VERMONT YANKEE
NUCLEAR POWER CORPORATION

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May 14, 2002
BVY 02-33

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

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
2001 Annual Radiological Environmental Operating Report

In accordance with Vermont Yankee Technical Specification 6.6.E, attached is a copy of the 2001 Annual Radiological Environmental Operating Report. This report contains a summary and analysis of the radiological environmental data collected for the calendar year 2001.

We trust that the information provided is adequate; however, should you have questions or require additional information, please contact Mr. Sam A. Wender at (802) 258-5650.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Gautam Sen
Licensing Manager

Attachment

cc: USNRC Region 1 Administrator
USNRC Resident Inspector – VYNPS
USNRC Project Manager – VYNPS
Vermont Department of Public Service
Vermont Division of Occupational and Radiological Health

IE25

SUMMARY OF VERMONT YANKEE COMMITMENTS

BVY NO.: 02-33 "2001 Annual Radiological Environmental Operating Report"

The following table identifies commitments made in this document by Vermont Yankee. Any other actions discussed in the submittal represent intended or planned actions by Vermont Yankee. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Licensing Manager of any questions regarding this document or any associated commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"
None	N/A

VERMONT YANKEE NUCLEAR POWER STATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

January - December 2001

May 2002

Prepared by:
Vermont Yankee Nuclear Power Corporation
Chemistry Department

Acknowledgment

Special thanks to the Vermont Yankee Public Affairs Department for the use of their original water color by William Hays of the power station as seen from the New Hampshire shore of the Connecticut River for the covers of this report.

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1. INTRODUCTION

This report summarizes the findings of the Radiological Environmental Monitoring Program (REMP) conducted by Vermont Yankee Nuclear Power Corporation in the vicinity of the Vermont Yankee Nuclear Power Station (VYNPS) in Vernon, Vermont during the calendar year 2001. It is submitted annually in compliance with plant Technical Specification 6.6.E. The remainder of this report is organized as follows:

Section 2: Provides an introductory explanation to the background radioactivity and radiation that is detected in the plant environs.

Section 3: Provides a brief description of the Vermont Yankee Nuclear Power Station site and its environs.

Section 4: Provides a description of the overall REMP program design. Included is a summary of the Vermont Yankee Nuclear Power Station (VYNPS) Off-Site Dose Calculation Manual (ODCM) requirements for REMP sampling, tables listing all locations sampled or monitored in 2001 with compass sectors and distances from the plant, and maps showing each REMP location. Tables listing Lower Limit of Detection requirements and Reporting Levels are also included.

Section 5: Consists of the summarized data as required by the VYNPS ODCM. The tables are in a format similar to that specified by the NRC Radiological Assessment Branch Technical Position on Environmental Monitoring (Reference 1). Also included is a summary of the 2001 environmental TLD measurements.

Section 6: Provides the results of the 2001 monitoring program. The performance of the program in meeting regulatory requirements as given in the ODCM is discussed, and the data acquired during the year are analyzed.

Section 7: Provides an overview of the Quality Assurance programs used at the Duke Engineering & Services Laboratory and Teledyne Brown Engineering Laboratory. Included are the laboratories' results of the Analytics Intercomparison Program.

Section 8: Summarizes the requirements and the results of the 2001 Land Use Census.

Section 9: Gives a summary of the 2001 Radiological Environmental Monitoring Program.

Appendix A: Provides an explanation of year 2000 Questionable Data listed in the year 2000 report.

2. BACKGROUND RADIOACTIVITY

Radiation or radioactivity potentially detected in the Vermont Yankee environment can be grouped into three categories. The first is "naturally-occurring' radiation and radioactivity. The second is "man-made" radioactivity from sources other than the Vermont Yankee plant. The third potential source of radioactivity is due to emissions from the Vermont Yankee plant. For the purposes of the Vermont Yankee REMP, the first two categories are classified as "background" radiation, and are the subject of discussion in this section of the report. The third category is the one that the REMP is designed to detect and evaluate.

2.1 Naturally Occurring Background Radioactivity

Natural radiation and radioactivity in the environment, which provide the major source of human radiation exposure, may be subdivided into three separate categories: "primordial radioactivity," "cosmogenic radioactivity" and "cosmic radiation." "Primordial radioactivity" is made up of those radionuclides that were created with the universe and that have a sufficiently long half-life to be still present on the earth. Included in this category are the radionuclides that these elements have decayed into. A few of the more important radionuclides in this category are Uranium-238 (U-238), Thorium-232 (Th-232), Rubidium-87 (Rb-87), Potassium-40 (K-40), Radium-226 (Ra-226), and Radon-222 (Rn-222). Uranium-238 and Thorium-232 are readily detected in soil and rock, whether through direct field measurements or through laboratory analysis of samples. Radium-226 in the earth can find its way from the soil into ground water, and is often detectable there. Radon-222 is one of the components of natural background in air, and its daughter products are detectable on air sampling filters. Potassium-40 comprises about 0.01 percent of all natural potassium in the earth, and is consequently detectable in most biological substances, including the human body. There are many more primordial radionuclides found in the environment in addition to the major ones discussed above (Reference 2).

The second sub-category of naturally-occurring radiation and radioactivity is "cosmogenic radioactivity." This is produced through the nuclear interaction of high energy cosmic radiation with elements in the earth's atmosphere, and to a much lesser degree, in the earth's crust. These radioactive elements are then incorporated into the entire geosphere and atmosphere, including the earth's soil, surface rock, biosphere, sediments, ocean floors, polar ice and atmosphere. The major radionuclides in this category are Carbon-14 (C-14), Hydrogen-3 (H-3 or Tritium), Sodium-22 (Na-22), and Beryllium-7 (Be-7). Beryllium-7 is the one most readily detected, and is found on air sampling filters and occasionally in biological media (Reference 2).

The third sub-category of naturally-occurring radiation and radioactivity is "cosmic radiation." This consists of high energy atomic and sub-atomic particles of extra-terrestrial origin and the secondary particles and radiation that are produced through their interaction in the earth's atmosphere. The majority of this radiation comes from outside of our solar system, and to a lesser degree from the sun. We are protected from most of this radiation by the earth's atmosphere, which absorbs the radiation. Consequently, one can see that with increasing elevation one would be exposed to more cosmic radiation as a direct result of a thinner layer of air for protection. This "direct radiation" is detected in the field with gamma spectroscopy equipment, high pressure ion chambers and thermoluminescent dosimeters (TLDs).

2.2 Man-Made Background Radioactivity

The second source of "background" radioactivity in the Vermont Yankee environment is from "man-made" sources not related to the power plant. The most recent contributor to this category was the fallout from the Chernobyl accident in April of 1986, which was detected in the Vermont Yankee environment and other parts of the world. A much greater contributor to this category, however, has been fallout from atmospheric nuclear weapons tests. Tests were conducted from 1945 through 1980 by the United States, the Soviet Union, the United Kingdom, China and France, with the large majority of testing occurring during the periods 1954-1958 and 1961-1962. (A test ban treaty was signed in 1963 by the United States, Soviet Union and United Kingdom, but not by France and China.) Atmospheric testing was conducted by the People's Republic of China as recently as October 1980. Much of the fallout detected today is due to this explosion and the last large scale one, done in November of 1976 (Reference 3).

The radioactivity produced by these detonations was deposited worldwide. The amount of fallout deposited in any given area is dependent on many factors, such as the explosive yield of the device, the latitude and altitude of the detonation, the season in which it occurred, and the timing of subsequent rainfall which washes fallout from the troposphere (Reference 4). Most of this fallout has decayed into stable elements, but the residual radioactivity is still readily detectable in environmental samples worldwide. The two predominant radionuclides are Cesium137 (Cs-137) and Strontium-90 (Sr-90). They are found in soil and in vegetation, and since cows and goats graze large areas of vegetation, these radionuclides are also readily detected in milk.

Other potential "man-made" sources of environmental "background" radioactivity include other nuclear power plants, coal-fired power plants, national defense installations, hospitals, research laboratories and industry. These collectively are insignificant on a global scale when compared to the sources discussed above (natural and fallout).

3. GENERAL PLANT AND SITE INFORMATION

The Vermont Yankee Nuclear Power Station is located in the town of Vernon, Vermont in Windham County. The 130-acre site is on the west shore of the Connecticut River, immediately upstream of the Vernon Hydroelectric Station. The land is bounded on the north, south and west by privately-owned land, and on the east by the Connecticut River. The surrounding area is generally rural and lightly populated, and the topography is flat or gently rolling.

Construction of the single 540 megawatt BWR (Boiling Water Reactor) plant began in 1967. The pre-operational Radiological Environmental Monitoring Program, designed to measure environmental radiation and radioactivity levels in the area prior to station operation, began in 1970. Commercial operation began on November 30, 1972.

4. PROGRAM DESIGN

The Radiological Environmental Monitoring Program (REMP) for the Vermont Yankee Nuclear Power Station (VYNPS) was designed with specific objectives in mind. These are:

- To provide an early indication of the appearance or accumulation of any radioactive material in the environment caused by the operation of the station.
- To provide assurance to regulatory agencies and the public that the station's environmental impact is known and within anticipated limits.
- To verify the adequacy and proper functioning of station effluent controls and monitoring systems.
- To provide standby monitoring capability for rapid assessment of risk to the general public in the event of unanticipated or accidental releases of radioactive material.

The program was initiated in 1970, approximately two years before the plant began commercial operation. It has been in operation continuously since that time, with improvements made periodically over those years.

The current program is designed to meet the intent of NRC Regulatory Guide 4.1, *Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants;* NRC Regulatory Guide 4.8, *Environmental Technical Specifications for Nuclear Power Plants;* the NRC Radiological Assessment Branch Technical Position of November 1979, *An Acceptable Radiological Environmental Monitoring Program;* and NRC NUREG-0473, *Radiological Effluent Technical Specifications for BWRs.* The environmental TLD program has been designed and tested around NRC Regulatory Guide 4.13, *Performance, Testing and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications.* The quality assurance program is designed around the guidance given in NRC Regulatory Guide *4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment.*

The sampling requirements of the REMP are given in the Off-Site Dose Calculation Manual Table 3.5.1. and are summarized in Table 4.1 of this report. The identification of the required sampling locations is given in the Off-Site Dose Calculation Manual (ODCM), Chapter 7. These sampling and monitoring locations are shown graphically on the maps in Figures 4.1 through 4.6 of this report.

The Vermont Yankee Chemistry Department conducts the radiological environmental monitoring program and collects all airborne, terrestrial and ground water samples. VYNPS maintains a contract with Normandeau Associates to collect all fish, river water and river sediment samples. In 2001, analytical measurements of environmental samples were performed at the Duke Engineering & Services Environmental Laboratory (DESEL) and Teledyne Brown Engineering Laboratory (TBE). TLD badges are posted and retrieved by the Vermont Yankee Chemistry Department, and are analyzed by the DESEL.

4.1 Monitoring Zones

The REMP is designed to allow comparison of levels of radioactivity in samples from the area possibly influenced by the plant to levels found in areas not influenced by the plant. Monitoring locations within the first zone are called "indicators." Those within the second zone are called "controls." The distinction between the two zones, depending on the type of sample or sample pathway, is based on one or more of several factors, such as site meteorological history, meteorological dispersion calculations, relative direction from the plant, river flow, and distance. Analysis of survey data from the two zones aids in determining if there is a significant difference between the two areas. It can also help in differentiating between radioactivity and radiation due to plant releases and that due to other fluctuations in the environment, such as atmospheric nuclear weapons test fallout or seasonal variations in the natural background.

4.2 Pathways Monitored

Four pathway categories are monitored by the REMP. They are the airborne, waterborne, ingestion and direct radiation pathways. Each of these four categories is monitored by the collection of one or more sample media, which are listed below, and are described in more detail in this section:

Airborne Pathway
- Air Particulate Sampling
- Charcoal Cartridge (Radioiodine) Sampling

Waterborne Pathways
- River Water Sampling
- Ground Water Sampling
- Sediment Sampling

Ingestion Pathways
- Milk Sampling
- Silage Sampling
- Mixed Grass Sampling
- Fish Sampling

Direct Radiation Pathway
- TLD Monitoring

4.3 Descriptions of Monitoring Programs

4.3.1 Air Sampling

Continuous air samplers are installed at seven locations. (Five are required by the VYNPS ODCM.) The sampling pumps at these locations operate continuously at a flow rate of approximately one cubic foot per minute. Airborne particulates are collected by passing air through a 50 mm glass-fiber filter. A dry gas meter is incorporated into the sampling stream to measure the total volume of air sampled in a given interval. The entire system is housed in a weatherproof structure. The filters were collected biweekly through Week Number 40 and then increased to a weekly frequency with the collection of air samples in Week Number 41, and to allow for the decay of radon daughter products, the analysis for gross beta radioactivity is delayed for more than 24 hours. The biweekly filters and weekly filters were composited by location at the environmental laboratory for a quarterly gamma spectroscopy analysis.

If the gross-beta activity on an air particulate sample is greater than ten times the yearly mean of the control samples, ODCM Table 3.5.1, Note c, requires a gamma isotopic analysis on the sample. Whenever the main plant stack effluent release rate of I-131 is equal to or greater than 0.1 μCi/sec, weekly air particulate collection is required by ODCM Table 3.5.1, Note h.

4.3.2 Charcoal Cartridge (Radioiodine) Sampling

Continuous air samplers are installed at seven locations. (Five are required by the ODCM Table 3.5.1.) The sampling pumps at these locations operate continuously at a flow rate of approximately one cubic foot per minute. A 60 cc TEDA-impregnated charcoal cartridge is located downstream of the air particulate filter described in Section 4.3.1 above. A dry gas meter is incorporated into the sampling stream to measure the total volume of air sampled in a given interval. The entire system is housed in a weatherproof structure. These cartridges are collected and analyzed biweekly for I-131.

Whenever the main plant stack effluent release rate of 1-131 is equal to or greater than 0.1 μCi/sec, weekly charcoal cartridge collection is required, pursuant to ODCM Table 3.5.1, Note h.

4.3.3 River Water Sampling

An automatic compositing sampler is maintained at the downstream sampling location by the Vermont Yankee Chemistry Department staff. Normandeau Associates personnel maintain the pump that delivers river water to the sampler. The sampler is controlled by a timer that collects a frequent aliquot of river water. An additional grab sample is collected monthly at the upstream control location. Each sample is analyzed for gamma-emitting radionuclides. Although not required by the VYNPS ODCM, a gross-beta

analysis is performed on each sample. The monthly composite and grab samples are composited by location by the contracted environmental laboratory for a quarterly H-3 analysis.

4.3.4 Ground Water Sampling

Grab samples are collected quarterly from four indicator locations and one control location. Only one indicator and one control are required by the VYNPS ODCM. Each sample is analyzed for gamma-emitting radionuclides and H-3. Although not required by the VYNPS ODCM, a gross-beta analysis is also performed on each sample.

4.3.5 Sediment Sampling

River sediment grab samples are collected semiannually from the downriver location and at the North Storm Drain Outfall by Normandeau Associates. Each sample is analyzed at the contracted environmental laboratory for gamma-emitting radionuclides.

4.3.6 Milk Sampling

When milk animals are identified as being on pasture feed (May through October), milk samples are collected twice per month from that location. Throughout the rest of the year, and for the full year where animals are not on pasture, milk samples are collected on a monthly schedule. Three locations are chosen as a result of the annual Land Use Census, based on meteorological dispersion calculations. The fourth location is a control, which is located sufficiently far away from the plant to be outside any potential influence from it. Other samples may be collected from locations of interest.

Immediately after collection, each milk sample is refrigerated and then shipped to the contracted environmental laboratory. Each sample is analyzed for gamma-emitting radionuclides. A separate low-level I-131 analysis is performed to meet the Lower Limit of Detection requirements in the ODCM. Although not required by the ODCM, Sr-89 and Sr-90 analyses are also performed on quarterly composited samples.

4.3.7 Silage Sampling

Silage samples are collected at the milk sampling location at the time of harvest, if available. The silage from each location is shipped to the contracted environmental laboratory where it is analyzed for gamma-emitting radionuclides. Although not required by the ODCM, the silage samples are analyzed for low-level I-131.

4.3.8 Mixed Grass Sampling

At each air sampling station, a mixed grass sample is collected quarterly, when available. Enough grass is clipped to provide the minimal sample weight needed to achieve the required Lower Limit of Detection (LLD). The mixed grass samples are analyzed for gamma-emitting radionuclides. Although not required by the ODCM, the grass samples are analyzed for low-level I-131.

4.3.9 Fish Sampling

Fish samples are collected semiannually at two locations (upstream of the plant and in Vernon Pond) by Normandeau Associates. The samples are frozen and delivered to the environmental laboratory where the edible portions are analyzed for gamma-emitting radionuclides.

4.3.10 TLD Monitoring

Direct gamma radiation exposure is continuously monitored with the use of thermoluminescent dosimeters (TLDs). Specifically, Panasonic UD-801AS1 and UD-814AS1 calcium sulfate dosimeters are used, with a total of five elements in place at each monitoring location. Each pair of dosimeters is sealed in a plastic bag, which is in turn housed in a plastic-screened container. This container is attached to an object such as a fence or utility pole.

A total of 40 stations are required by the ODCM. Of these, 24 must be read out quarterly, while those from the remaining 16 incident response (outer ring) stations need only be de-dosed (annealed) quarterly, unless an ODCM gaseous release Control was exceeded during the period. Although not required by the ODCM, the TLDs from the 16 outer ring stations are read out quarterly along with the other stations' TLDs. In addition to the TLDs required by the ODCM, thirteen more are typically posted at or near the site boundary. The plant staff posts and retrieves all TLDs, while the contracted environmental laboratory processes them.

TABLE 4.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

(as required by ODCM Table 3.5.1)*

Exposure Pathway and/or Sample Media	Collection			Analysis	
	Number of Sample Locations	Routine Sampling Mode	Collection Frequency	Analysis Type	Analysis Frequency
1. Direct Radiation (TLDs)	40	Continuous	Quarterly	Gamma dose; Outer Ring - dc-dose only, unless gaseous release Control was exceeded	Each TLD
2. Airborne (Particulates and Radioiodine)	5	Continuous	Weekly (note 1)	Particulate Sample: Gross Beta	Each Sample
				Gamma Isotopic	Quarterly Composite (by location)
				Radioiodine Canister: I-131	Each Sample
3. Waterborne					
a. Surface water	2	Downstream. Automatic composite	Monthly	Gamma Isotopic Tritium (H-3)	Each Sample Quarterly Composite
b. Ground water	2	Upstream: grab Grab	Quarterly	Gamma Isotopic Tritium (H-3)	Each Sample Each Sample
c. Shoreline Sediment	2	Downstream: grab N. Storm Drain Outfall: grab	Semiannually	Gamma Isotopic	Each Sample

- See ODCM Table 3.5.1 for complete footnotes.

Note 1 – BiWeekly frequency increased to Weekly on Week Number 41 (10/02/02)

TABLE 4.1, cont.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(as required by ODCM Table 3.5.1)*

Exposure Pathway and/or Sample Media	Collection			Analysis	
	Nominal Number of Sample Locations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Analysis Frequency
4. Ingestion					
a. Milk	4	Grab	Monthly (Semimonthly when on pasture)	Gamma Isotopic I-131	Each sample Each sample
b. Fish	2	Grab	Semiannually	Gamma Isotopic on edible portions	Each sample
c. Vegetation					
Grass sample	1 at each air sampling station	Grab	Quarterly when available	Gamma Isotopic	Each sample
Silage sample	1 at each milk sampling station	Grab	At harvest	Gamma Isotopic	Each sample

* See ODCM Table 3.5.1 for complete footnotes.

TABLE 4.2

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS (NON-TLD) IN 2001
VERMONT YANKEE NUCLEAR POWER STATION

Exposure Pathway	Station Code	Station Description	Zone[(a)]	Distance From Plant Stack (km)	Direction From Plant
I. Airborne					
	AP/CF-11	River Sta. No. 3.3	I	1.9	SSE
	AP/CF-12	N. Hinsdale, NH	I	3.6	NNW
	AP/CF-13	Hinsdale Substation	I	3.1	E
	AP/CF-14	Northfield, MA	I	11.6	SSE
	AP/CF-15	Tyler Hill Road	I	3.1	WNW
	AP/CF-21	Spofford Lake	C	16.4	NNE
	AP/CF-40	Gov. Hunt House	I	--	On-site
2. Waterborne					
a. Surface	WR-11	River Sta. No. 3.3	I	1.9	SSE
	WR-21	Rt.9 Bridge	C	11.8	NNW
b. Ground	WG-11	Plant Well	I	0.2	On-site
	WG-12	Vernon Nursing Well	I	2.1	SSE
	WG-13	COB Well	I	0.3	On-site
	WG-14	Plant Support Bldg (PSB) Well	I	0.3	On-site
	WT-14	Test Well 201	I	--	On-site
	WT-16	Test Well 202	I	--	On-site
	WT-17	Test Well 203	I	--	On-site
	WT-18	Test Well 204	I	--	On-site
	WG-22	Skibniowsky Well	C	13.7	N
c. Sediment	SE-11	Shoreline Downriver	I	0.6	SSE
	SE-12	North Storm Drain Outfall	I	0.1	E

TABLE 4.2, cont.

