/1	0.147	3/3	
04	TLD	0.29±0.05	1/1	0.163	3/3	
05	TLD	0.32±0.04	1/1	0.164	3/3	
06	TLD	0.37±0.03	1/1	0.223	3/3	
07	TLD	0.31±0.02	1/1	0.166	3/3	
21	TLD	0.26±0.02	1/1	0.196	3/3	
22	TLD	0.39±0.04	1/1	0.224	3/3	
23	TLD	0.28±0.02	1/1	0.209	3/3	
*24	TLD	0.24±0.01	1/1	0.133	3/3	
01-07 21-24	TLD	0.30±0.05	11/11	0.181	33/33	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SURFACE WATER

(pCi/liter)

STATION NUMBER 08
DISCHARGE COOLING WATER

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
I-131	L.T. 3. E-01	L.T. 2. E-01	L.T. 5. E-01
GAMMA SPECTRUM ANALYSIS:			
BE-7	L.T. 5. E 01	L.T. 8. E 01	L.T. 8. E 01
K-40	L.T. 8. E 01	L.T. 2. E 02	L.T. 2. E 02
MN-54	L.T. 4. E 00	L.T. 7. E 00	L.T. 6. E 00
CO-58	L.T. 5. E 00	L.T. 8. E 00	L.T. 7. E 00
FE-59	L.T. 1. E 01	L.T. 2. E 01	L.T. 2. E 01
CO-60	L.T. 4. E 00	L.T. 8. E 00	L.T. 7. E 00
ZN-65	L.T. 8. E 00	L.T. 2. E 01	L.T. 2. E 01
ZR-95	L.T. 5. E 00	L.T. 9. E 00	L.T. 8. E 00
RU-103	L.T. 7. E 00	L.T. 1. E 01	L.T. 1. E 01
RU-106	L.T. 4. E 01	L.T. 7. E 01	L.T. 6. E 01
I-131	L.T. 9. E 01	L.T. 3. E 01	L.T. 6. E 01
CS-134	L.T. 4. E 00	L.T. 9. E 00	L.T. 7. E 00
CS-137	L.T. 4. E 00	L.T. 8. E 00	L.T. 6. E 00
BA-140	L.T. 3. E 01	L.T. 2. E 01	L.T. 3. E 01
CE-141	L.T. 2. E 01	L.T. 3. E 01	L.T. 2. E 01
CE-144	L.T. 4. E 01	L.T. 9. E 01	L.T. 6. E 01
RA-226	L.T. 8. E 01	L.T. 2. E 02	L.T. 1. E 02
TH-228	L.T. 7. E 00	L.T. 2. E 01	L.T. 1. E 01
TRITIUM ANALYSIS:		SECOND QUARTER COMPOSITE	
H-3		L.T. 1. E 02	

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SURFACE WATER

(pCi/Liter)

STATION NUMBER 09
RESERVOIR WATER

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
I-131	L.T. 3. E-01	L.T. 2. E-01	L.T. 6. E-01
GAMMA SPECTRUM ANALYSIS:			
BE-7	L.T. 4. E 01	L.T. 7. E 01	L.T. 7. E 01
K-40	L.T. 7. E 01	L.T. 2. E 02	L.T. 1. E 02
MN-54	L.T. 3. E 00	L.T. 7. E 00	L.T. 7. E 00
CO-58	L.T. 4. E 00	L.T. 7. E 00	L.T. 8. E 00
FE-59	L.T. 9. E 00	L.T. 2. E 01	L.T. 2. E 01
CO-60	L.T. 3. E 00	L.T. 7. E 00	L.T. 7. E 00
ZN-65	L.T. 7. E 00	L.T. 2. E 01	L.T. 2. E 01
ZR-95	L.T. 4. E 00	L.T. 7. E 00	L.T. 8. E 00
RU-103	L.T. 5. E 00	L.T. 9. E 00	L.T. 1. E 01
RU-106	L.T. 3. E 01	L.T. 6. E 01	L.T. 6. E 01
I-131	L.T. 6. E 01	L.T. 3. E 01	L.T. 4. E 01
CS-134	L.T. 4. E 00	L.T. 7. E 00	L.T. 8. E 00
CS-137	L.T. 3. E 00	L.T. 6. E 00	L.T. 7. E 00
BA-140	L.T. 2. E 01	L.T. 2. E 01	L.T. 2. E 01
CE-141	L.T. 1. E 01	L.T. 2. E 01	L.T. 2. E 01
CE-144	L.T. 3. E 01	L.T. 6. E 01	L.T. 8. E 01
RA-226	L.T. 8. E 01	L.T. 1. E 02	L.T. 2. E 02
TH-228	L.T. 6. E 00	L.T. 1. E 01	L.T. 1. E 01
TRITIUM ANALYSIS:		SECOND QUARTER COMPOSITE	
H-3		3.80+-0.80E 02	