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS (NON-TLD) IN 2001
VERMONT YANKEE NUCLEAR POWER STATION

Exposure Pathway	Station Code	Station Description	Zone[a]	Direction From Plant Stack(km)	Distance From Plant Stack
3. Ingestion					
a. Milk	TM-11	Miller Farm	I	0.8	W
	TM-14	Brown Farm	I	2.2	S
	TM-18	Blodgett Farm	I	3.6	SE
	TM-22	Franklin Farm	I	9.7	WSW
	TM-24	County Farm	C	21.6	N
	TM-25	Downey-Spencer	I	6.9	W
	TM-26	Cheney Hill Farm	I	7.5	WNW
b. Fish	FH-11	Vernon Pond	I	0.6[b]	SSE
	FH-21	Rt.9 Bridge	C	11.8	NNW
c. Mixed Grass	TG-11	River Sta. No. 3.3	I	1.9	SSE
	TG-12	N. Hinsdale, NH	I	3.6	NNW
	TG-13	Hinsdale Substation	I	3.1	E
	TG-14	Northfield, MA	I	11.6	SSE
	TG-15	Tyler Hill Rd.	I	3.1	WNW
	TG-21	Spofford Lake	C	16.4	NNE
	TG-40	Gov. Hunt House	I	--	On-site
d. Silage	TC-11	Miller Farm	I	0.8	W
	TC-14	Brown Farm	I	2.2	S
	TC-18	Blodgett Farm	I	3.6	SE
	TC-22	Franklin Farm	I	9.7	WSW
	TC-24	County Farm	C	21.6	N
	TC-25	Downey-Spencer	I	6.9	W
	TC-26	Cheney Hill Farm	I	7.5	WNW

(a) I = Indicator Stations; C = Control Stations
(b) Fish samples are collected anywhere in Vernon Pond, which is adjacent to the plant (see Figure 4.1).

TABLE 4.3

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS (TLD) IN 2001
VERMONT YANKEE NUCLEAR POWER STATION

Station Code	Station Description	Zone[a]	Distance From Plant (km) [d]	Direction From Plant[d]
DR-1	River Sta. No. 3.3	I	1.6	SSE
DR-2	N. Hinsdale, NH	I	3.9	NNW
DR-3	Hinsdale Substation	I	3.0	E
DR-4	Northfield, MA	C	11.3	SSE
DR-5	Spofford Lake	C	16.5	NNE
DR-6	Vernon School	I	0.52	WSW
DR-7	Site Boundary[c]	SB	0.28	W
DR-8	Site Boundary	SB	0.25	SSW
DR-9	Inner Ring	I	1.7	N
DR-10	Outer Ring	O	4.5	N
DR-11	Inner Ring	I	1.6	NNE
DR-12	Outer Ring	O	3.6	NNE
DR-13	InnerRing	I	1.2	NE
DR-14	Outer Ring	O	3.9	NE
DR-15	Inner Ring	I	1.5	ENE
DR-16	Outer Ring	O	2.8	ENE
DR-17	Inner Ring	I	1.2	E
DR-18	Outer Ring	O	3.0	E
DR-19	Inner Ring	I	3.7	ESE
DR-20	Outer Ring	O	5.3	ESE
DR-21	Inner Ring	I	1.8	SE
DR-22	Outer Ring	O	3.3	SE
DR-23	Inner Ring	I	2.0	SSE
DR-24	Outer Ring	O	3.9	SSE
DR-25	Inner Ring	I	1.9	S
DR-26	Outer Ring	O	3.8	S
DR-27	Inner Ring	I	1.1	SSW
DR-28	Outer Ring	O	2.2	SSW
DR-29	Inner Ring	I	0.9	SW
DR-30	Outer Ring	O	2.4	SW

TABLE 4.3, cont.

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS (TLD) IN 2001 VERMONT YANKEE NUCLEAR POWER STATION

Station Code	Station Description	Zone[a]	Distance From Plant (km)[d]	Direction From Plant[d]
DR-31	Inner Ring	I	0.71	WSW
DR-32	Outer Ring	O	5.1	WSW
DR-33	Inner Ring	I	0.66	WNW
DR-34	Outer Ring	O	4.6	W
DR-35	Inner Ring	I	1.3	WNW
DR-36	Outer Ring	O	4.4	WNW
DR-37	Inner Ring	I	2.8	NW
DR-38	Outer Ring	O	7.3	NW
DR-39	Inner Ring	I	3.1	NNW
DR-40	Outer Ring	O	5.0	NNW
DR-41[b]	Site Boundary	SB	0.38	SSW
DR-42[b]	Site Boundary	SB	0.59	S
DR-43[b]	Site Boundary	SB	0.44	SSE
DR-44[b]	Site Boundary	SB	0.19	SE
DR-45[b]	Site Boundary	SB	0.12	NE
DR-46[b]	Site Boundary	SB	0.28	NNW
DR-47[b]	Site Boundary	SB	0.50	NNW
DR-48[b]	Site Boundary	SB	0.82	NW
DR-49[b]	Site Boundary	SB	0.55	WNW
DR-50[b]	Gov. Hunt House	I	0.35	SSW
DR-51[b]	Site Boundary	SB	0.26	W
DR-52[b]	Site Boundary	SB	0.24	SW
DR-53[b]	Site Boundary	SB	0.21	WSW

(a) I = Inner Ring TLD; O = Outer Ring Incident Response TLD; C = Control TLD; SB = Site Boundary TLD.

(b) This location is not considered a requirement of ODCM Table 3.5.1.

(c) DR-7 satisfies ODCM Table 3.5.1 for an inner ring direct radiation monitoring location. However, it is averaged as a Site Boundary TLD due to its close proximity to the plant.

(d) Distance and direction is relative to the center of the Turbine Building for direct radiation monitors.

TABLE 4.4
ENVIRONMENTAL LOWER LIMIT OF DETECTION (LLD) SENSITIVITY REQUIREMENTS

Analysis	Water (pCi/l)	Airborne Particulates or Gases (pCi/m^3)	Fish (pCi/Kg)	Milk (pCi/l)	Vegetation (pCi/Kg)	Sediment (pCi/Kg - dry)
Gross-Beta	4	0.01				
H-3	3000					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131		0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

See ODCM Table 4.5.1 for explanatory footnotes

TABLE 4.5

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/l)	Airborne Particulates or Gases (pCi/m^3)	Fish (pCi/Kg)	Milk (pCi/l)	Food Product (pCi/Kg)	Sediment (pCi/Kg-dry)
H-3	20,000[(a)]					
Mn-54	1000		30,000			
Fe-59	400		10,000			
Co-58	1000		30,000			
Co-60	300		10,000			3000[(b)]
Zn-65	300		20,000			
Zr-Nb-95	400					
I-131		0.9		3	100	
Cs-134	30	10	1000	60	1000	
Cs-137	50	20	2000	70	2000	
Ba-La-140	200			300		

(a) Reporting Level for drinking water pathways. For non-drinking water, a value of 30,000 pCi/liter may be used.
(b) Reporting Level for grab samples taken at the North Storm Drain Outfall only.

See ODCM Table 3.5.2 for additional explanatory footnotes.