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

RIVER WATER

(pCi/liter)

STATION NUMBER 11

DATE COLLECTED:	JUNE
RADIOCHEMICAL ANALYSIS:	
SR-89	L.T. 1. E 00
SR-90	L.T. 6. E-01
GAMMA SPECTRUM ANALYSIS:	
BE-7	L.T. 9. E 01
K-40	L.T. 2. E 02
MN-54	L.T. 8. E 00
CO-58	L.T. 9. E 00
FE-59	L.T. 2. E 01
CO-60	L.T. 8. E 00
ZN-65	L.T. 2. E 01
ZR-95	L.T. 1. E 01
RU-103	L.T. 1. E 01
RU-106	L.T. 8. E 01
I-131	L.T. 6. E 01
CS-134	L.T. 9. E 00
CS-137	L.T. 7. E 00
BA-140	L.T. 2. E 01
CE-141	L.T. 3. E 01
CE-144	L.T. 1. E 02
RA-226	L.T. 2. E 02
TH-228	L.T. 2. E 01
TRITIUM ANALYSIS:	
H-3	1.0 +-0.8 E 02

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF SURFACE WATER

(pCi/liter)

SECOND QUARTER

	STATION NUMBER 08	STATION NUMBER 09	STATION NUMBER 11
RADIOCHEMICAL ANALYSIS:			
SR-89	L.T. 4. E 00	L.T. 4. E 00	L.T. 1. E 00
SR-90	3.2 +-2.1 E-0	L.T. 5. E-01	L.T. 6. E-01
TRITIUM ANALYSIS:			
H-3	L.T. 1.0 E 02	3.8 +-0.8 E 02	1.0 +-0.8 E 02

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF RADIONUCLIDES IN SURFACE WATER

pCi/liter

SECOND QUARTER 1978

STATION	LOCATION		I-131	GAMMA ISOTOPIC	H-3	Sr-89	Sr-90
08	Discharge Cooling Water	MEAN	<0.3	MDL	<100	<4	0.32
		RANGE	-	Table 3	-	-	-
		DETECTION/TOTAL	0/3	0/3	0/1	0/1	1/1
09	Reservoir	MEAN	<0.4	MDL	380	<4	<0.5
		RANGE	-	Table 3	-	-	-
		DETECTION/TOTAL	0/3	0/3	1/1	0/1	0/1
11	North Anna River	MEAN	NR	MDL	100	<1	<0.6
		RANGE	-	Table 3	-	-	-
		DETECTION/TOTAL	-	0/1	1/1	0/1	0/1

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Surface Water COLLECTION PERIOD March 31, 1978 TO June 30, 1978

UNITS pCi/liter

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
08	I-131	L.T. 0.3	0/3	LLD	0/3	
Discharge Cooling	Gamma Isotopic	MDL	0/3	LLD	0/4	
Water	Tritium	L.T. 100	0/1	170	2/2	
*09	I-131	L.T. 0.4	0/3	LLD	0/3	
Resevoir	Gamma Isotopic	MDL	0/3	LLD	0/4	
	Tritium	380	1/1	250	1/2	
North Anna	Gamma Isotopic	MDL (Table 3)	0/1	LLD	0/2	
River	Tritium	100	1/1	240	1/2	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

GROUND WATER

(pCi/liter)

STATION NUMBER 01

DATE COLLECTED:	JUNE
RADIOCHEMICAL ANALYSIS:	
SR-89	L.T. 2. E 00
SR-90	6.6 +-3.6 E-01
GAMMA SPECTRUM ANALYSIS:	
BE-7	L.T. 8. E 01
K-40	L.T. 1. E 02
MN-54	L.T. 6. E 00
CO-58	L.T. 7. E 00
CO-60	L.T. 6. E 00
ZR-95	L.T. 8. E 00
RU-103	L.T. 1. E 01
RU-106	L.T. 6. E 01
I-131	L.T. 1. E 02
CS-134	L.T. 7. E 00
CS-137	L.T. 6. E 00
BA-140	L.T. 4. E 01
CE-141	L.T. 3. E 01
CE-144	L.T. 7. E 01
RA-226	L.T. 2. E 02
TH-228	L.T. 1. E 01
TRITIUM ANALYSIS:	
H-3	L.T. 1. E 02

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Ground (well) Water COLLECTION PERIOD June 27, 1978 TO

UNITS pCi/liter

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
01A	H-3	L.T. 100		MDL	0/1	1st quarter 1978
	Sr-89	L.T. 2		-		Required in 2nd quarterly
	Sr-90	0.66±0.36		-		" "
	Gamma Isotopic	MDL	0/1	MDL	0/1	1st quarter 1978

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

MILK

(pCi/liter)

STATION NUMBER 12

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
I-131	L.T. 3. E-01	L.T. 3. E-01	L.T. 3. E-01
GAMMA SPECTRUM ANALYSIS:			
BE-7	L.T. 8. E 01	L.T. 7. E 01	L.T. 8. E 01
K-40	1.18+-0.15E 03	1.24+-0.14E 03	1.24+-0.14E 03
MN-54	L.T. 8. E 00	L.T. 7. E 00	L.T. 7. E 00
CO-58	L.T. 8. E 00	L.T. 7. E 00	L.T. 8. E 00
FE-59	L.T. 2. E 01	L.T. 2. E 01	L.T. 2. E 01
CO-60	L.T. 1. E 01	L.T. 8. E 00	L.T. 9. E 00
ZN-65	L.T. 2. E 00	L.T. 2. E 01	L.T. 2. E 01
ZR-95	L.T. 9. E 00	L.T. 7. E 00	L.T. 8. E 00
RU-103	L.T. 9. E 00	L.T. 8. E 00	L.T. 9. E 00
RU-106	L.T. 8. E 01	L.T. 6. E 01	L.T. 7. E 01
I-131	L.T. 2. E 01	L.T. 1. E 01	L.T. 7. E 00
CS-134	L.T. 1. E 01	L.T. 8. E 00	L.T. 8. E 00
CS-137	L.T. 9. E 00	1.11+-0.42E 01	L.T. 8. E 00
BA-140	L.T. 1. E 01	L.T. 1. E 01	L.T. 1. E 01
CE-141	L.T. 2. E 01	L.T. 1. E 01	L.T. 2. E 01
CE-144	L.T. 9. E 01	L.T. 6. E 01	L.T. 9. E 01
RA-226	L.T. 2. E 02	L.T. 1. E 02	L.T. 2. E 02
TH-228	L.T. 2. E 01	L.T. 1. E 01	L.T. 1. E 01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

MILK

(pCi/liter)

STATION NUMBER 13

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
I-131	L.T. 2. E-01	L.T. 4. E-01	L.T. 3. E-01
GAMMA SPECTRUM ANALYSIS:			
BE-7	L.T. 8. E 01	L.T. 8. E 01	L.T. 6. E 01
K-40	1.17+-0.15E 03	1.01+-0.14E 03	1.05+-0.13E 03
MN-54	L.T. 8. E 00	L.T. 8. E 00	L.T. 7. E 00
CO-58	L.T. 8. E 00	L.T. 8. E 00	L.T. 7. E 00
FE-59	L.T. 2. E 01	L.T. 2. E 01	L.T. 2. E 01
CO-60	L.T. 8. E 00	L.T. 8. E 00	L.T. 8. E 00
ZN-65	L.T. 2. E 01	L.T. 2. E 01	L.T. 2. E 01
ZR-95	L.T. 9. E 00	L.T. 9. E 00	L.T. 7. E 00
RU-103	L.T. 9. E 00	L.T. 9. E 00	L.T. 8. E 00
RU-106	L.T. 8. E 01	L.T. 7. E 01	L.T. 6. E 01
I-131	L.T. 2. E 01	L.T. 2. E 01	L.T. 2. E 01
CS-134	L.T. 9. E 00	L.T. 9. E 00	L.T. 7. E 00
CS-137	L.T. 9. E 00	7.74+-4.65E 00	9.98+-4.75E 00
BA-140	L.T. 1. E 01	L.T. 1. E 01	L.T. 1. E 01
CE-141	L.T. 2. E 01	L.T. 2. E 01	L.T. 1. E 01
CE-144	L.T. 9. E 01	L.T. 9. E 01	L.T. 6. E 01
RA-226	L.T. 2. E 02	L.T. 2. E 02	L.T. 1. E 02
TH-228	L.T. 2. E 01	L.T. 2. E 01	L.T. 1. E 01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