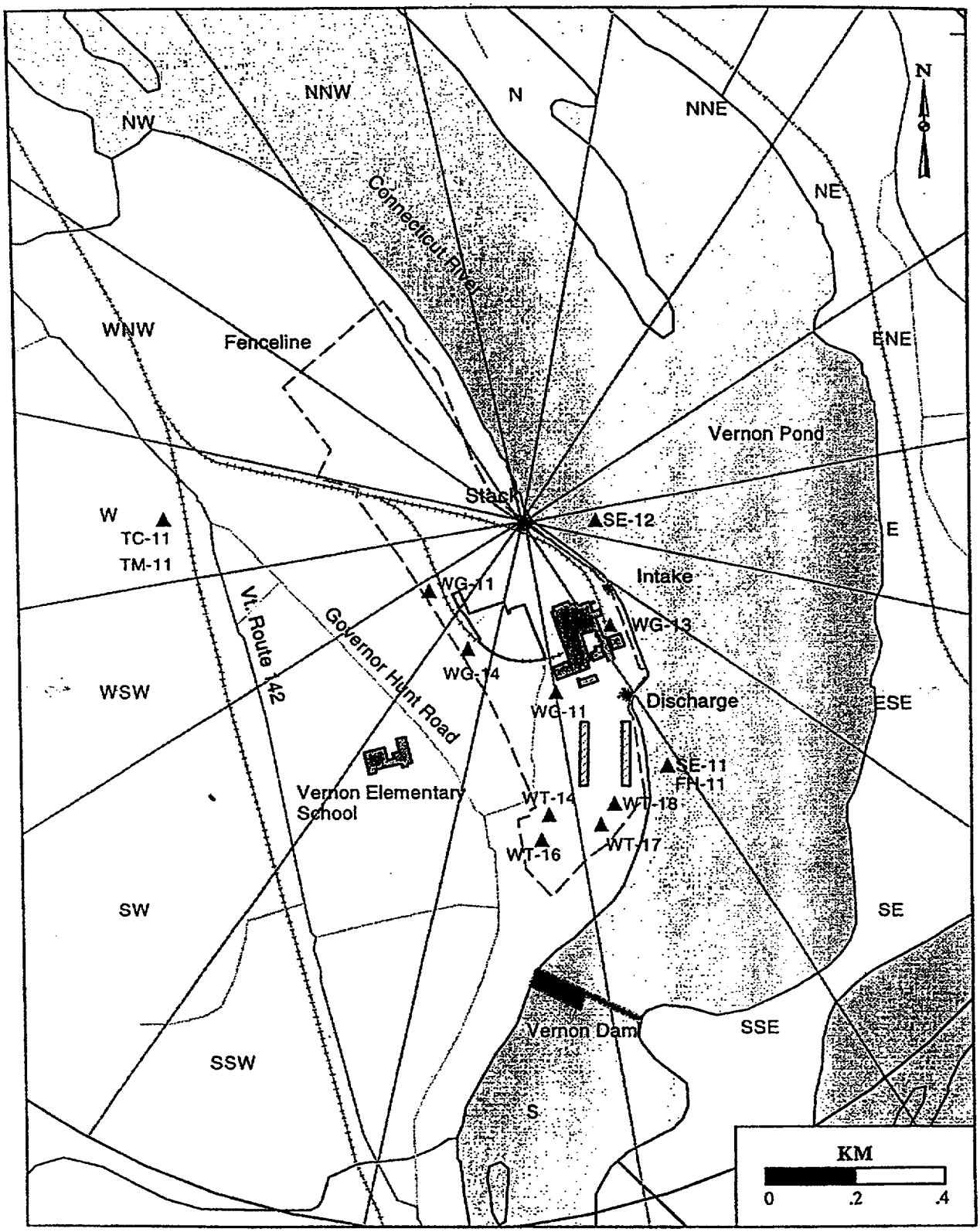


Figure 4-1 Environmental Sampling Locations in Close Proximity to the Plant

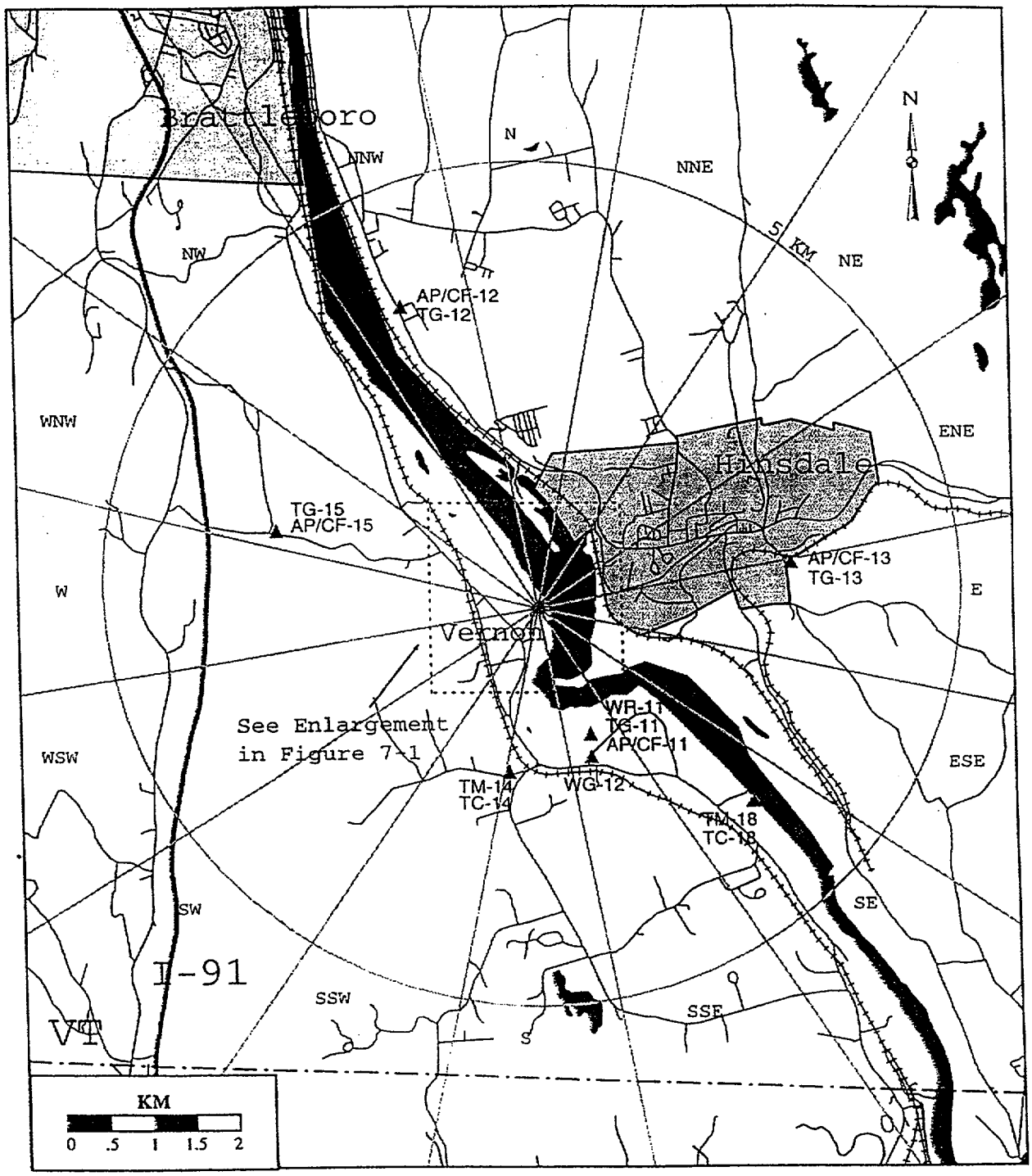


Figure 4-2 Environmental Sampling Locations Within 5 Km of the Plant

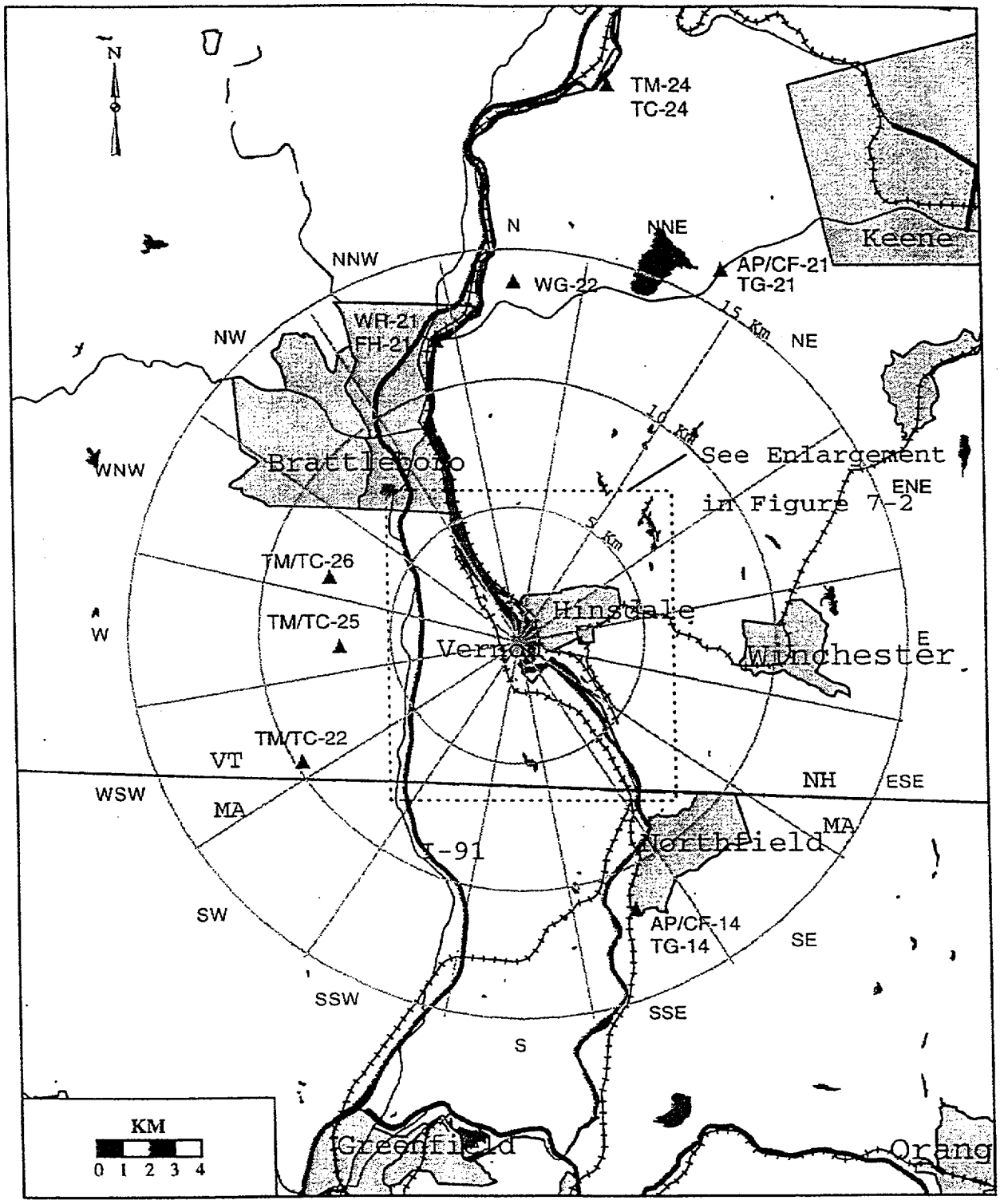


Figure 4-3 Environmental Sampling Locations
Greater than 5 Km from the Plant

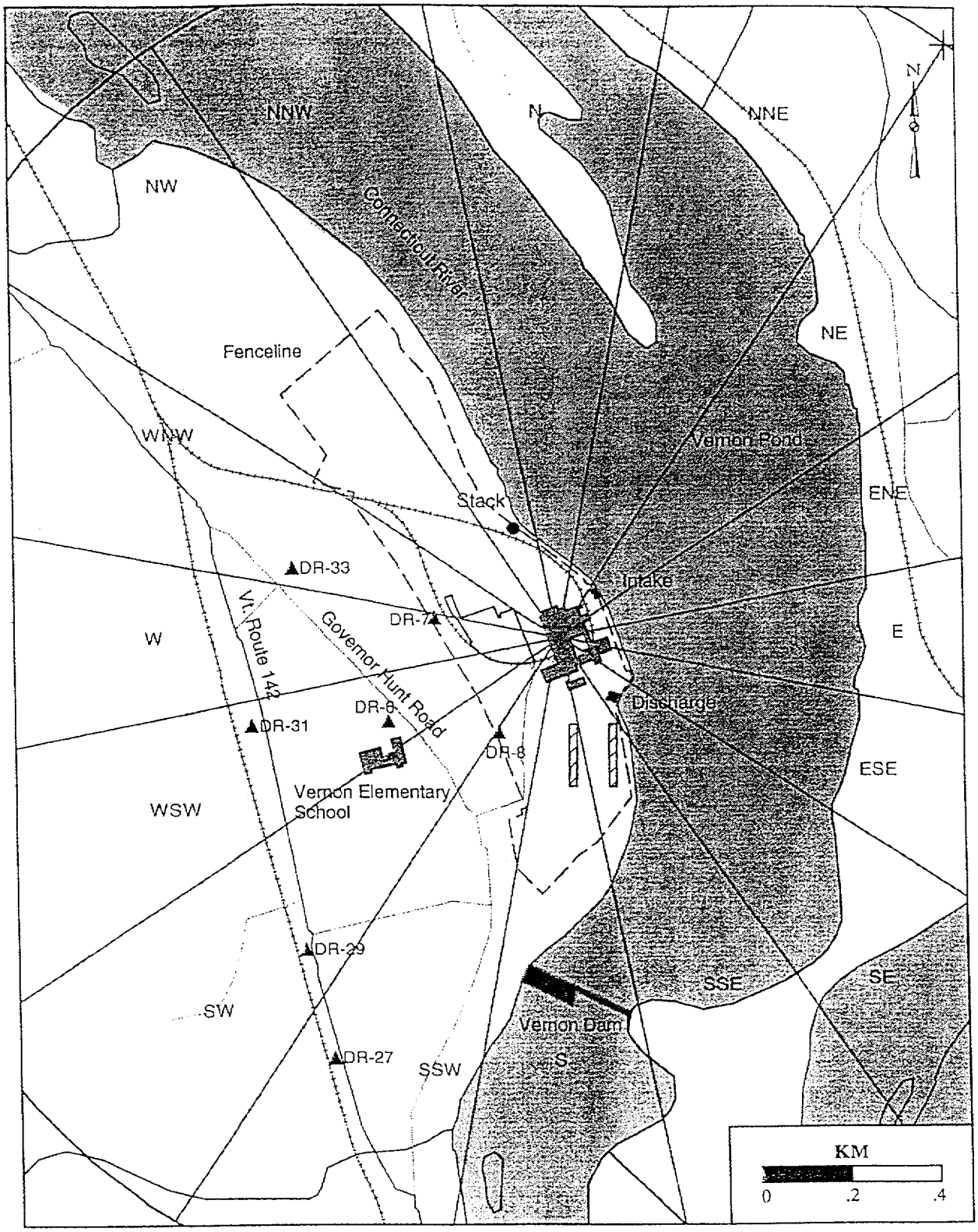


Figure 4-4 TLD Locations in Close Proximity to the Plant

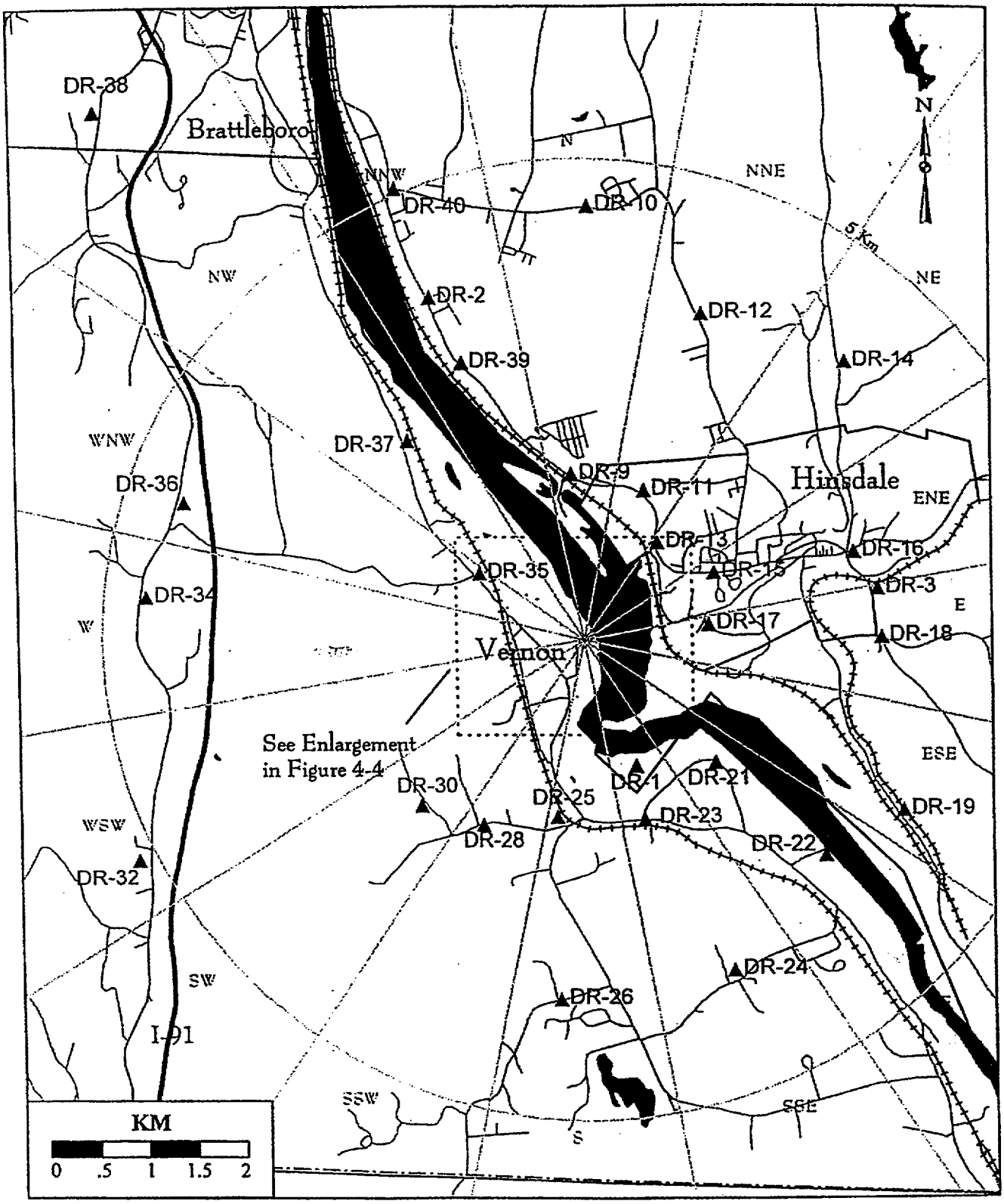


Figure 4-5 TLD Locations Within 5 Km of Plant

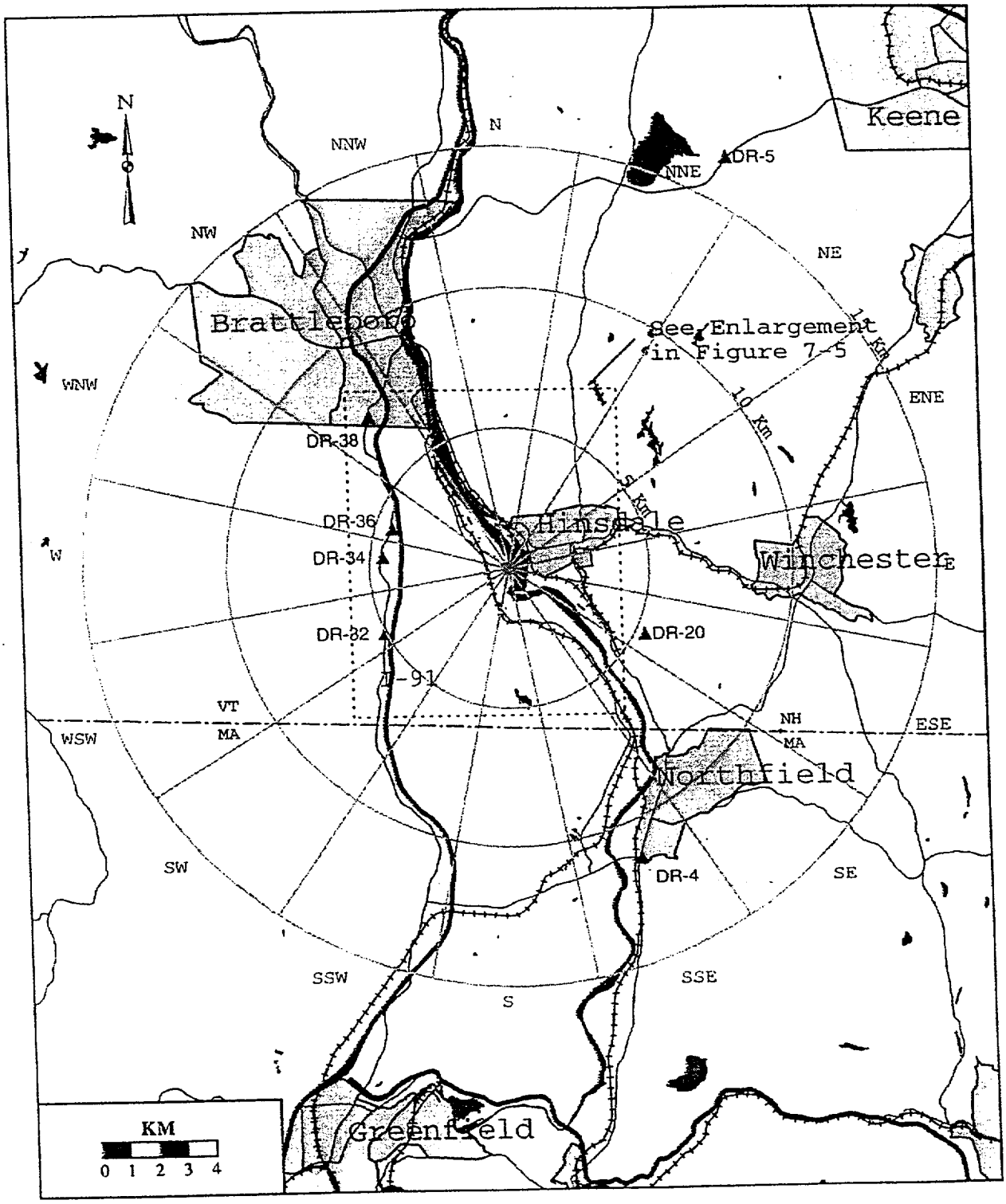


Figure 4-6 TLD Locations Greater than 5 Km from the Plant

5. RADIOLOGICAL DATA SUMMARY TABLES

This section summarizes the analytical results of the environmental samples that were collected during 2001. These results, shown in Table 5.1, are presented in a format similar to that prescribed in the NRC's Radiological Assessment Branch Technical Position on Environmental Monitoring (Reference 1). The results are ordered by sample media type and then by radionuclide. The units for each media type are also given.

In 2001, Vermont Yankee contracted with two laboratories for the analyses of the environmental samples. The first laboratory was used primarily during the 1st quarter. The second laboratory was used during the 2nd, 3rd and 4th quarters of 2001.

The left-most column of Table 5.1 contains the radionuclide of interest, the total number of analyses for that radionuclide in 2001, and the number of measurements which exceeded the Reporting Levels found in Table 3.5.2 of the VYNPS Off-site Dose Calculation Manual. The latter are classified as "Non-routine" measurements. The second column lists the required Lower Limit of Detection (LLD) for those radionuclides that have detection capability requirements as specified in the ODCM Table 4.5.1. The absence of a value in this column indicates that no LLD is specified in the ODCM for that radionuclide in that media. The target LLD for any analysis is typically 50 percent of the most restrictive required LLD. Occasionally the required LLD is not met. This may be due to malfunctions in sampling equipment, which results in low sample volume or delays in analysis at the laboratory. Such cases are addressed in Section 6.2.

For each radionuclide and media type, the remaining three columns summarize the data for the following categories of monitoring locations: (1) the Indicator stations, which are within the range of influence of the plant and which could be affected by its operation; (2) the station which had the highest mean concentration during 2001 for that radionuclide; and (3) the Control stations, which are beyond the influence of the plant. Direct radiation monitoring stations (using TLDs) are grouped into Inner Ring, Outer ring, Site Boundary and Control.

In each of these columns, for each radionuclide, the following statistical values are given:

- The mean value of all concentrations, including those results that are less than the *a posteriori* LLD for that analysis.
- The minimum and maximum concentration, including those results that are less than the *a posteriori* LLD. In previous years, data less than the *a posteriori* LLD were converted to zero for purposes of reporting the means and ranges.
- The "Number Detected" is the number of positive measurements. A measurement is considered positive when the concentration is greater than three times the standard deviation in the concentration and greater than or equal to the *a posteriori* LLD (Minimum Detectable Concentration or MDC).

- The "Total Analyzed" for each column is also given.

Each single radioactivity measurement datum in this report is based on a single measurement and is reported as a concentration plus or minus a one standard deviation uncertainty. The standard deviation on each measurement represents only the random uncertainty associated with the radioactive decay process (counting statistics), and not the propagation of all possible uncertainties in the analytical procedure.

Any concentration below the *a posteriori* LLD for its analysis is averaged with those values above the *a posteriori* LLD to determine the average of the results. Likewise, the values are reported in ranges even though they are below the *a posteriori* LLD. To be consistent with normal data review practices used by Vermont Yankee, a "positive measurement" is considered to be one whose concentration is greater than three times its associated standard deviation and greater than or equal to the *a posteriori* LLD.

The radionuclides reported in this section represent those that: 1) had an LLD requirement in Table 4.5.1 of the ODCM, or a Reporting Level listed in Table 3.5.2 of the ODCM, or 2) had a positive measurement of radioactivity, whether it was naturally-occurring or man-made; or 3) were of special interest for any other reason. The radionuclides that were routinely analyzed and reported by the environmental laboratory (in a gamma spectroscopy analysis) were: Th-232, Ag-110m, Ba/La-140, Be-7, Ce-141, Ce-144, Co-57, Co-58, Co-60, Cr-51, Cs-134, Cs-137, Fe-59, I-131, I-133, K-40, Mn-54, Mo-99, Np-239, Ru-103, Ru-106, Sb-124, Se-75, TeI-132, Zn-65 and Zr-95.

Data from direct radiation measurements made by TLDs are provided in Table 5.2 in a format essentially the same as above. The complete listing of quarterly TLD data is provided in Table 5.3.

Radiological Environmental Program Summary

2001 Radiological Environmental Operating Report
Vermont Yankee

Table 5.1:

Sample Medium:	Air Particulate (AP)
Sample Medium:	Charcoal Cartridge (CF)
Sample Medium:	River Water (WR)
Sample Medium:	Ground Water (WG)
Sample Medium:	Sediment (SE)
Sample Medium:	Test Well (WT)
Sample Medium:	Milk (TM)
Sample Medium:	Silage (TC)
Sample Medium:	Mixed Grass (TG)
Sample Medium:	Fish (FH)

AP

Table 5.1
Radiological Environmental Program Summary
Vermont Yankee Nuclear Power Plant, Vernon, VT
(January - December 2001)

Medium: Air Particulate (AP) UNITS: pCi/cubic meter

AP

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Be-7	None Required	*Station*		
Number of Analyses	28	40		
*Non-Routine***	0			
Range — *Mean*		0.1540	0.1673	0.1785
Range — *Maximum*		0.2750	0.2750	0.2750
Range — *Minimum*		0.0457	0.0884	0.0820
*Number Detected****		23	4	4
Total Analyzed		24	4	4
Cs-134	0.05	*Station*		
Number of Analyses	27	40		
*Non-Routine***	0			
Range — *Mean*		-0.0001	0.0001	-0.0003
Range — *Maximum*		0.0005	0.0005	-0.0001
Range — *Minimum*		-0.0010	-0.0002	-0.0005
*Number Detected****		0	0	0
Total Analyzed		23	4	4
Cs-137	0.06	*Station*		
Number of Analyses	28	13		
*Non-Routine***	0			
Range — *Mean*		0.0000	0.0002	0.0001
Range — *Maximum*		0.0004	0.0003	0.0003
Range — *Minimum*		-0.0010	0.0001	-0.0001
*Number Detected****		0	0	0
Total Analyzed		24	4	4
GR-B	0.01	*Station*		
Number of Analyses	216	11		
*Non-Routine***	0			
Range — *Mean*		0.0215	0.0427	0.0171
Range — *Maximum*		0.8093	0.8093	0.0290
Range — *Minimum*		0.0091	0.0096	0.0100
*Number Detected****		185	31	31
Total Analyzed		185	31	31

AP

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
K-40	None Required		Station	
Number of Analyses	28		15	
Non-Routine**	0			
Range Mean		0.0020	0.0113	-0.0027
Range Maximum		0.0355	0.0355	0.0031
Range Minimum		-0.0068	0.0008	-0.0061
Number Detected***		2	2	0
Total Analyzed		24	4	4
Nb-95	None Required		Station	
Number of Analyses	27		11	
Non-Routine**	0			
Range Mean		0.0003	0.0005	0.0002
Range Maximum		0.0032	0.0024	0.0007
Range Minimum		-0.0024	-0.0021	-0.0001
Number Detected***		2	1	0
Total Analyzed		23	4	4
Ra-226	None Required		Station	
Number of Analyses	28		40	
Non-Routine**	0			
Range Mean		-0.0016	0.0028	0.0017
Range Maximum		0.0118	0.0118	0.0052
Range Minimum		-0.0121	-0.0010	-0.0034
Number Detected***		0	0	1
Total Analyzed		24	4	4
Th-228	None Required		Station	
Number of Analyses	21		13	
Non-Routine**	0			
Range Mean		0.0004	0.0010	0.0005
Range Maximum		0.0031	0.0030	0.0009
Range Minimum		-0.0004	-0.0001	0.0002
Number Detected***		0	1	0
Total Analyzed		18	3	3
Th-232	None Required		Station	
Number of Analyses	20		14	
Non-Routine**	0			
Range Mean		0.0002	0.0006	0.0003
Range Maximum		0.0012	0.0012	0.0015
Range Minimum		-0.0016	0.0000	-0.0006
Number Detected***		0	1	0
Total Analyzed		17	3	3

AP

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*

**The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.*

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations). Note, this does not include measurements that were less than the Minimum Detectable Concentration.*

CF

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Charcoal Cartridge (CF) UNITS: pCi/cubic meter

CF				
*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
I-131	0.07		*Station*	
Number of Analyses	216		11	
*Non-Routine***	0			
Range — *Mean*		0.0005	0.0027	-0.0003
Range — *Maximum*		0.0314	0.0182	0.0112
Range — *Minimum*		-0.0370	-0.0221	-0.0203
*Number Detected****		0	0	0
Total Analyzed		185	31	31

**The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.*

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations).*

WR

Table 5.1

Radiological Environmental Program Summary
Vermont Yankee Nuclear Power Plant, Vernon, VT
(January - December 2001)

Medium: River Water (WR) UNITS: pCi/L

WR *Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Ba-La-140	15		*Station*	
Number of Analyses	24		11	
*Non-Routine***	0			
Range — *Mean*		1.3288	1.3288	1.7647
Range — *Maximum*		5.9700	5.9700	12.5000
Range — *Minimum*		-2.7700	-2.7700	-3.0400
*Number Detected****		0	0	0
Total Analyzed		12	12	12
Be-7	None Required		*Station*	
Number of Analyses	24		11	
*Non-Routine***	0			
Range — *Mean*		3.9782	3.9782	-0.3203
Range — *Maximum*		23.3000	23.3000	31.5000
Range — *Minimum*		-10.4000	-10.4000	-23.8000
*Number Detected****		1	1	0
Total Analyzed		12	12	12
Co-58	15		*Station*	
Number of Analyses	24		11	
*Non-Routine***	0			
Range — *Mean*		-0.3150	-0.3150	-1.0716
Range — *Maximum*		2.9600	2.9600	1.2400
Range — *Minimum*		-3.0500	-3.0500	-4.7200
*Number Detected****		0	0	0
Total Analyzed		12	12	12
Co-60	15		*Station*	
Number of Analyses	24		21	
*Non-Routine***	0			
Range — *Mean*		0.0713	0.4568	0.4568
Range — *Maximum*		1.5900	3.6000	3.6000
Range — *Minimum*		-2.2020	-1.9700	-1.9700
*Number Detected****		0	0	0
Total Analyzed		12	12	12

WR

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Cs-134	15	Station		
Number of Analyses	24	11		
Non-Routine**	0			
Range — Mean		1.0875	1.0875	-0.4015
Range — Maximum		18.7000	18.7000	1.6540
Range — Minimum		-2.6900	-2.6900	-2.9500
Number Detected***		1	1	0
Total Analyzed		12	12	12
Cs-137	18	Station		
Number of Analyses	24	11		
Non-Routine**	0			
Range — Mean		0.6974	0.6974	0.7195
Range — Maximum		3.7500	3.7500	4.3200
Range — Minimum		-0.9128	-0.9128	-1.2790
Number Detected***		0	0	0
Total Analyzed		12	12	12
Fe-59	30	Station		
Number of Analyses	24	11		
Non-Routine**	0			
Range — Mean		1.0736	1.0736	1.6978
Range — Maximum		5.6500	5.6500	7.6000
Range — Minimum		-2.4500	-2.4500	-2.7100
Number Detected***		0	0	0
Total Analyzed		12	12	12
GR-B	4	Station		
Number of Analyses	24	11		
Non-Routine**	0			
Range — Mean		1.5856	1.5856	1.7095
Range — Maximum		2.7000	2.7000	3.9422
Range — Minimum		0.6075	0.6075	0.1755
Number Detected***		5	5	6
Total Analyzed		12	12	12
H-3	3000	Station		
Number of Analyses	8	11		
Non-Routine**	0			
Range — Mean		86.5238	86.5238	116.3163
Range — Maximum		227.0952	227.0952	356.2651
Range — Minimum		11.0000	11.0000	22.0000
Number Detected***		0	0	0
Total Analyzed		4	4	4

WR

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
I-131	None Required		Station	
Number of Analyses	24		11	
Non-Routine**	0			
Range — Mean		0.3335	0.3335	0.6086
Range — Maximum		8.3200	8.3200	7.4000
Range — Minimum		-5.4100	-5.4100	-4.2100
Number Detected***		0	0	0
Total Analyzed		12	12	12
Mn-54	15		Station	
Number of Analyses	24		21	
Non-Routine**	0			
Range — Mean		0.2151	0.5221	0.5221
Range — Maximum		2.6800	3.3500	3.3500
Range — Minimum		-0.8800	-1.2900	-1.2900
Number Detected***		0	0	0
Total Analyzed		12	12	12
Nb-95	None Required		Station	
Number of Analyses	24		11	
Non-Routine**	0			
Range — Mean		0.6608	0.6608	1.1651
Range — Maximum		2.5700	2.5700	6.1500
Range — Minimum		-1.9800	-1.9800	-1.8300
Number Detected***		0	0	1
Total Analyzed		12	12	12
Ra-226	None Required		Station	
Number of Analyses	24		11	
Non-Routine**	0			
Range — Mean		9.9392	9.9392	-10.3192
Range — Maximum		89.7000	89.7000	59.9000
Range — Minimum		-42.1000	-42.1000	-99.1000
Number Detected***		1	1	0
Total Analyzed		12	12	12
Th-228	None Required		Station	
Number of Analyses	24		11	
Non-Routine**	0			
Range — Mean		1.1215	1.1215	1.5437
Range — Maximum		8.9790	8.9790	14.1000
Range — Minimum		-4.6200	-4.6200	-17.3000
Number Detected***		0	0	1
Total Analyzed		12	12	12

WR

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Th-232	None Required		Station	
Number of Analyses	18		11	
Non-Routine**	0			
Range Mean		4.9006	4.9006	1.4461
Range Maximum		15.8000	15.8000	11.7000
Range Minimum		-6.3000	-6.3000	-3.3600
Number Detected***		2	2	1
Total Analyzed		9	9	9
Zn-65	30		Station	
Number of Analyses	24		11	
Non-Routine**	0			
Range Mean		0.0931	0.0931	-3.0627
Range Maximum		6.9770	6.9770	4.3410
Range Minimum		-3.8100	-3.8100	-13.2000
Number Detected***		0	0	0
Total Analyzed		12	12	12
Zr-95	15		Station	
Number of Analyses	24		21	
Non-Routine**	0			
Range Mean		-0.0595	0.5004	0.5004
Range Maximum		4.2400	3.1800	3.1800
Range Minimum		-5.5600	-3.4300	-3.4300
Number Detected***		0	0	0
Total Analyzed		12	12	12

The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fractionof sampling analyses yielding detectable measurements (i.e. >3 standard deviations).*

WG

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Ground Water (WG) UNITS: pCi/L

WG Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Ba-La-140	15		Station	
Number of Analyses	29		12	
Non-Routine**	0			
Range Mean		0.4159	2.3803	2.0620
Range Maximum		8.2300	8.2300	11.3000
Range Minimum		-6.3100	-0.6280	-1.9300
Number Detected***		0	0	0
Total Analyzed		23	6	6
Co-58	15		Station	
Number of Analyses	25		13	
Non-Routine**	0			
Range Mean		-0.8229	-0.3707	-1.3032
Range Maximum		3.6690	0.7795	0.2810
Range Minimum		-3.4900	-1.5300	-2.3890
Number Detected***		0	0	0
Total Analyzed		20	5	5
Co-60	15		Station	
Number of Analyses	25		12	
Non-Routine**	0			
Range Mean		-0.1622	0.6041	0.2804
Range Maximum		1.5500	1.5500	1.4700
Range Minimum		-1.7100	-1.0700	-1.2110
Number Detected***		0	0	0
Total Analyzed		20	5	5
Cs-134	15		Station	
Number of Analyses	25		11	
Non-Routine**	0			
Range Mean		-0.5865	0.1235	-1.2343
Range Maximum		2.5170	1.8600	-0.2367
Range Minimum		-11.6000	-0.7106	-1.9300
Number Detected***		0	0	0
Total Analyzed		20	5	5

WG

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Cs-137	18	Station		
Number of Analyses	25		14	
Non-Routine**	0			
Range Mean		0.2266	0.4488	-0.0022
Range Maximum		3.3400	3.3400	4.3000
Range Minimum		-3.9400	-3.9400	-2.2750
Number Detected***		0	0	0
Total Analyzed		20	5	5
GR-B	4	Station		
Number of Analyses	25		11	
Non-Routine**	0			
Range Mean		4.6030	8.0566	-2.9884
Range Maximum		14.9418	14.9418	3.3000
Range Minimum		-9.7000	3.2000	-26.0000
Number Detected***		12	5	2
Total Analyzed		20	5	5
H-3	3000	Station		
Number of Analyses	25		22	
Non-Routine**	0			
Range Mean		42.5638	128.8362	128.8362
Range Maximum		307.0388	338.1003	338.1003
Range Minimum		-85.0000	4.8000	4.8000
Number Detected***		0	0	0
Total Analyzed		20	5	5
I-131	None Required	Station		
Number of Analyses	25		12	
Non-Routine**	0			
Range Mean		0.5608	4.3350	2.3909
Range Maximum		12.7000	12.7000	8.5200
Range Minimum		-12.8000	0.1840	-1.8980
Number Detected***		0	0	0
Total Analyzed		20	5	5

WG

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Mn-54		15		Station	
Number of Analyses		25		13	
Non-Routine**		0			
Range	Mean		0.0467	0.1593	-1.0412
	Maximum		2.1700	0.9190	0.9780
	Minimum		-1.5000	-0.4800	-3.3100
Number Detected***			0	0	0
Total Analyzed			20	5	5
Ra-226		None Required		Station	
Number of Analyses		25		13	
Non-Routine**		0			
Range	Mean		11.9948	36.1152	11.6180
	Maximum		83.6200	80.8000	57.6000
	Minimum		-74.1000	-1.4440	-42.7000
Number Detected***			0	0	0
Total Analyzed			20	5	5
Th-232		None Required		Station	
Number of Analyses		15		14	
Non-Routine**		0			
Range	Mean		8.3566	13.2800	-4.2437
	Maximum		33.2000	33.2000	-0.5710
	Minimum		-7.9400	-2.2500	-6.1100
Number Detected***			2	1	0
Total Analyzed			12	3	3
Zn-65		30		Station	
Number of Analyses		25		13	
Non-Routine**		0			
Range	Mean		0.1753	1.8606	-3.2348
	Maximum		6.9430	6.0500	1.3620
	Minimum		-7.3500	-2.8830	-10.4300
Number Detected***			0	0	0
Total Analyzed			20	5	5

WG

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Zr-95		15		Station	
Number of Analyses		25		22	
Non-Routine**		0			
Range	Mean		-0.7564	0.4611	0.4611
	Maximum		2.9700	4.1100	4.1100
	Minimum		-2.9980	-1.2800	-1.2800
Number Detected***			0	0	0
Total Analyzed			20	5	5

*The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

**Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.

***The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations). Note, this does not include measurements that were less than the Minimum Detectable Concentration.

SE

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Sediment (SE) UNITS: pCi/Kg

SE

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Be-7	None Required		*Station*	
Number of Analyses	56		23	
*Non-Routine***	0			
Range — *Mean*		251.5309	690.7500	*No Data*
Range — *Maximum*		1090.0000	717.5000	*No Data*
Range — *Minimum*		-237.0000	664.0000	*No Data*
*Number Detected****		4	0	0
Total Analyzed		56	2	0
Ce-141	None Required		*Station*	
Number of Analyses	55		39	
*Non-Routine***	0			
Range — *Mean*		44.2552	118.9500	*No Data*
Range — *Maximum*		213.0000	213.0000	*No Data*
Range — *Minimum*		-137.9000	24.9000	*No Data*
*Number Detected****		0	0	0
Total Analyzed		55	2	0
Co-60	None Required		*Station*	
Number of Analyses	56		15	
*Non-Routine***	0			
Range — *Mean*		12.4174	45.0750	*No Data*
Range — *Maximum*		71.7500	71.7500	*No Data*
Range — *Minimum*		-23.8200	18.4000	*No Data*
*Number Detected****		0	0	0
Total Analyzed		56	2	0
Cs-134	150		*Station*	
Number of Analyses	56		29	
*Non-Routine***	0			
Range — *Mean*		1.4145	24.5850	*No Data*
Range — *Maximum*		46.2400	26.0000	*No Data*
Range — *Minimum*		-54.3600	23.1700	*No Data*
*Number Detected****		0	0	0
Total Analyzed		56	2	0

SE

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Cs-137		180	Station		
Number of Analyses	56		14		
Non-Routine**	0				
Range	Mean		137.4770	189.0000	No Data
	Maximum		219.0000	194.0000	No Data
	Minimum		29.1400	184.0000	No Data
Number Detected***			46	2	0
Total Analyzed			56	2	0
K-40		None Required	Station		
Number of Analyses	56		49		
Non-Routine**	0				
Range	Mean		15681.446	18415.0000	No Data
	Maximum		19200.000	19100.0000	No Data
	Minimum		7913.0000	17730.0000	No Data
Number Detected***			56	2	0
Total Analyzed			56	2	0
Ra-226		None Required	Station		
Number of Analyses	56		43		
Non-Routine**	0				
Range	Mean		1980.3220	3280.0000	No Data
	Maximum		4060.0000	4060.0000	No Data
	Minimum		81.5300	2500.0000	No Data
Number Detected***			44	2	0
Total Analyzed			56	2	0
Th-228		None Required	Station		
Number of Analyses	58		38		
Non-Routine**	0				
Range	Mean		1081.7034	1298.0000	No Data
	Maximum		1380.0000	1320.0000	No Data
	Minimum		544.4000	1276.0000	No Data
Number Detected***			58	2	0
Total Analyzed			58	2	0
Th-232		None Required	Station		
Number of Analyses	27		27		
Non-Routine**	0				
Range	Mean		1205.5185	1420.0000	No Data
	Maximum		1420.0000	1420.0000	No Data
	Minimum		933.0000	1420.0000	No Data
Number Detected***			27	1	0
Total Analyzed			27	1	0

SE

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*

**The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.*

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations). Note, this does not include measurements that were less than the Minimum Detectable Concentration.*

WT

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Test Wells (WT) UNITS: pCi/L

WT					
*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*	
Ba-La-140	None Required		*Station*		
Number of Analyses	8		14		
*Non-Routine***	0				
Range	*Mean*	-0.3672	4.8100	*No Data*	
	Maximum	5.5800	5.5800	*No Data*	
	Minimum	-4.9500	4.0400	*No Data*	
*Number Detected****		0	0	0	
Total Analyzed		8	2	0	
Be-7	None Required		*Station*		
Number of Analyses	8		18		
*Non-Routine***	0				
Range	*Mean*	13.5600	16.5950	*No Data*	
	Maximum	55.2000	34.1000	*No Data*	
	Minimum	-23.1000	-0.9100	*No Data*	
*Number Detected****		1	0	0	
Total Analyzed		8	2	0	
Co-58	None Required		*Station*		
Number of Analyses	8		18		
*Non-Routine***	0				
Range	*Mean*	-0.8532	0.1525	*No Data*	
	Maximum	0.7030	0.7030	*No Data*	
	Minimum	-2.4800	-0.3980	*No Data*	
*Number Detected****		0	0	0	
Total Analyzed		8	2	0	
Co-60	None Required		*Station*		
Number of Analyses	8		18		
*Non-Routine***	0				
Range	*Mean*	-0.0941	1.5435	*No Data*	
	Maximum	2.1600	2.1600	*No Data*	
	Minimum	-2.3500	0.9270	*No Data*	
*Number Detected****		0	0	0	
Total Analyzed		8	2	0	

WT

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Cs-134	None Required		Station	
Number of Analyses	8		17	
Non-Routine**	0			
Range Mean		-4.0470	-1.0450	No Data
Range Maximum		2.5400	1.1900	No Data
Range Minimum		-19.1000	-3.2800	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0
Cs-137	None Required		Station	
Number of Analyses	8		18	
Non-Routine**	0			
Range Mean		2.0326	2.9300	No Data
Range Maximum		5.3900	4.7200	No Data
Range Minimum		-0.5650	1.1400	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0
Eu-154	None Required		Station	
Number of Analyses	8		14	
Non-Routine**	0			
Range Mean		4.3217	10.8950	No Data
Range Maximum		20.3000	20.3000	No Data
Range Minimum		-2.5500	1.4900	No Data
Number Detected***		1	1	0
Total Analyzed		8	2	0
Fe-59	None Required		Station	
Number of Analyses	8		17	
Non-Routine**	0			
Range Mean		1.8609	4.6900	No Data
Range Maximum		10.8000	10.8000	No Data
Range Minimum		-3.1200	-1.4200	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0

WT

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
GR-B	None Required		Station	
Number of Analyses	8		17	
Non-Routine**	0			
Range: Mean		34.7375	51.7000	No Data
Range: Maximum		97.0000	97.0000	No Data
Range: Minimum		2.9000	6.4000	No Data
Number Detected***		8	2	0
Total Analyzed		8	2	0
H-3	None Required		Station	
Number of Analyses	8		14	
Non-Routine**	0			
Range: Mean		-24.3750	21.0000	No Data
Range: Maximum		92.0000	58.0000	No Data
Range: Minimum		-200.0000	-16.0000	No Data
Number Detected***		1	0	0
Total Analyzed		8	2	0
I-131	None Required		Station	
Number of Analyses	8		14	
Non-Routine**	0			
Range: Mean		1.4125	7.4050	No Data
Range: Maximum		9.5100	9.5100	No Data
Range: Minimum		-7.7000	5.3000	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0
Mn-54	None Required		Station	
Number of Analyses	8		17	
Non-Routine**	0			
Range: Mean		0.9249	2.4850	No Data
Range: Maximum		2.8900	2.8900	No Data
Range: Minimum		-1.5900	2.0800	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0

WT

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Nb-95	None Required		Station	
Number of Analyses	8		16	
Non-Routine**	0			
Range — Mean		1.7859	3.4430	No Data
Range — Maximum		7.4400	7.4400	No Data
Range — Minimum		-1.0900	-0.5540	No Data
Number Detected***		1	1	0
Total Analyzed		8	2	0
Te-132	None Required		Station	
Number of Analyses	8		18	
Non-Routine**	0			
Range — Mean		27.0400	33.3050	No Data
Range — Maximum		71.2000	71.2000	No Data
Range — Minimum		-4.5900	-4.5900	No Data
Number Detected***		1	0	0
Total Analyzed		8	2	0
Th-228	None Required		Station	
Number of Analyses	8		16	
Non-Routine**	0			
Range — Mean		2.5946	3.3050	No Data
Range — Maximum		5.6100	5.6100	No Data
Range — Minimum		0.0337	1.0000	No Data
Number Detected***		1	0	0
Total Analyzed		8	2	0
Th-232	None Required		Station	
Number of Analyses	8		14	
Non-Routine**	0			
Range — Mean		3.1850	14.8000	No Data
Range — Maximum		18.9000	18.9000	No Data
Range — Minimum		-17.0000	10.7000	No Data
Number Detected***		1	1	0
Total Analyzed		8	2	0

WT

Radionuclides*	Required LLD	Indicator Station	Station with Highest Mean	Control Station
Zn-65	None Required		Station	
Number of Analyses	8		17	
Non-Routine**	0			
Range Mean		-5.1015	0.8040	No Data
Range Maximum		1.3900	1.3900	No Data
Range Minimum		-13.3000	0.2180	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0
Zr-95	None Required		Station	
Number of Analyses	8		18	
Non-Routine**	0			
Range Mean		-0.3654	2.2700	No Data
Range Maximum		2.3800	2.3800	No Data
Range Minimum		-5.0500	2.1600	No Data
Number Detected***		0	0	0
Total Analyzed		8	2	0

The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations).*

TM

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Milk (TM) UNITS: pCi/L

TM Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Ba-La-140		15	Station		
Number of Analyses	144		11		
Non-Routine**	0				
Range	Mean		0.0546	0.9155	-0.2868
	Maximum		7.5000	7.5000	6.6400
	Minimum		-11.1000	-4.0687	-7.1000
Number Detected***			0	0	0
Total Analyzed			125	18	19
Co-57		None Required	Station		
Number of Analyses	143		22		
Non-Routine**	0				
Range	Mean		0.0136	0.3381	-0.4857
	Maximum		3.7600	2.3310	2.7810
	Minimum		-4.7600	-2.0230	-4.7500
Number Detected***			0	0	0
Total Analyzed			125	31	18
Cs-134		15	Station		
Number of Analyses	141		18		
Non-Routine**	0				
Range	Mean		-0.4241	0.0135	-1.3629
	Maximum		3.4130	3.0400	2.1590
	Minimum		-10.8000	-3.1970	-10.1000
Number Detected***			0	0	0
Total Analyzed			124	21	17
Cs-137		18	Station		
Number of Analyses	142		25		
Non-Routine**	0				
Range	Mean		1.4010	3.0627	0.9162
	Maximum		6.5300	5.7600	4.4700
	Minimum		-2.6400	0.9745	-1.6820
Number Detected***			1	0	0
Total Analyzed			124	14	18

TM

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
I-131		1		Station	
Number of Analyses	144			22	
Non-Routine**	0				
Range	Mean		0.0719	0.0911	0.0882
	Maximum		0.8023	0.8023	0.5850
	Minimum		-0.3816	-0.1307	-0.0757
	Number Detected***		0	0	0
	Total Analyzed		126	32	18
K-40		None Required		Station	
Number of Analyses	144			25	
Non-Routine**	0				
Range	Mean		1412.3492	1727.0000	1363.1111
	Maximum		2300.0000	2070.0000	1602.0000
	Minimum		853.0000	853.0000	1200.0000
	Number Detected***		126	15	18
	Total Analyzed		126	15	18
Sr-89		None Required		Station	
Number of Analyses	30			25	
Non-Routine**	0				
Range	Mean		-0.4726	2.5123	-0.8642
	Maximum		5.6491	5.6491	2.2107
	Minimum		-5.4530	-2.2000	-4.6476
	Number Detected***		0	0	0
	Total Analyzed		26	4	4
Sr-90		None Required		Station	
Number of Analyses	30			26	
Non-Routine**	0				
Range	Mean		1.8506	2.5728	0.9633
	Maximum		5.7167	3.5964	3.0905
	Minimum		-2.6287	1.4000	-0.8175
	Number Detected***		21	4	3
	Total Analyzed		26	4	4

TM

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Th-228		None Required		Station	
Number of Analyses	144			11	
Non-Routine**	0				
Range	Mean		0.6113	1.7855	3.5072
	Maximum		16.3000	16.3000	16.8700
	Minimum		-12.9600	-7.2500	-12.3000
Number Detected***			1	1	1
Total Analyzed			126	18	18
Th-232		None Required		Station	
Number of Analyses	74			26	
Non-Routine**	0				
Range	Mean		4.6489	7.9666	3.5190
	Maximum		33.5000	21.3000	13.7000
	Minimum		-18.1000	-0.4650	-3.9000
Number Detected***			4	0	0
Total Analyzed			65	12	9

*The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

**Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.

***The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations). Note, this does not include measurements that were less than the Minimum Detectable Concentration.