MILK

(pCi/liter)

STATION NUMBER 14

DATE COLLECTED:	APRIL	MAY	JUNE
RADIOCHEMICAL ANALYSIS:			
I-131	L.T. 3. E-01	L.T. 3. E-01	L.T. 3. E-01
GAMMA SPECTRUM ANALYSIS:			
BE-7	L.T. 6. E 01	L.T. 6. E 01	L.T. 6. E 01
K-40	1.10+-0.14E 03	8.43+-1.33E 02	9.54+-1.34E 02
MN-54	L.T. 6. E 00	L.T. 6. E 00	L.T. 6. E 00
CO-58	L.T. 7. E 00	L.T. 7. E 00	L.T. 7. E 00
FE-59	L.T. 2. E 01	L.T. 2. E 01	L.T. 1. E 01
CO-60	L.T. 7. E 00	L.T. 7. E 00	L.T. 6. E 00
ZN-65	L.T. 5. E 00	L.T. 2. E 00	L.T. 1. E 01
ZR-95	L.T. 2. E 00	L.T. 7. E 00	L.T. 7. E 00
RU-103	L.T. 2. E 00	L.T. 8. E 00	L.T. 8. E 00
RU-106	L.T. 2. E 01	L.T. 6. E 01	L.T. 6. E 01
I-131	L.T. 4. E 00	L.T. 1. E 01	L.T. 2. E 01
CS-134	L.T. 2. E 00	L.T. 7. E 00	L.T. 7. E 00
CS-137	L.T. 8. E 00	1.59+-0.46E 01	L.T. 8. E 00
BA-140	L.T. 1. E 01	L.T. 1. E 01	L.T. 1. E 01
CE-141	L.T. 2. E 01	L.T. 1. E 00	L.T. 2. E 01
CE-144	L.T. 6. E 01	L.T. 6. E 01	L.T. 6. E 01
RA-226	L.T. 1. E 02	L.T. 1. E 02	L.T. 2. E 02
TH-228	L.T. 1. E 01	L.T. 1. E 01	L.T. 1. E 01

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

QUARTERLY COMPOSITE OF MILK

(pCi/liter)

SECOND QUARTER

	STATION NUMBER 12	STATION NUMBER 13	STATION NUMBER 14
RADIOCHEMICAL ANALYSIS:			
SR-89	L.T. 6. E 00	L.T. 4. E 00	L.T. 3. E 00
SR-90	2.7 +-0.5 E 00	3.9 +-0.5 E 00	2.9 +-0.5 E 00

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF RADIONUCLIDES IN MILK

pCi/liter

SECOND QUARTER 1979

STATION		I-131	Sr-89 (a)	Sr-90 (a)	K-40	Cs-137
12	APRIL	<0.3	-	-	1180	< 9
	MAY	<0.3	-	-	1240	11
	JUNE	<0.3	<6	2.7	1240	< 8
13	APRIL	<0.2	-	-	1170	< 9
	MAY	<0.4	-	-	1010	7.7
	JUNE	<0.3	<4	3.9	1050	10
14	APRIL	<0.3	-	-	1100	< 8
	MAY	<0.3	-	-	843	16
	JUNE	<0.3	<3	2.9	954	< 8
MEAN		LLD	LLD	3.2	1084	11
RANGE		-	-	2.7-3.9	843-1240	7.7-16
DETECTION/ TOTAL		0/9	0/3	3/3	9/9	4/9
				3/3		

(a) Composite of three monthly samples for the quarterly measurement.