TC

Table 5.1

Radiological Environmental Program Summary
Vermont Yankee Nuclear Power Plant, Vernon, VT
(January - December 2001)

Medium: Silage (TC) UNITS: pCi/Kg

TC

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Be-7	None Required		*Station*	
Number of Analyses	7		18	
*Non-Routine***	0			
Range — *Mean*		483.6167	1280.0000	183.0000
Range — *Maximum*		1280.0000	1280.0000	183.0000
Range — *Minimum*		-15.1000	1280.0000	183.0000
*Number Detected****		4	1	1
Total Analyzed		6	1	1
Bi-214	None Required		*Station*	
Number of Analyses	6		26	
*Non-Routine***	0			
Range — *Mean*		44.9800	77.1000	151.0000
Range — *Maximum*		77.1000	77.1000	151.0000
Range — *Minimum*		8.9000	77.1000	151.0000
*Number Detected****		2	1	1
Total Analyzed		5	1	1
Cs-134	60		*Station*	
Number of Analyses	6		22	
*Non-Routine***	0			
Range — *Mean*		-16.9628	5.2200	-12.1000
Range — *Maximum*		5.2200	5.2200	-12.1000
Range — *Minimum*		-62.9000	5.2200	-12.1000
*Number Detected****		0	0	0
Total Analyzed		5	1	1
Cs-137	80		*Station*	
Number of Analyses	7		25	
*Non-Routine***	0			
Range — *Mean*		13.8570	58.5000	9.8300
Range — *Maximum*		58.5000	58.5000	9.8300
Range — *Minimum*		0.5340	58.5000	9.8300
*Number Detected****		1	1	1
Total Analyzed		6	1	1

TC

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
I-131		60		Station	
Number of Analyses	7			25	
Non-Routine**	0				
Range	Mean		9.6667	57.9000	24.7000
	Maximum		57.9000	57.9000	24.7000
	Minimum		-20.2000	57.9000	24.7000
Number Detected***			0	0	0
Total Analyzed			6	1	1
K-40		None Required		Station	
Number of Analyses	7			25	
Non-Routine**	0				
Range	Mean		4442.1667	8470.0000	5450.0000
	Maximum		8470.0000	8470.0000	5450.0000
	Minimum		953.0000	8470.0000	5450.0000
Number Detected***			6	1	1
Total Analyzed			6	1	1
Th-228		None Required		Station	
Number of Analyses	7			11	
Non-Routine**	0				
Range	Mean		29.9617	70.3000	14.4000
	Maximum		70.3000	70.3000	14.4000
	Minimum		3.8700	70.3000	14.4000
Number Detected***			2	1	1
Total Analyzed			6	1	1
Th-232		None Required		Station	
Number of Analyses	7			25	
Non-Routine**	0				
Range	Mean		38.9867	87.5000	36.7000
	Maximum		87.5000	87.5000	36.7000
	Minimum		-9.0800	87.5000	36.7000
Number Detected***			1	1	1
Total Analyzed			6	1	1

*The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

**Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.

***The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations).

TG

Table 5.1

Radiological Environmental Program Summary

Vermont Yankee Nuclear Power Plant, Vernon, VT

(January - December 2001)

Medium: Mixed Grass (TG) UNITS: pCi/Kg

TG

*Radionuclides**	*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Be-7	None Required	*Station*		
Number of Analyses	30		12	
*Non-Routine***	0			
Range — *Mean*		1934.6154	3725.0000	2012.5000
Range — *Maximum*		4460.0000	4460.0000	2950.0000
Range — *Minimum*		219.0000	3200.0000	850.0000
*Number Detected****		26	4	4
Total Analyzed		26	4	4
Cs-134	60	*Station*		
Number of Analyses	30		13	
*Non-Routine***	0			
Range — *Mean*		-3.8529	-0.1710	-9.8350
Range — *Maximum*		14.8900	5.2400	4.7500
Range — *Minimum*		-25.2000	-5.8800	-30.2000
*Number Detected****		0	0	0
Total Analyzed		26	4	4
Cs-137	80	*Station*		
Number of Analyses	28		13	
*Non-Routine***	0			
Range — *Mean*		9.0185	15.4450	7.1550
Range — *Maximum*		27.2000	27.2000	12.3000
Range — *Minimum*		-3.1600	4.2800	2.3000
*Number Detected****		3	2	0
Total Analyzed		24	4	4
I-131	60	*Station*		
Number of Analyses	30		14	
*Non-Routine***	0			
Range — *Mean*		3.1186	13.7225	2.3275
Range — *Maximum*		80.1000	80.1000	18.4000
Range — *Minimum*		-29.3000	-10.3000	-12.1000
*Number Detected****		0	0	0
Total Analyzed		26	4	4

TG

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
K-40		None Required		Station	
Number of Analyses	30			14	
Non-Routine**	0				
Range	Mean		5014.2308	5632.5000	4720.0000
	Maximum		8280.0000	8280.0000	7030.0000
	Minimum		1900.0000	1900.0000	2760.0000
	Number Detected***		26	4	4
	Total Analyzed		26	4	4
Th-228		None Required		Station	
Number of Analyses	30			11	
Non-Routine**	0				
Range	Mean		15.2060	27.8240	3.3000
	Maximum		83.8100	83.8100	18.5000
	Minimum		-13.2000	8.0600	-28.4000
	Number Detected***		4	1	0
	Total Analyzed		26	5	4
Th-232		None Required		Station	
Number of Analyses	27			14	
Non-Routine**	0				
Range	Mean		35.5039	66.8000	44.5050
	Maximum		89.9000	77.8000	108.0000
	Minimum		2.9200	41.1000	1.8200
	Number Detected***		3	1	0
	Total Analyzed		23	4	4

The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

***Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

****The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations). Note, this does not include measurements that were less than the Minimum Detectable Concentration.*

FH

Table 5.1

Radiological Environmental Program Summary
Vermont Yankee Nuclear Power Plant, Vernon, VT
(January - December 2001)

Medium: Fish (FH) UNITS: pCi/Kg

FH

*Radionuclides**		*Required LLD*	*Indicator Station*	*Station with Highest Mean*	*Control Station*
Co-58		130	*Station*		
Number of Analyses	4		21		
*Non-Routine***	0				
Range	*Mean*		-19.5760	-2.6000	-2.6000
	Maximum		-6.7520	10.1000	10.1000
	Minimum		-32.4000	-15.3000	-15.3000
	*Number Detected****		0	0	0
	Total Analyzed		2	2	2
Co-60		130	*Station*		
Number of Analyses	4		11		
*Non-Routine***	0				
Range	*Mean*		16.9350	16.9350	-2.4950
	Maximum		23.5700	23.5700	1.7400
	Minimum		10.3000	10.3000	-6.7300
	*Number Detected****		0	0	0
	Total Analyzed		2	2	2
Cs-134		130	*Station*		
Number of Analyses	4		11		
*Non-Routine***	0				
Range	*Mean*		-9.8885	-9.8885	-12.1050
	Maximum		1.0230	1.0230	-4.5300
	Minimum		-20.8000	-20.8000	-19.6800
	*Number Detected****		0	0	0
	Total Analyzed		2	2	2
Cs-137		150	*Station*		
Number of Analyses	4		11		
*Non-Routine***	0				
Range	*Mean*		23.1850	23.1850	17.1750
	Maximum		25.5000	25.5000	20.8000
	Minimum		20.8700	20.8700	13.5500
	*Number Detected****		1	1	1
	Total Analyzed		2	2	2

FH

Radionuclides*		Required LLD	Indicator Station	Station with Highest Mean	Control Station
Fe-59		260		Station	
Number of Analyses		4		11	
Non-Routine**		0			
Range	Mean		30.5470	30.5470	13.9695
	Maximum		60.1100	60.1100	25.0000
	Minimum		0.9840	0.9840	2.9390
Number Detected***			0	0	0
Total Analyzed			2	2	2
K-40		None Required		Station	
Number of Analyses		4		11	
Non-Routine**		0			
Range	Mean		3088.5000	3088.5000	2853.0000
	Maximum		3240.0000	3240.0000	3320.0000
	Minimum		2937.0000	2937.0000	2386.0000
Number Detected***			2	2	2
Total Analyzed			2	2	2
Mn-54		130		Station	
Number of Analyses		4		11	
Non-Routine**		0			
Range	Mean		1.4435	1.4435	-0.1065
	Maximum		4.1300	4.1300	7.6500
	Minimum		-1.2430	-1.2430	-7.8630
Number Detected***			0	0	0
Total Analyzed			2	2	2
Zn-65		260		Station	
Number of Analyses		4		21	
Non-Routine**		0			
Range	Mean		6.8050	39.0435	39.0435
	Maximum		12.5300	71.3000	71.3000
	Minimum		1.0800	6.7870	6.7870
Number Detected***			0	1	1
Total Analyzed			2	2	2

The only radionuclides reported in this table are those with LLD requirements and those for which positive radioactivity was detected. See Section 5 of this report for a discussion of other radionucides that were analyzed.

**Non-Routine refers to those radionuclides that exceeded the Reporting Lveles in Technical Specification Table 3.9.4.*

***The fraction of sampling analyses yielding detectable measurements (i.e. >3 standard deviations).*

Environmental TLD Data

2001 Radiological Environmental Operating Report
Vermont Yankee

Tables:

5.2 – Data Summary
5.3 - Measurements

TABLE 5.2

ENVIRONMENTAL TLD DATA SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
(JANUARY - DECEMBER 2001)

INNER RING TLD	OUTER RING TLD	OFFSITE STATION WITH HIGHEST MEAN	CONTROL TLDs
MEAN*	MEAN*	STA.NO MEAN*	MEAN*
RANGE*	RANGE*	RANGE*	RANGE*
(N0. MEASUREMENTS)**	(N0. MEASUREMENTS)**	(N0. MEASUREMENTS)**	(N0. MEASUREMENTS)**
6.4 ± 0.3	6.5 ± 0.4	DR-36 7.6 ± 0.4	6.4 ± 0.35
5.0 - 7.5	5.5 - 7.6	5.9 - 8.4	6.2 - 6.7
83	63	4	8

SITE BOUNDARY TLD WITH HIGHEST MEAN	SITE BOUNDARY TLD
STA.NO. MEAN*	MEAN*
RANGE*	RANGE*
(NO. MEASUREMENTS)**	(NO. MEASUREMENTS)**
DR-45 12.0 + 0.7	7.9 ± 0.41
11.5 - 12.5	6.4 - 12.0
4	56

* Units are in micro-R per hour.

** Each "measurement" is based typically on quarterly readings from five TLD elements.

TABLE 5.3

ENVIRONMENTAL TLD MEASUREMENTS
2001
(Micro-R per Hour)

Sta. No.	Description	1ST QUARTER EXP.	S.D.	2ND QUARTER EXP.	S.D.	3RD QUARTER EXP.	S.D.	4TH QUARTER EXP.	S.D.	ANNUAL AVE. EXP.
DR-01	River Sta. No. 3.3	5.6	0.4	6.3	0.3	6.2	0.5	6.4	0.2	6.1
DR-02	N Hinsdale, NH	5.3	0.4	7.0	0.4	6.9	0.4	6.8	0.2	6.5
DR-03	Hinsdale Substation	6.1	0.4	8.0	0.4	7.9	0.4	7.9	0.5	7.5
DR-04	Northfield, MA	5.4	0.4	6.7	0.3	6.4	0.3	6.4	0.3	6.2
DR-05	Spofford Lake, NH	5.5	0.5	7.0	0.4	7.1	0.4	7.0	0.3	6.7
DR-06	Vernon School	5.4	0.4	6.9	0.3	6.8	0.3	6.9	0.3	6.5
DR-07	Site Boundary	6.3	0.5	7.9	0.3	7.9	0.3	8.2	0.3	7.6
DR-08	Site Boundary	7.4	0.5	8.5	0.3	8.4	0.4	8.4	0.4	8.2
DR-09	Inner Ring	5.3	0.3	6.5	0.3	6.0	0.3	6.5	0.3	6.0
DR-10	Outer Ring	4.6	0.4	5.9	0.3	5.6	0.3	6.1	0.3	5.5
DR-11	Inner Ring	5.0	0.4	6.3	0.3	6.1	0.3	6.2	0.2	5.9
DR-12	Outer Ring	4.8	0.4	6.2	0.3	5.9	0.3	5.9	0.3	5.7
DR-13	Inner Ring	5.7	0.5	6.9	0.3	6.5	0.3	6.5	0.3	6.4
DR-14	Outer Ring	5.5	0.4	8.1	0.4	7.8	0.4	8.0	0.4	7.3
DR-15	Inner Ring	5.8	0.5	7.2	0.3	*		6.8	0.5	6.6
DR-16	Outer Ring	6.3	0.5	7.3	0.3	7.0	0.4	7.4	0.2	7.0
DR-17	Inner Ring	4.9	0.4	6.4	0.3	6.4	0.3	6.6	0.3	6.1
DR-18	Outer Ring	5.3	0.4	7.0	0.7	6.7	0.4	6.7	0.3	6.4
DR-19	Inner Ring	5.7	0.4	7.6	0.4	7.7	0.4	7.6	0.4	7.2
DR-20	Outer Ring	5.5	0.4	7.3	0.3	7.7	0.4	7.8	0.3	7.1
DR-21	Inner Ring	5.4	0.3	6.9	0.3	6.8	0.4	6.9	0.2	6.5
DR-22	Outer Ring	5.7	0.4	6.8	0.3	6.7	0.3	6.9	0.3	6.5
DR-23	Inner Ring	5.4	0.4	6.4	0.3	6.5	0.4	6.6	0.2	6.2
DR-24	Outer Ring	4.9	0.3	6.1	0.4	6.0	0.3	6.1	0.3	5.8
DR-25	Inner Ring	5.6	0.4	7.0	0.3	6.7	0.3	6.7	0.3	6.5
DR-26	Outer Ring	5.0	0.4	6.7	0.3	6.8	0.3	7.0	0.3	6.4
DR-27	Inner Ring	5.4	0.3	7.0	0.3	6.6	0.4	6.9	0.2	6.5
DR-28	Outer Ring	5.1	0.3	6.6	0.6	6.9	0.4	6.4	0.3	6.3
DR-29	Inner Ring	5.7	0.4	6.6	0.3	6.9	0.3	6.8	0.2	6.5
DR-30	Outer Ring	5.8	0.4	6.7	0.3	7.0	0.4	6.9	0.3	6.6
DR-31	Inner Ring	5.5	0.5	7.1	0.4	6.8	0.4	7.1	0.3	6.6
DR-32	Outer Ring	5.1	0.4	6.9	0.3	7.1	0.4	7.2	0.2	6.6
DR-33	Inner Ring	5.4	0.4	7.0	0.3	7.0	0.3	7.2	0.2	6.6
DR-34	Outer Ring	5.6	0.4	7.4	0.3	7.1	0.3	7.4	0.3	6.9
DR-35	Inner Ring	5.7	0.4	7.0	0.5	6.7	0.3	6.8	0.3	6.6
DR-36	Outer Ring	5.9	0.4	7.9	0.4	8.4	0.4	8.4	0.3	7.6
DR-37	Inner Ring	5.1	0.5	6.9	0.3	6.8	0.3	6.9	0.3	6.4
DR-38	Outer Ring	*		7.3	0.4	7.6	0.4	7.5	0.3	7.5
DR-39	Inner Ring	5.1	0.4	7.1	0.3	6.8	0.4	7.1	0.3	6.5
DR-40	Outer Ring	5.4	0.5	6.7	0.4	6.8	0.3	6.9	0.4	6.4

* Data not available due to missing TLD.

TABLE 5.3

ENVIRONMENTAL TLD MEASUREMENTS
2001
(Micro-R per Hour)

Sta. No.	Description	1ST QUARTER EXP.	S.D.	2ND QUARTER EXP.	S.D.	3RD QUARTER EXP.	S.D.	4TH QUARTER EXP.	S.D.	ANNUAL AVE. EXP.
DR-41	Site Boundary	5.6	± 0.4	7.8	± 0.3	7.8	± 0.4	7.7	± 0.3	7.2
DR-42	Site Boundary	5.2	± 0.4	6.9	± 0.3	7.0	± 0.4	6.9	± 0.3	6.5
DR-43	Site Boundary	5.7	± 0.4	7.4	± 0.3	7.5	± 0.4	7.6	± 0.2	7.1
DR-44	Site Boundary	7.6	± 0.5	8.1	± 0.4	8.1	± 0.5	8.0	± 0.3	8.0
DR-45	Site Boundary	11.5	± 0.9	12.4	± 0.4	11.6	± 0.7	12.5	± 0.6	12.0
DR-46	Site Boundary	7.2	± 0.5	8.9	± 0.4	9.1	± 0.5	9.1	± 0.5	8.6
DR-47	Site Boundary	6.0	± 0.5	7.9	± 0.3	8.3	± 0.4	8.3	± 0.4	7.6
DR-48	Site Boundary	5.5	± 0.4	7.1	± 0.4	7.3	± 0.4	7.3	± 0.3	6.8
DR-49	Site Boundary	5.4	± 0.4	6.7	± 0.4	6.6	± 0.4	6.7	± 0.3	6.4
DR-50	Governor Hunt House	6.0	± 0.4	7.1	± 0.5	7.1	± 0.4	6.9	± 0.3	6.8
DR-51	Site Boundary	6.6	± 0.5	8.0	± 0.3	8.6	± 0.5	8.6	± 0.4	7.9
DR-52	Site Boundary	7.3	± 0.7	8.4	± 0.4	9.0	± 0.4	8.8	± 0.4	8.4
DR-53	Site Boundary	7.6	± 0.6	9.1	± 0.5	9.7	± 0.5	9.6	± 0.4	9.0

6. ANALYSIS OF ENVIRONMENTAL RESULTS

6.1 Sampling Program Deviations

Off-site Dose Calculation Manual Control 3.5.1 allows for deviations "if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons." In 2001, several deviations were noted in the REMP. These deviations did not compromise the program's effectiveness and in fact, with the exception of the loss of a set of air samples during shipment, are considered typical with respect to what is normally anticipated for any radiological environmental monitoring program. The specific deviations for 2001 were:

a) The power at the air sample station in North Hinsdale (AP/CF-12) was disconnected by Public Service Company of New Hampshire. The company had been asked to disconnect the power at an abandoned air station and mistakenly disconnected it at this location. This problem was discovered on 12/27/00 during the 4th quarterly environmental TLD changeout. The sampling station only missed 28 hours of sampling time from 12/26/00 until 1/9/01 when the air samples were then collected.

b) The outer ring TLD in the NW sector, DR-38 was reported missing for the 1st quarter of the year on March 29, 2001 during the TLD changeout surveillance. Deep snow encountered during the collection hindered the technician's search for the lost TLD. No sign of the TLD or its holder was identified.

c) Upon observing high river water conditions on April 24, 2001, as a result of winter snowmelt runoff, the technician investigated the operability of the river water pump supplying water to the River Water Sample Compositor (WR 11 – Station 3-3). He found that the pump was out of service and therefore no flow was reaching the sample compositor. Daily grab samples were immediately initiated until the river level receded and the river water pump could be restored to service.

d) Failure of a Ground Fault Interrupter resulted in the loss of power to the Northfield, Massachusetts Air Sample Station (AP/CF 14). The failure was discovered by the technician during route sample collection on May 29, 2001 and power was restored on June 12, 2001. A loss of approximately 475 hours of sample collection was experienced during this period.

e) Power at the Air Sample Station (AP/CF 11 – River Station) and the River Water Sample Compositor(WR 11 – Station 3-3) was shutdown for approximately 3 hours on August 11, 2001 due to a scheduled power outage for the area. No air sample volume or river water composite was collected during this three hour period. This event was discovered by the technician during routine sample collection on August 12, 2001.

f) During a lightning storm on August 12, 2001 water supply was lost for a short period (not more than 2 sample cycles) to the River Water Sample Compositor (WR 11 – Station 3-3). This event was discovered when thermal data ceased to be transmitted to the plant computer from this sample station.

g) Environmental Air Samples collected on August 7, (Week 32) 2001 were discovered to be lost during sample shipment and receipt at the vendor laboratory. Air Particulate/Charcoal Filter (AP/CF) samples for all of the seven stations (AP/CF 11, 12, 13, 14, 15, 21 and 40) collected on that date were

sent to the vendor laboratory but were not received by the laboratory. An investigation of the event led to the implementation of significant changes in sample shipment practices.

h) The inner ring TLD in the ENE sector, DR-15 was reported missing for the 3rd quarter of the year on October 1, 2001 during the TLD changeout surveillance. No sign of the TLD or its holder was evident following an area search by the technician.

i) The following data indicates the percentage of time that each air sampling station operated during year 2001. The data was based on an electric timer at each station. This data indicates that any power interruptions did not result in a significant loss of data for the airborne contaminant sampling program. Location AP/CF is not a location required by the ODCM. Minor power interruptions are expected due to minor maintenance repairs during the year.

AP/CF #	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
11	97.6%	100.0%	99.7%	100.0%
12	95.6%	89.5%	100.0%	100.0%
13	100.0%	100.0%	100.0%	100.0%
14	99.9%	76.4%	99.3%	100.0%
15	99.8%	99.9%	86.0%	100.0%
21	100.0%	98.2%	86.1%	100.0%
40	100.0%	100.0%	100.0%	100.0%

6.2 Comparison of Achieved LLDs with Requirements

Table 4.5.1 of the VYNPS ODCM (also shown in Table 4.4 of this report) gives the required Lower Limits of Detection (LLDs) for environmental sample analyses. On occasion, an LLD is not achievable due to a situation such as a low sample volume caused by sampling equipment malfunction. In such a case, ODCM 10.2 requires a discussion of the situation. At the contracted environmental laboratory, the target LLD for any analysis is, for the majority, 50 percent of the most restrictive required LLD. Expressed differently, the typical sensitivities achieved for each analysis are at least 2 times greater than that required by the VYNPS ODCM.

For each analysis having an LLD requirement in ODCM Table 4.5.1, the *a posteriori* (after the fact) LLD calculated for that analysis was compared with the required LLD. During 2001, there were several samples where the *a posteriori* LLD exceeded a corresponding LLD requirement. All but five of the analyses appeared to have had delays in counting at the contractor laboratory, which resulted in the analyses not meeting the target LLD. The Terrestrial Vegetation samples (TG) collected in week 47 were of insufficient weight to allow the laboratory to achieve the I-131 LLD for vegetation. The growth of grass in the month of November is severely curtailed due to advancing cold weather. The following table lists the samples and the isotope measured that did not meet the required LLD of Table 4.5.1 of the ODCM.

Sample Analyses Not Meeting the Required LLD

Media	Station #	Week #	Nuclide	Activity	1 Std Dev	MDA	LLD
CF	15	36	I-131	-1.34E-02	5.10E-02	1.43E-01	7.00E-02
WR	11	24	Ba-La-140	1.04E+00	9.40E+00	2.62E+01	1.50E+01
WG	14	18	Ba-La-140	-6.31E+00	7.05E+00	1.92E+01	1.50E+01
WG	13	18	GR-B	1.00E+01	1.70E+01	5.00E+01	4.00E+00
WG	14	18	GR-B	-9.70E+00	1.52E+01	5.00E+01	4.00E+00
WG	22	18	GR-B	-2.60E+01	1.43E+01	5.00E+01	4.00E+00
TM	14	25	Ba-La-140	-9.04E-01	3.73E+00	1.51E+01	1.50E+01
TM	14	27	Ba-La-140	1.16E+00	4.39E+00	1.58E+01	1.50E+01
TM	11	27	Ba-La-140	-4.07E+00	4.14E+00	1.67E+01	1.50E+01
TM	18	27	Ba-La-140	-1.05E+00	4.08E+00	1.67E+01	1.50E+01
TM	26	18	Ba-La-140	-1.64E+00	4.35E+00	1.70E+01	1.50E+01
TM	22	29	Ba-La-140	5.98E-01	6.60E+00	1.84E+01	1.50E+01
TC	25	42	I-131	5.79E+01	4.74E+01	1.34E+02	6.00E+01
TG	12	47	I-131	1.70E+01	2.13E+00	6.14E+01	6.00E+01
TG	40	47	I-131	-1.33E+01	3.80E+01	1.06E+02	6.00E+01
TG	15	47	I-131	2.87E+01	5.30E+01	1.50E+02	6.00E+01
TG	21	47	I-131	1.84E+01	6.35E+01	1.79E+02	6.00E+01
TG	14	47	I-131	8.01E+01	6.60E+01	1.89E+02	6.00E+01

Several other samples submitted to the second laboratory failed to meet the required LLDs, but the samples were not from locations required by the ODCM. Those missed LLD analyses are not included in this table. They were from locations voluntarily added as enhancements to the program. It should be noted that changes were made in the way that samples are prioritized at the vendor laboratory and during the month of December, delays in sample counting were minimized. That trend is continuing in the ensuing year.

6.3 Comparison of Results with Reporting Levels

ODCM Section 10.3.4 requires written notification to the NRC within 30 days of receipt of an analysis result whenever a Reporting Level in ODCM Table 3.5.2 is exceeded. Reporting Levels are the environmental concentrations that relate to the ALARA design dose objectives of 10 CFR 50, Appendix I. Environmental concentrations are averaged over the calendar quarters for the purposes of this comparison. The Reporting Levels are intended to apply only to measured levels of radioactivity due to plant effluents. During 2001, no analytical result exceeded a corresponding reporting level requirement in Table 3.5.2 of the ODCM.

6.4 Changes in Sampling Locations

The Vermont Yankee Nuclear Power Station Off-Site Dose Calculation Manual Section 10.2 states that if "new environmental sampling locations are identified in accordance with Control 3.5.2, the new locations shall be identified in the next Annual Radiological Environmental Operating Report." There were no required sampling location changes due to the Land Use Census conducted in 2001.

One sampling location was suggested in the Land Use Census assessment. A new dairy farm located on the east bank of the Connecticut River south in lower Hinsdale New Hampshire started operations in late summer, 2001. Subsequent evaluation of this new farm indicated that although it was not in "...at least a 20% greater dose commitment than the values currently being calculated in accordance with the ODCM Control 4.3.3.", it did rank as number two on the list of all farms included in the Land Use Census. With this in mind, we have attempted to establish a method of collecting sample from the bulk tank at this dairy since late in 2001. At this time, no samples have been obtained due to configuration of the bulk tank and deterioration of the bottom valve that prohibits opening the valve unless it is connected to a milk collection truck. During the last discussion with the farmers, they indicated that they were in the process of obtaining a new bulk tank with new valve. They hoped to have this tank in place by early summer of 2002. Following a successful trial sample collection from this farm, this new location will be added to the ODCM and routine samples will ensue.

This year, Vermont Yankee is continuing to add data from the on-site air sampling station, AP/CF 40, at the Governor Hunt House. This location has been used continuously as a demonstration since early in the program, but the data has not previously been included in this report.

6.5 Data Analysis by Media Type

The 2001 REMP data for each media type is discussed below. Whenever a specific measurement result is presented, it is given as the concentration plus or minus one standard deviation. This standard deviation represents only the random uncertainty associated with the radioactive decay process (counting statistics), and not the propagation of all possible uncertainties in the analytical procedure. An analysis is considered to yield a "detectable measurement' when the concentration exceeds three times the standard deviation for that analysis and is greater than or equal to the Minimum Detectable Concentration (MDC) for the analysis. With respect to data plots, all net concentrations are plotted as reported, without regard to whether the value is "detectable" or "non-detectable".

6.5.1 Airborne Pathways

6.5.1.1 Air Particulates

The periodic air particulate filters from each of the seven sampling sites were analyzed for gross-beta radioactivity. At the end of each quarter, the filters from each sampling site were composited for a gamma analysis. The results of the air particulate sampling program are shown in Table 5.1 and Figures 6.1 through 6.7. This is the second year that the results for the on-site air particulate station, Gov. Hunt (AP-40) have been included.

Gross beta activity was detected in all air particulate filters that were analyzed. As noted in Section 6.1, one set of air particulate and charcoal filters was lost during the delivery process to the vendor laboratory. As shown in Figure 6.1, there is no significant difference between the quarterly average concentrations at the indicator (near-plant) stations and the control (distant from plant) stations with the exception of a single, relatively higher value obtained from one sample at AP-11(River Station). Also notable in Figure 6.1 is a distinct annual cycle, with the minimum concentration in the second quarter, and the maximum concentration in the first quarter.

Figures 6.2 through 6.7 show the weekly gross beta concentration at each air particulate sampling location compared to the control air particulate sampling location at AP-21 (Spofford Lake, NH). Small differences are evident and expected between individual sampling locations. Figure 6.2 clearly demonstrates the unusual gross beta concentration identified on AP-11 during the first quarter of 2001. It can also be seen that the gross-beta measurements on air particulate filters fluctuate significantly over the course of a year. The measurements from control station AP-21 vary similarly, indicating that these fluctuations are due to regional changes in naturally-occurring airborne radioactive materials, and not due to Vermont Yankee operations.

There were five naturally-occurring gamma-emitting radionuclides detected on the air particulate filters during this reporting period. Be-7, a naturally-occurring cosmogenic radionuclide, was detected on 27 of 28 filter sets analyzed. K-40 was detected on a total of 2 out of 28 analyzed. Ra-226 was detected once out of 28. Th-228 and 232 were detected once each out of 28 analyzed. Nb-95, a plant related nuclide, was detected two times in 28 analyses. It is believed that this nuclide is a result of sample contamination at the analytical lab since this nuclide is not seen in plant effluents.

6.5.1.2 Charcoal Cartridges

Charcoal cartridges from each of the seven air sampling sites were analyzed for I-131 each time they were collected. The results of these analyses are summarized in Table 5.1. As in previous years, no I-131 was detected in any charcoal cartridge. This is the second year that the results for the on-site air iodine sampling station, Gov. Hunt (CF-40) have been included.

6.5.2 Waterborne Pathways

6.5.2.1 River Water

Aliquots of river water were automatically collected periodically from the Connecticut River downstream from the plant discharge area and hydro station, location WR-11. Monthly grab samples were also collected at the upstream control location, also on the Connecticut River, location WR-21. The composited samples at WR-11 were collected monthly and sent along with the WR-21 grab samples to the contracted environmental laboratory for analysis. Table 5.1 shows that gross-beta measurements were positive in 5 out of 12 indicator samples and 6 out of 12 control samples, as would be expected, due to naturally-occurring radionuclides in the water. As seen in Figure 6.8, the mean concentration of the indicator locations was similar to the mean concentration at the control location in 2000.

One sample had a very small amount of detectable Cs-134 (just 25% higher than the required LLD in Table 4.4) at 18.7 E+00 + 1.51E+00 pCi/liter. This nuclide is considered to be plant-related activity, however, subsequent samples failed to identify any further Cs-134.. Vermont Yankee has not made routine radioactive liquid releases to the Connecticut River since 1982.

For each sampling site, the monthly samples were composited into quarterly samples for H-3 (Tritium) analyses. None of the samples contained detectable quantities of H-3.

6.5.2.2 Ground Water

Quarterly ground water samples were collected from four indicator locations (only one is required by VYNPS ODCM) and one control location during 2001. WG-13 (COB Well), an on-site well location, has been routinely sampled since the second half of 1996. In 1999, WG-14 (PBS Well) another on-site well location, was added to the program. Table 5.1 and Figure 6.9 show that gross-beta measurements were positive in 12 out of 20 indicator samples and in 2 out of 5 control samples. The beta activity is due to naturally-occurring radionuclides in the water. The levels at all sampling locations, including the higher levels at station WG-11, were consistent with that detected in previous years. Naturally occurring Th-228 was also detected in one sample No other gamma-emitting radionuclides or tritium were detected in any

of the samples.

6.5.2.3 Sediment

Semi-annual river sediment grab samples were collected from two indicator locations during 2001. The North Storm Drain Outfall location (SE-12) is an area where up to 40 different locations can be sampled within a 20 ft by 140 ft area. In 2001, 26 locations were sampled at SE-12 during each of the semi-annual collections. Two samples were collected at SE-11 during the year. As would be expected, naturally-occurring Potassium-40 (K-40) was detected in all of the samples. Radium-226 (Ra-226) was detected in 44 of 56 samples. Thorium-228 (Th-228) was detected in 58 of 58 samples analyzed. Thorium-232 (Th-232) was detected 18 samples analyzed. Cesium-137 (Cs-137) was detected in 46 out of 56 of the indicator samples. The levels of Cs-137 measured at both locations were consistent with what has been measured in the previous several years and with those detected at other New England locations. Cobalt-60 (Co-60) was not detected this year although it often has been detected in recent years at very low levels. Co-60 is sometimes present at the North Storm Drain Outfall sampling location as a result of the presence of plant related radionuclides in the onsite storm drain system. See section 6.5.2.6 for more information.

6.5.2.4 Test Wells

During 1996 sampling was initiated at test wells around the outer edges of an area in the south portion of the VYNPS site where septic sludge is spread. This sampling continued through 2001. The test well locations are shown on Figure 4.1 and the results are summarized in Table 5.1 under the media category, Test Well (WT). In 2001, two samples were taken at each of the four locations and all were analyzed for gamma isotopic, gross beta and H-3 activity.

Prior to the gross beta analysis, each sample was filtered through a 0.45 micron Gelman Tuffryn membrane filter. Gross beta activity was detected in all 8 samples collected with levels ranging from 20 to 130 pCi/kg.

6.5.2.5 Storm Drain System

The presence of plant-related radionuclides in the onsite storm drain system has been identified in previous years at Vermont Yankee (VY). As a consequence, a 50.59 evaluation of radioactive materials discharged via the storm drain system was performed in 1998. This assessment was in response to I&E Information and Enforcement Bulletin No. 80-10 and NRC Information Notice No. 91-40. The evaluation demonstrated that the total curies released via the VYNPS storm drain system are not sufficient to result in a significant dose (i.e. dose does not exceed 10% of the technical specification objective of 0.3 millirem per year to the total body, and 1.0 millirem per year to the target organ for the maximally exposed receptor). Water and sediment in the onsite storm drain system was routinely sampled throughout

2001 at various points. The results of this sampling are summarized below.

Sediment samples were taken from the storm drain system at onsite manhole locations in 2001 for a total of 26 samples. All samples were analyzed for gamma emitting isotopes. Table 6-1 summarizes the analytical results of the sediment samples. Naturally occurring isotopes K-40, Th-228, Th-232, Ra-226, and Be-7 were found in most of the samples as expected. The highest detected concentration for all plant related radionuclides that were detected in sediment samples was found in sample SE-95, which is also designated by the plant as Manhole 12.

Water samples were taken from the storm drain system at various access points in 2001 including Manholes MH-8, MH-11H, MH-12A, MH-13, and MH-14. Table 6-2 summarizes the analytical results of water samples from the storm drain system in 2001. Nb-95 was detected in trace amounts in just one of the samples. Naturally-occurring Th-228 was detected in three of the samples. Low levels of gross beta activity were detected in 21 out of 26 samples analyzed at concentrations that are typical of any environmental water sample. Tritium (H-3) was detected in only one of the 26 samples analyzed at a very low level of activity.

In 1998, an additional dose assessment was performed that incorporated all of the 1998 storm drain system analytical results (including both sediment and water). The dose assessment was performed using the maximum measured concentration of radionuclides in 1998, and a conservative estimate of the volume of sediment and water discharged via the storm drain system. The results of this dose assessment are estimates of the total body and maximum organ dose equaling 3.2% and 1.6% of the corresponding Technical Specification dose limits respectively. Therefore, there was no significant dose impact from plant-related radionuclides in the storm drain system in 1998. The sampling conducted in 2001 indicates that the presence of radionuclides in the storm drain system has not changed significantly. Therefore, the storm drain system remains an insignificant impact to dose. The VYNPS staff will continue to monitor the presence of plant related radionuclides in the storm drain system.

Table 6.1

Summary of Storm Drain System Sediment Sample Analyses*

Isotope	No. Detected**	Mean (pCi/kg)	Range (pCi/kg)	Station With Highest Detected Concentration
Be-7	24/24	7.3 E 3	(0.18 – 43.5) E 3	MH-12 (SE-95)
K-40	24/24	1.0 E 4	(0.17 - 1.48) E 4	MH-11F (SE-98)
Th-232	17/24	5.3 E 2	(1.06-8.47) E 2	MH-11F (SE-98)
Th-228	23/24	4.7 E 2	(0.10-0.71) E 3	MH-11F (SE-98)
Mn-54	6/24	6.2 E 1	(1.7-11.5) E 1	MH-12 (SE-95)
Ra-226	19/24	1.2 E 3	(0..12-3.72) E 3	MH-12 (SE-95)
Cs-134	4/24	3.3 E 1	(1.2-4.8) E 1	MH-11E (SE-99)
Cs-137	20/24	1.6 E 3	(.015-5.2) E 3	MH-12 (SE-95)
Zn-65	6/24	1.4 E 2	(0.46-1.98)E 2	MH-12 (SE-95)
Ag-110m	1/24	2.2 E 1	NA	MH-12A (SE-92)
Co-57	1/24	2.7 E 1	NA	MH-11F (SE-98)
Sb-124	2/24	3.8 E 1	(1.48-6.08)E 1	MH-12 (SE-95)
Ru-103	1/24	3.0 E 1	NA	MH-12A (SE-92)
Nb-95	3/24	3.9 E 1	(2.6-5.7)E 1	MH-12A (SE-92)
Co-60	12/24	9.6 E 2	(0..13-2.94) E 3	MH-12 (SE-95)

* Radionuclides that were not detected in any sample are not listed

** The fraction of sample analyses yielding detectable measurements (i.e. >3 standard deviations).

The mean and the range are determined only from the samples where activity was >3 standard deviations.

Table 6.2

Summary of Storm Drain System Water Sample Analyses*

Isotope	No. Detected **	Mean (pCi/kg)	Range (pCi/kg)	Station With Highest Detected Concentration
Gross Beta	21/26	4.1 E 0	(1.5 – 6.3) E 0	MH-12A (WW-12)
Nb-95	1/26	7.4 E 0	NA	MH-14 (WW-10)
Th-228	3/26	6.0 E 0	(4.7 – 6.9) E 0	MH-14 (WW-10)
H-3	1/26	9.7 E 1	NA	MH-14 (WW-10)

* Radionuclides that were not detected in any sample are not listed

** The fraction of sample analyses yielding detectable measurements (i.e. >3 standard deviations).

6.5.3 Ingestion Pathways

6.5.3.1 Milk

Milk samples from cows or goats at several local farms were collected monthly during 2001. Semi-monthly collections were made during the "pasture season" since the milking cows or goats were identified as being fed pasture grass during that time. Each sample was analyzed for I-131 and other gamma-emitting radionuclides. Quarterly composites (by location) were analyzed for Sr-89 and Sr-90.

As expected, naturally-occurring K-40 was detected in all samples. Naturally-occurring Th-232 and Th-228 were detected in a few of the samples. Also expected was Sr-90. Sr-90 was detected in 21 out of 28 indicator samples and 3 out of 4 control samples. Although Sr-90 is a by-product of nuclear power plant operations, the levels detected in milk are consistent with that expected from worldwide fallout from nuclear weapons tests, and to a much lesser degree from fallout from the Chernobyl incident. The Sr-90 levels shown in Table 5.1 and Figure 6.11 are consistent with those detected at other New England farms participating in other plant environmental monitoring programs. This radionuclide and Cs-137 are present throughout the natural environment as a result of atmospheric nuclear weapons testing that started primarily in the late 1950's and continued through 1980. They are found in soil and vegetation, as well as anything that feeds upon vegetation, directly or indirectly. The detection of Cs-137 in environmental milk samples is expected and has been detected in previous years. Cs-137 was detected in 1 of 124 samples in 2001. See Figure 6.10. It should be noted here that most of the Cs-137 concentrations and many of the Sr-90 concentrations shown on Figures 6.10 and 6.11, respectively, are considered "not detectable." All values have been plotted, regardless of whether they were considered statistically significant or not. As shown in these figures, the levels are also consistent with those detected in previous years near the VYNPS plant. There is also little actual difference in concentrations between farms.

6.5.3.2 Silage

A silage sample was collected from each of the required milk sampling stations during October. Each of these was analyzed for gamma-emitting radionuclides and I-131. As expected with all biological media, naturally-occurring K-40 was detected in all samples. Naturally-occurring Be-7 was also detected in 6 of the 7 samples. Th-228, also naturally-occurring, was detected in 3 of seven samples. Th-232, also naturally-occurring, was detected in 3 of seven samples. Bi-214, a naturally-occurring Ra-226 daughter, was detected in 3 of the 6 samples. Cs-137 was detected in 2 of seven samples. No I-131 was detected in any sample.

6.5.3.3 Mixed Grass

Mixed grass samples were collected at each of the air sampling stations on four occasions during 2001. As expected with all biological media, naturally-occurring K-40 and Be-7 were detected in all samples. Th-228 and Th-232 were detected in 4 and 3 of the 26 indicator stations samples.

Cs-137 was detected in 3 of the 24 indicator stations, although at extremely low levels. The required LLD for this Cs-137 in this sample type is 80 pCi/kg and the highest measurement was 27.2 pCi/kg. Although not common, Cs-137 has been detected in mixed grass samples occasionally. It is likely that it is present in a small amount of soil that was inadvertently collected with the grass samples.

No other gamma emitting radionuclides were detected in any of the samples collected in 2001.

6.5.3.4 Fish

Semiannual samples of fish were collected from two locations in the Spring and Fall of 2001. Several species are collected such as Walleye, Small Mouth Bass, Large Mouth Bass, Yellow Perch, White Perch, and Rock Bass. The edible portions of each of these were analyzed for gamma-emitting radionuclides. As expected in biological matter, naturally-occurring K-40 was detected in all samples.

As shown in Table 5.1, Cs-137 was again detected in this year's samples although it was not detected in year 2000. It should be noted that most of the Cs-137 concentrations plotted in Figure 6.12 are considered "not detectable." All values were plotted regardless of whether they were considered statistically significant or not. The Cs-137 levels plotted for 2001 and previous years are typical of concentrations attributable to global nuclear weapons testing fallout.

Zn-65 was also identified in a fish sample from FH-21, the Rte.9 Bridge Control Sample point at a level of 71.3 $\pm$ 20.2 pCi/Kg with an MDC of 63.3 pCi/kg. This value is 27% of the LLD for Zn-65 in Fish required in Table 4.4 (ODCM Table 4.5.1). The source of this activity is, of course, from the power production process. However, it is possible that the presence of Zn-65 may have been the result of cross-contamination from the analytical laboratory, since Zn-65 has not been seen in fish samples from Vermont Yankee in the past.

No other radionuclides were detected.

6.5.4 Direct Radiation Pathway

Direct radiation was continuously measured at 53 locations surrounding the Vermont Yankee plant with the use of thermoluminescent dosimeters (TLDs). In 1999, DR-53 was added on the site boundary. The TLDs are collected every calendar quarter for readout at the environmental laboratory. The complete summary of data may be found in Table 5.3.

From Tables 5.2 and 5.3 and Figure 6.13, it can be seen that the Inner and Outer Ring TLD mean exposure rates were not significantly different in 2001. This indicates no significant overall increase in direct radiation exposure rates in the plant vicinity. It can also be seen from these tables that the Control TLD mean exposure rate was not significantly different than that at the Inner and Outer Rings. Figure 6.13 also shows an annual cycle at both indicator and control locations. The lowest point of the cycle occurs during the winter months. This is due primarily to the attenuating effect of the snow cover on radon emissions and on direct irradiation by naturally-occurring radionuclides in the soil. Differing amounts of these naturally-occurring radionuclides in the underlying soil, rock or nearby building materials result in different radiation levels between one field site and another.

Upon examining Figure 6.17, as well as Table 5.2, it is evident that in recent years station DR-45 had a higher average exposure rate than any other station. This location is on-site, and the higher exposure rates are due to plant operations and activities in the immediate vicinity of this TLD. There is no significant dose potential to the surrounding population or any real individual from these sources since they are located on the back side of the plant site, between the facility and the river. The same can be said for station DR-46, which has shown higher exposure rates in previous years.