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

SAMPLE TYPE Milk COLLECTION PERIOD April 1978 TO June 1978

UNITS pCi/liter

SAMPLING STATION NUMBER	ANALYSIS	QUARTERLY AVERAGE (a)	f (b)	PREVIOUS 3 qt. AVERAGE (a)	f (b)	REMARKS
12	I-131	LLD	0/3	LLD	0/5	
	Sr-89	LLD	0/1	LLD	0/3	
	Sr-90	2.7	1/1	3.2	3/3	
	K-40	1220	3/3	1152	5/5	
	Cs-137	11	1/3	8.1	2/5	
13	I-131	LLD	0/3	LLD	0/5	
	Sr-89	LLD	0/1	LLD	0/3	
	Sr-90	3.9	1/1	2.6	3/3	
	K-40	1077	3/3	1174	5/5	
	Cs-137	9	2/3	6.6	2/5	
14	I-131	LLD	0/3	LLD	0/5	
	Sr-89	LLD	0/1	LLD	0/3	
	Sr-90	2.9	1/1	3.3	3/3	
	K-40	966	3/3	1242	5/5	
	Cs-137	16	1/3	9.6	4/5	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

FISH

(pCi/gm WET)

STATION NUMBER 08

DATE COLLECTED:	APRIL
GAMMA SPECTRUM ANALYSIS:	
BE-7	L.T. 3. E-01
K-40	L.T. 8. E-01
MN-54	L.T. 3. E-02
CO-58	L.T. 3. E-02
FE-59	L.T. 6. E-02
CO-60	L.T. 3. E-02
ZN-65	L.T. 6. E-02
ZR-95	L.T. 3. E-02
RU-103	L.T. 3. E-02
RU-106	L.T. 3. E-01
I-131	L.T. 6. E-02
CS-134	L.T. 3. E-02
CS-137	L.T. 3. E-02
BA-140	L.T. 6. E-02
CE-141	L.T. 5. E-02
CE-144	L.T. 2. E-01
RA-226	L.T. 5. E-01
TH-228	L.T. 4. E-02

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

FISH

(pCi/gm WET)

STATION NUMBER 09

DATE COLLECTED:	APRIL
GAMMA SPECTRUM ANALYSIS:	
BE-7	L.T. 3. E-01
K-40	L.T. 1. E 00
MN-54	L.T. 3. E-02
CO-58	L.T. 3. E-02
FE-59	L.T. 6. E-02
CO-60	L.T. 3. E-02
ZN-65	L.T. 7. E-02
ZR-95	L.T. 3. E-02
RU-103	L.T. 4. E-02
RU-106	L.T. 3. E-01
I-131	L.T. 8. E-02
CS-134	L.T. 5. E-02
CS-137	5.21+-3.13E-02
BA-140	L.T. 7. E-02
CE-141	L.T. 6. E-02
CE-144	L.T. 2. E-01
RA-226	L.T. 5. E-01
TH-228	L.T. 5. E-02

TELEDYNE ISOTOPES

NORTH ANNA POWER STATION

SUMMARY OF RADIONUCLIDES IN FISH*

pCi/gm WET

ANNUAL COLLECTION NEAR BEGINNING OF FISHING SEASON

STATION	K-40	Cs-137
08	L.T. 8. E-01	L.T. 3. E-02
09	L.T. 1. E 00	5.21+-3.13E-02
MEAN	LLD	0.052
RANGE	-	-
DETECTION/ TOTAL	0/2	1/2

*Analyzed annually by gamma spectrometry near the beginning of the fishing season

QUARTERLY RADIOLOGICAL SUMMARIES
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION, MINERAL, VIRGINIA

(Annual at beginning of fishing period)

SAMPLE TYPE Fish COLLECTION PERIOD April 1978 TO

UNITS pCi/gm.wet

SAMPLING STATION NUMBER	ANALYSI.	QUARTERLY AVERAGE (a)	f (b)	4th QUARTER 1977 (A) AVERAGE (a)	f (b)	REMARKS
	Gamma Isotopic	-	-	-	-	-
08	K-40	L.T. 0.8	0/1	L.T. 2	0/1	
09	K-40	L.T. 1.0	0/1	1.8	1/1	
08	Cs-137	L.T. 0.03	0/1	L.T. 0.07	0/1	
09	Cs-137	0.052	1/1	L.T. 0.03	0/1	

* Control Station
(a) Average of detectable measurements only or LLD when no detection measured.
(b) f is the fraction of detectable to total measurements.

(A) Annual analysis at the beginning of the fishing season.