Environmental Program Trend Graphs

2001 Radiological Environmental Operating Report
Vermont Yankee

Graphs:

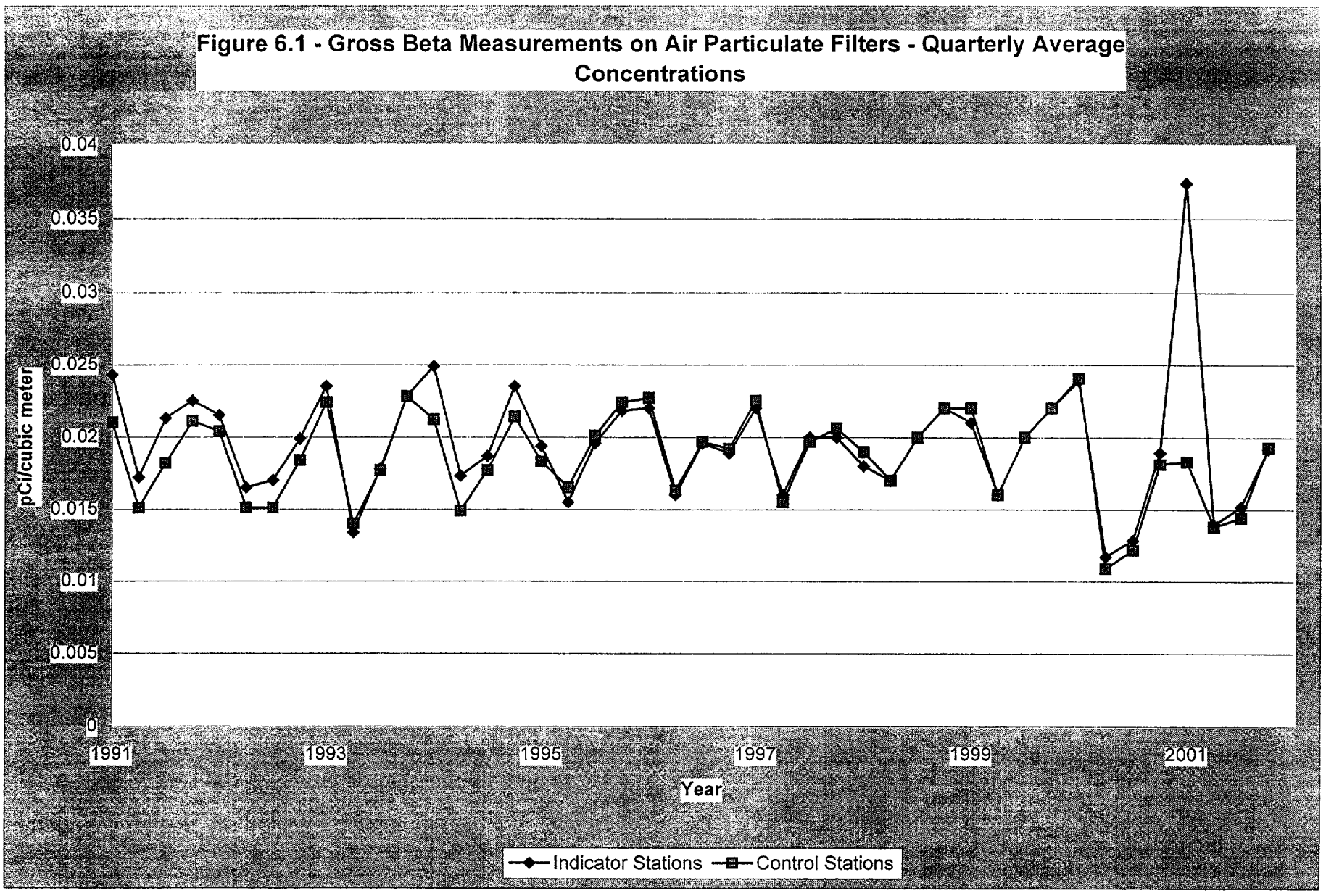


Figure 6.1 - Gross Beta Measurements on Air Particulate Filters - Quarterly Average Concentrations
pCi/cubic meter
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1991
1993
1995
1997
1999
2001
Year
Indicator Stations
Control Stations

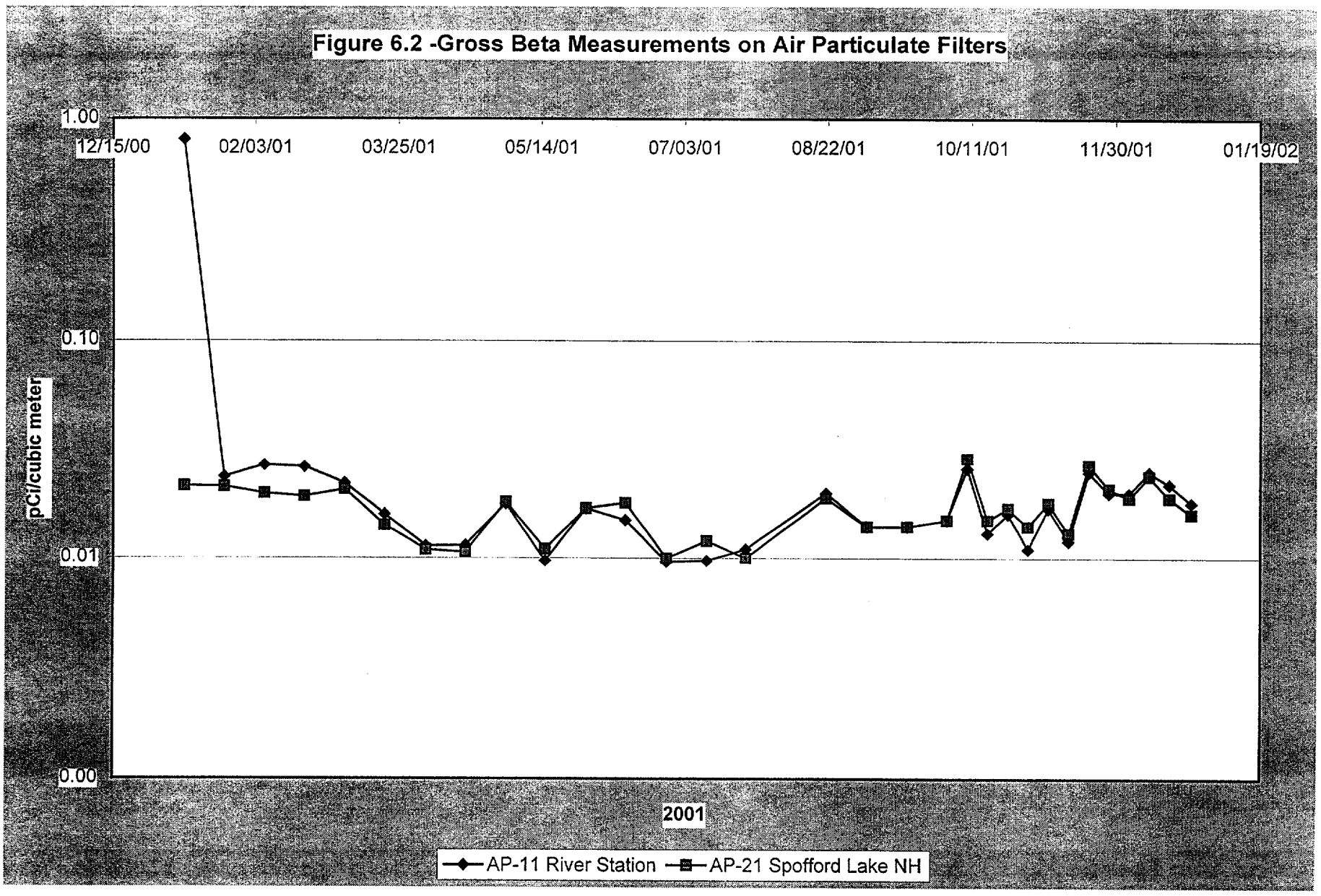


Figure 6.2 -Gross Beta Measurements on Air Particulate Filters
1.00
0.10
0.01
0.00
pCi/cubic meter
12/15/00
02/03/01
03/25/01
05/14/01
07/03/01
08/22/01
10/11/01
11/30/01
01/19/02
2001
AP-11 River Station
AP-21 Spofford Lake NH

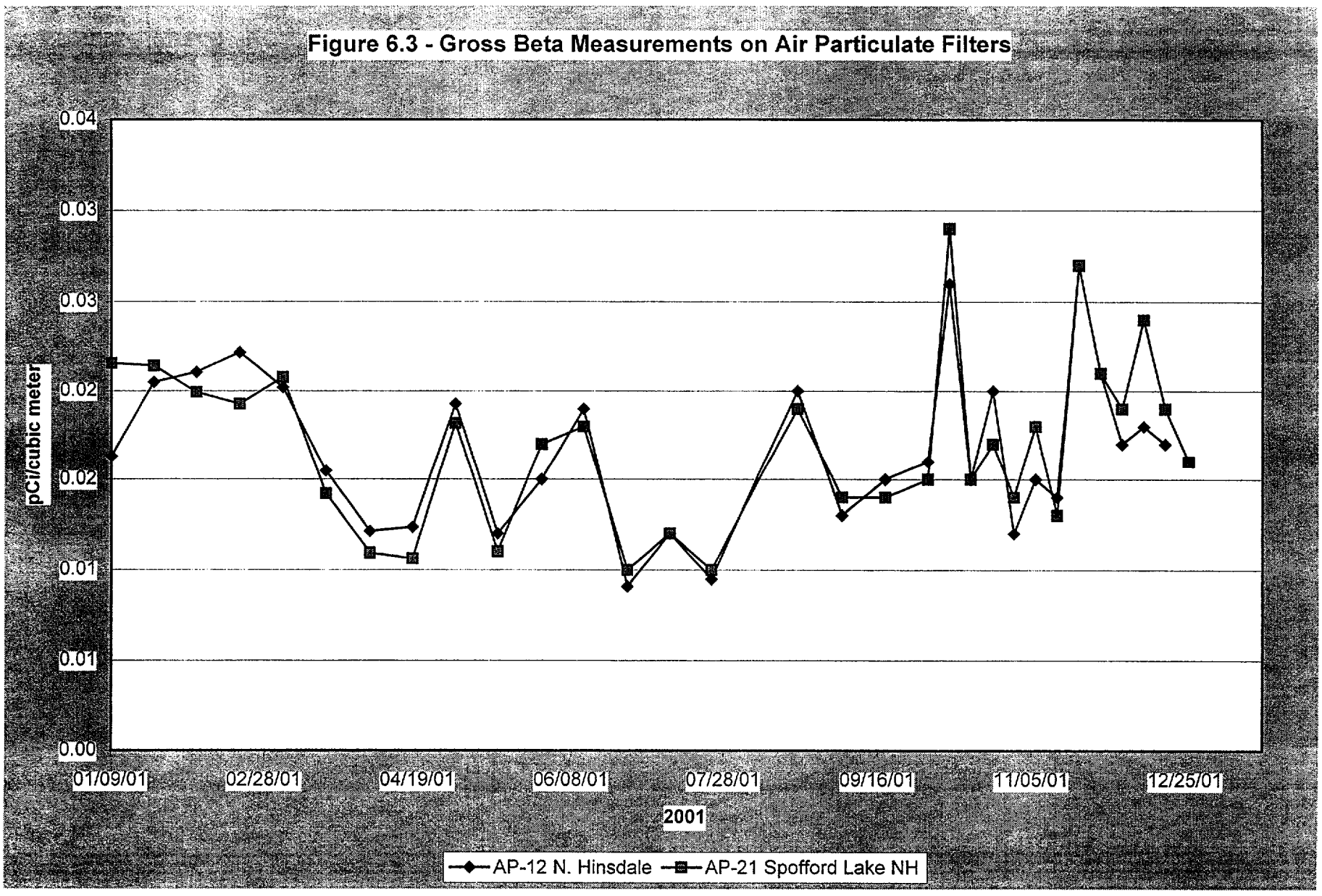
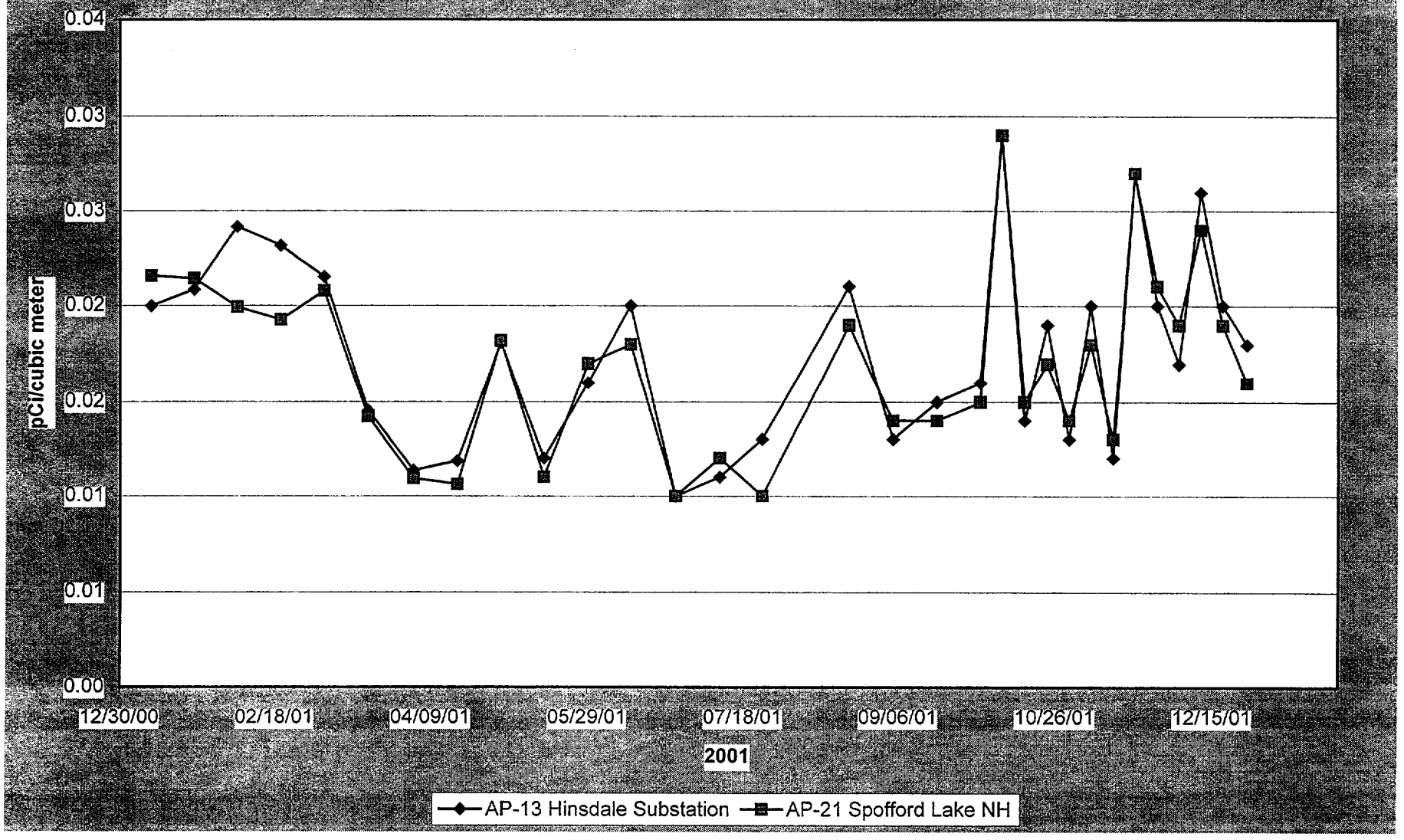


Figure 6.3 - Gross Beta Measurements on Air Particulate Filters
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
pCi/cubic meter
01/09/01
02/28/01
04/19/01
06/08/01
07/28/01
09/16/01
11/05/01
12/25/01
2001
AP-12 N. Hinsdale
AP-21 Spofford Lake NH

Figure 6.4 - Gross Beta Measurements on Air Particulate Filters



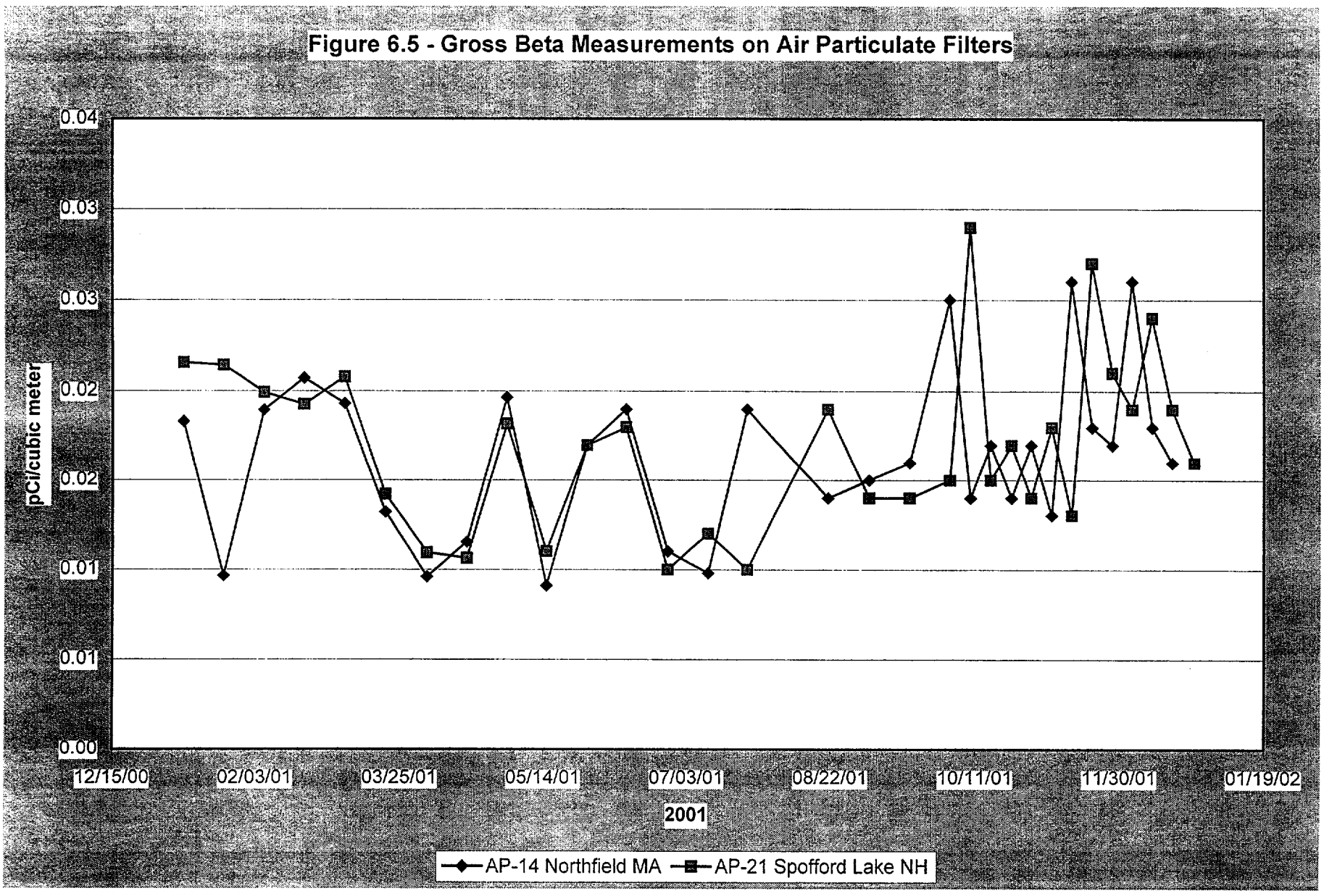


Figure 6.5 - Gross Beta Measurements on Air Particulate Filters
pCi/cubic meter
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
12/15/00
02/03/01
03/25/01
05/14/01
07/03/01
08/22/01
10/11/01
11/30/01
01/19/02
2001
AP-14 Northfield MA
AP-21 Spofford Lake NH

Figure 6.6 - Gross Beta Measurements on Air Particulate Filters

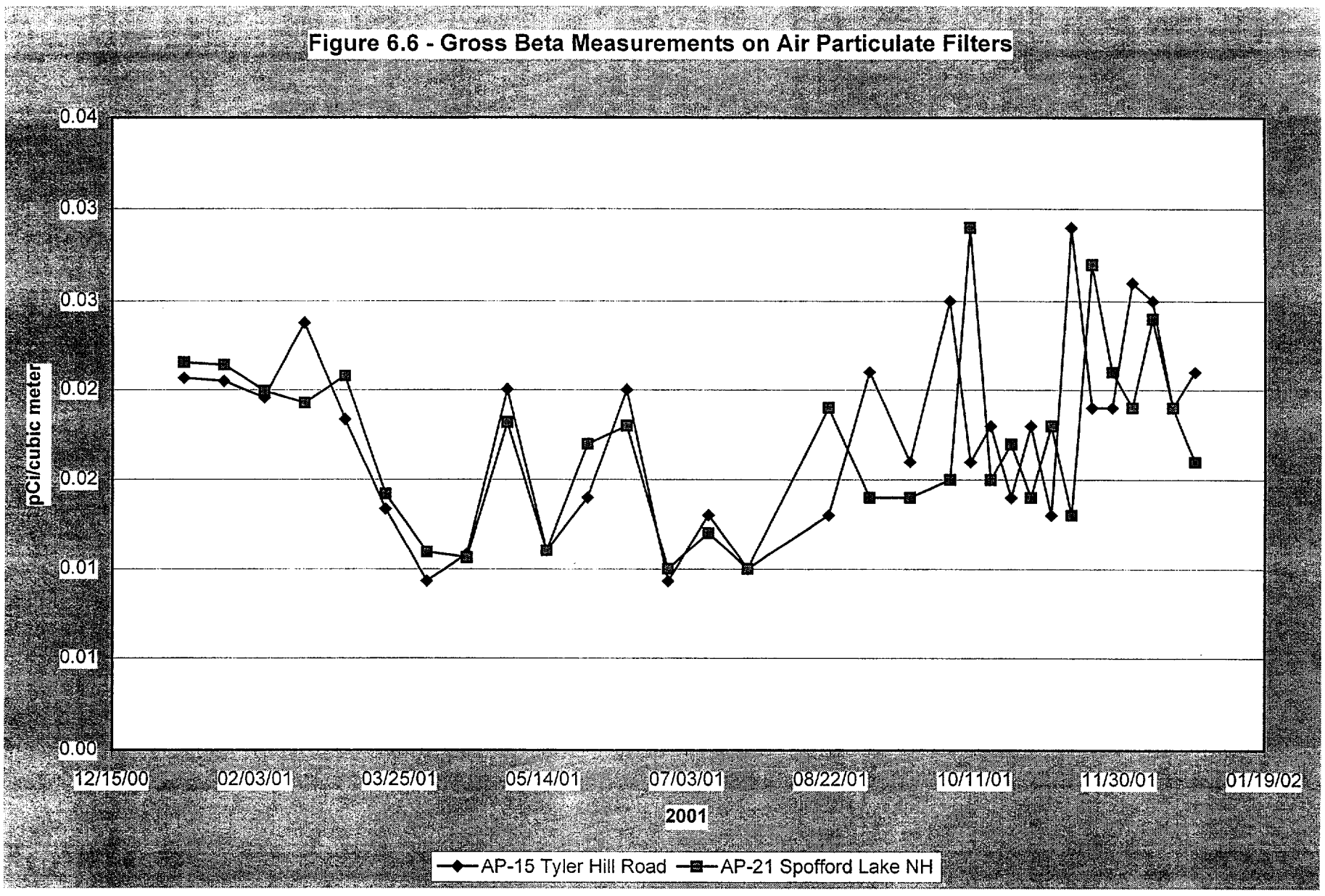
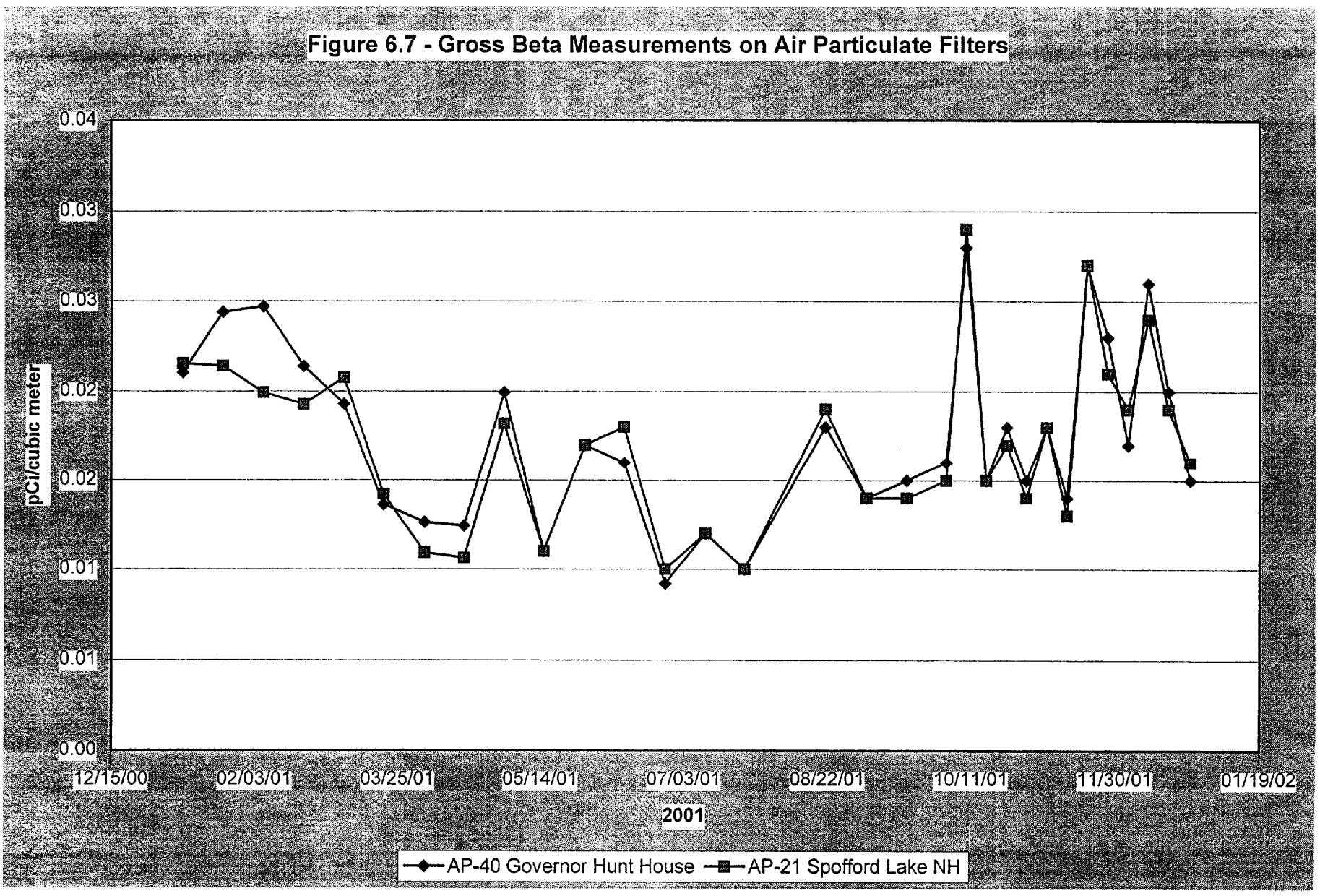
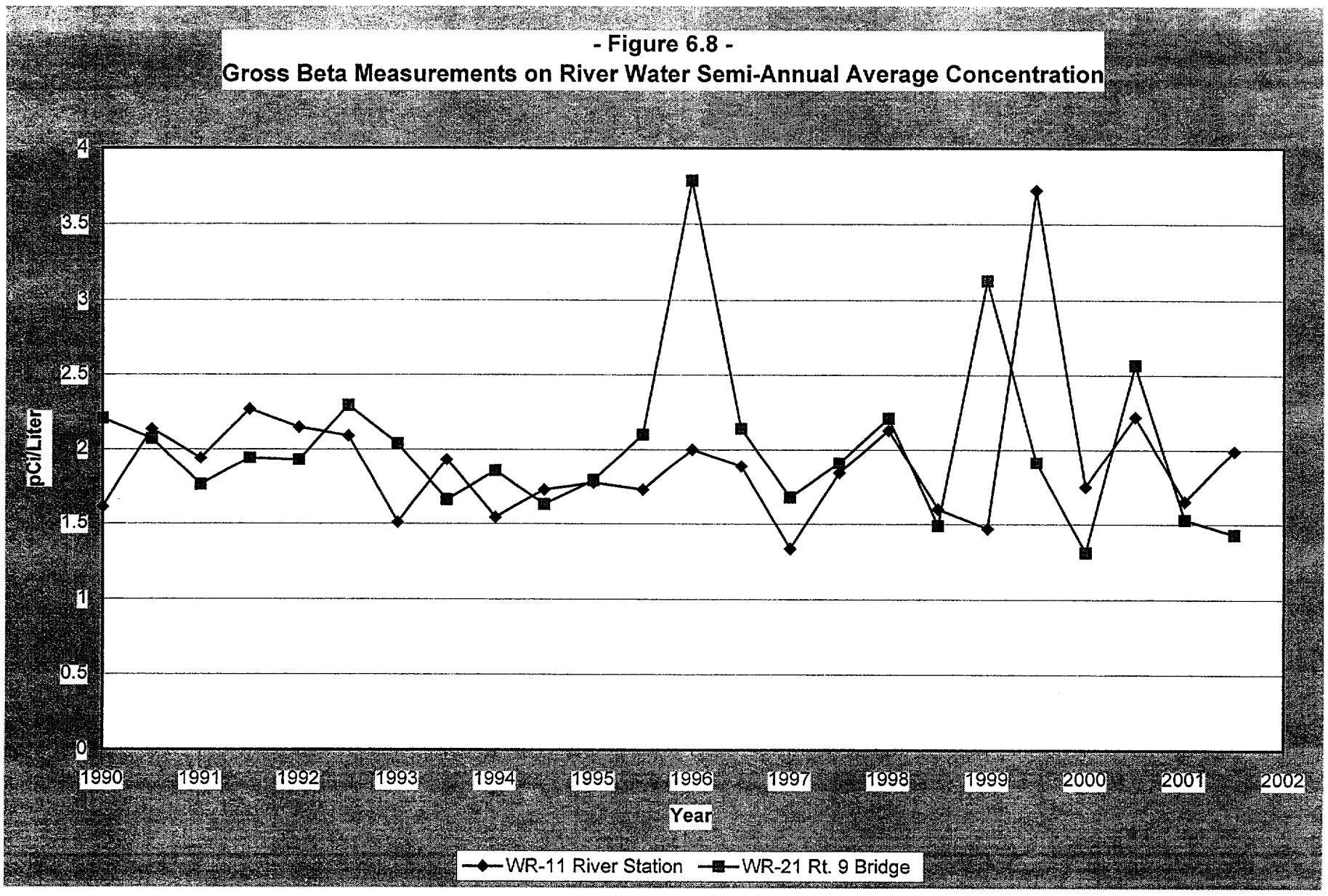


Figure 6.7 - Gross Beta Measurements on Air Particulate Filters



- Figure 6.8 -
Gross Beta Measurements on River Water Semi-Annual Average Concentration



- Figure 6.9 -
Gross Beta Measurements on Ground Water-
Semi Annual Average Concentrations

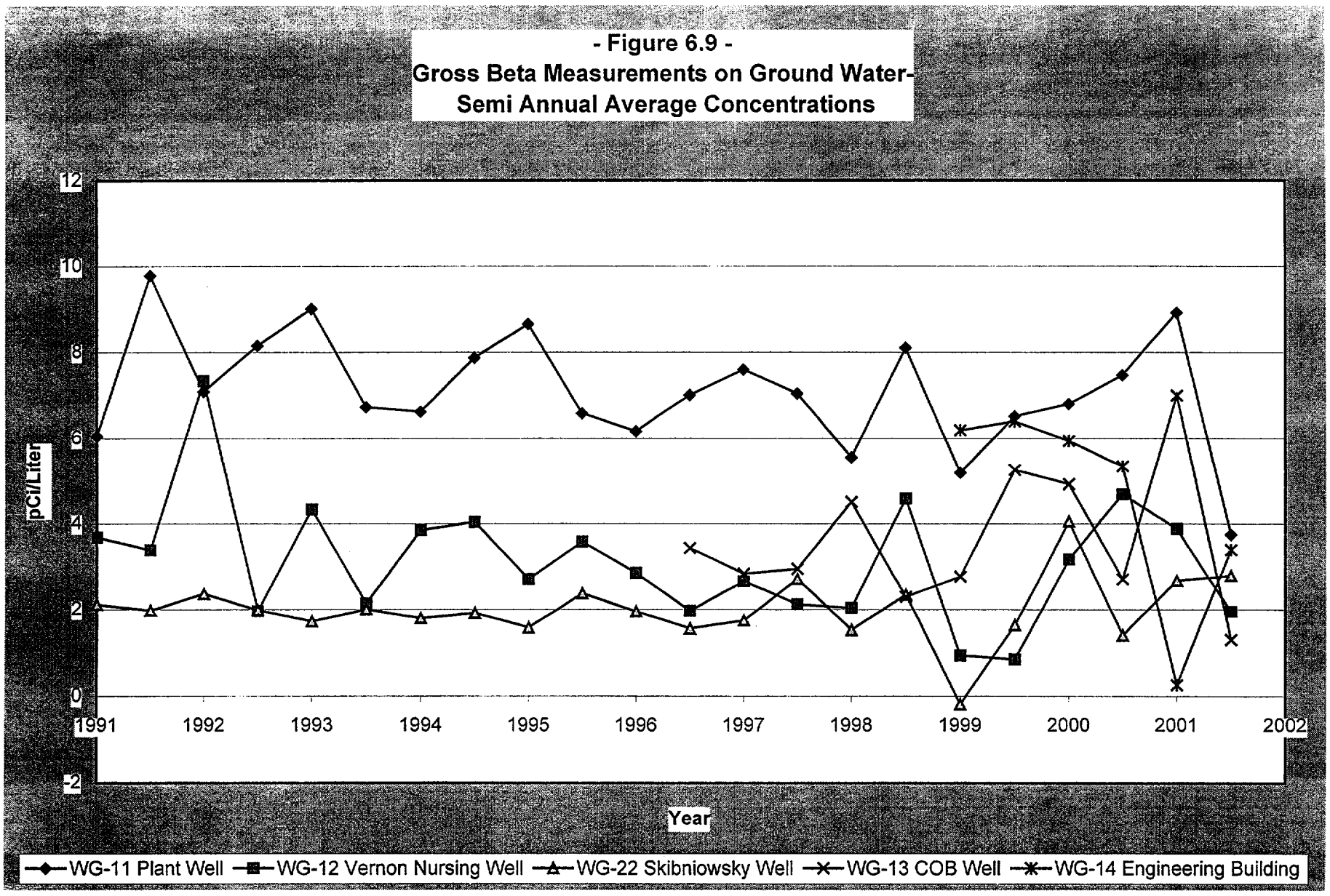
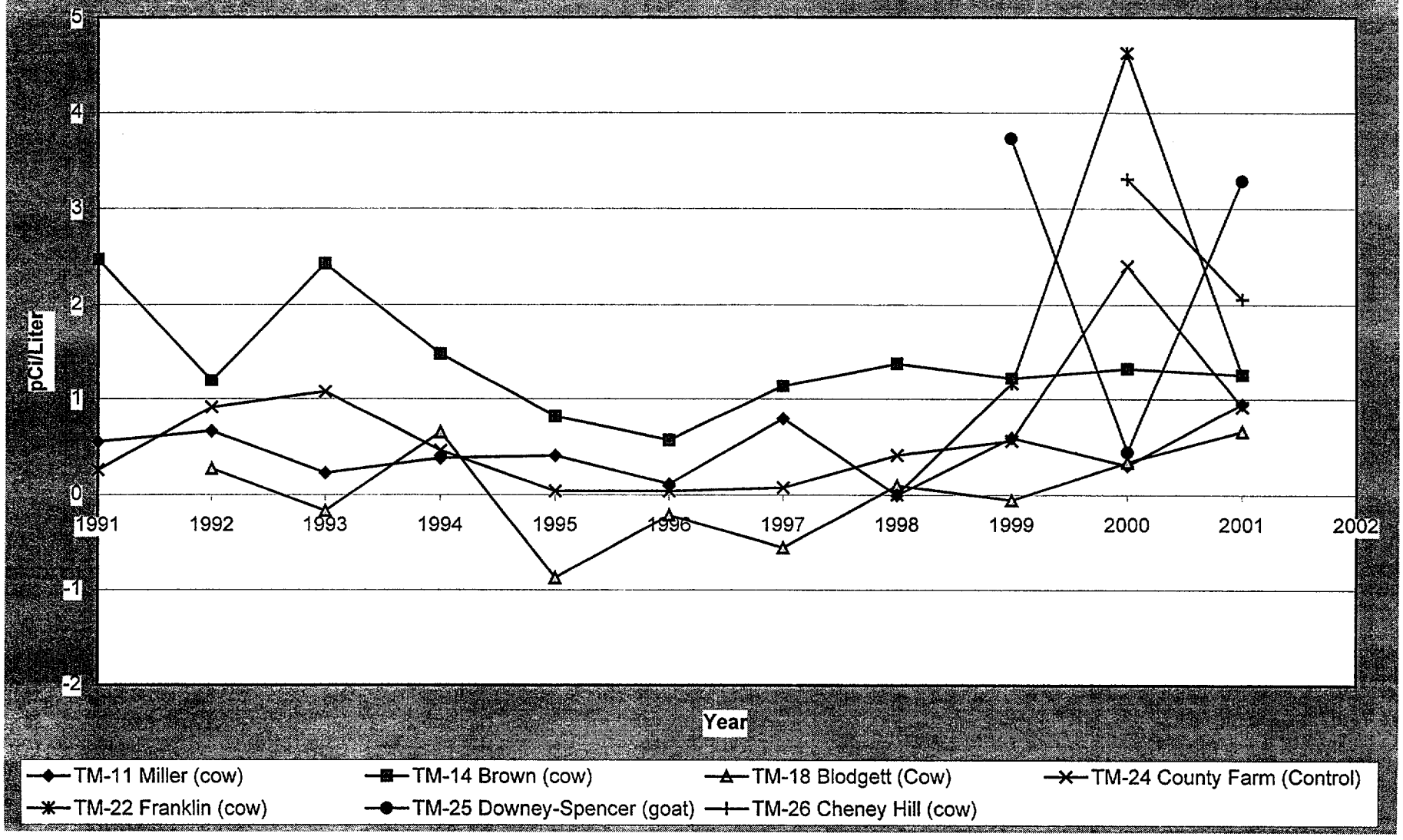


Figure 6.10 - Cesium-137 in Milk - Annual Average Concentration



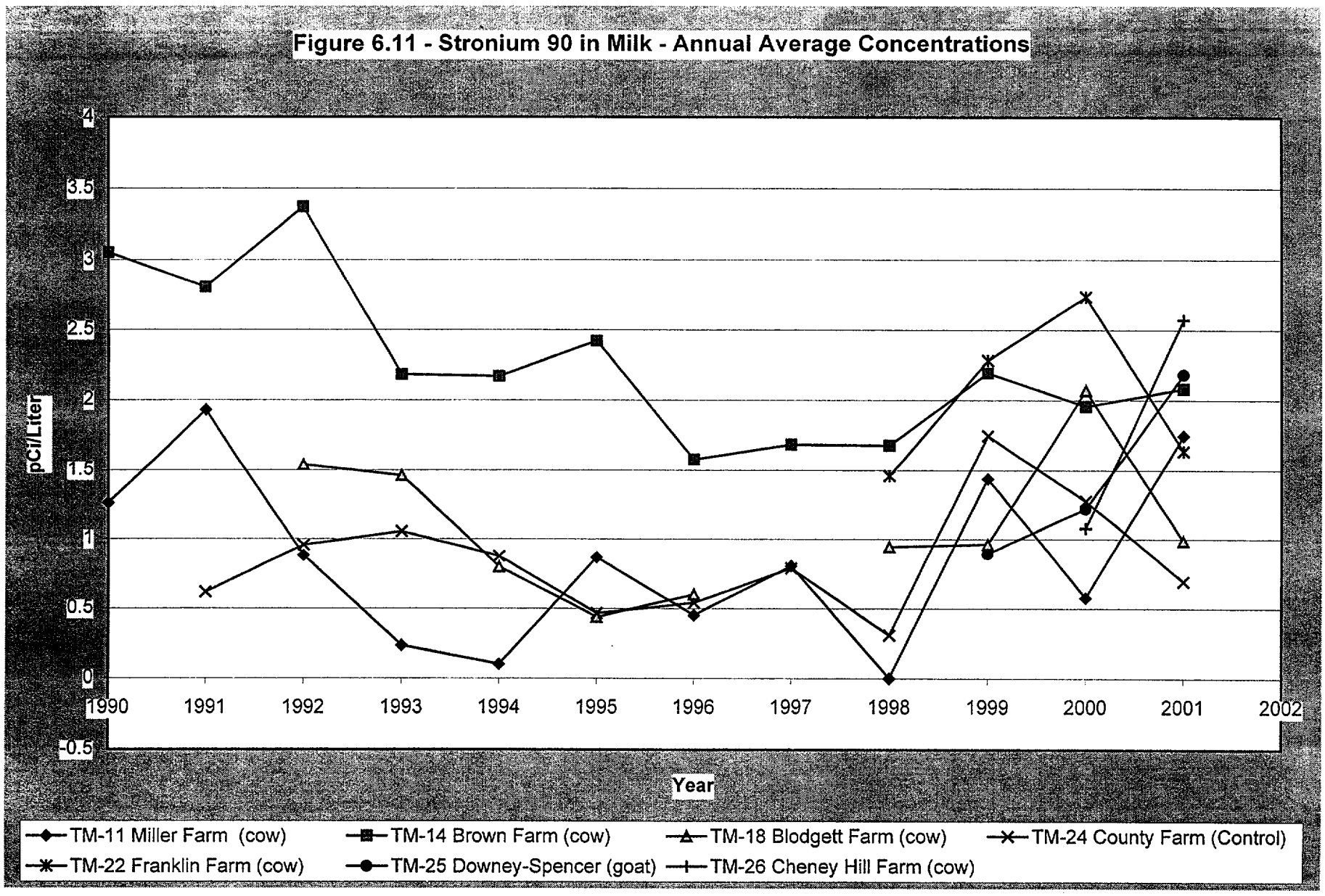


Figure 6.11 - Stronium 90 in Milk - Annual Average Concentrations
pCi/Liter
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
TM-11 Miller Farm (cow)
TM-14 Brown Farm (cow)
TM-18 Blodgett Farm (cow)
TM-24 County Farm (Control)
TM-22 Franklin Farm (cow)
TM-25 Downey-Spencer (goat)
TM-26 Cheney Hill Farm (cow)

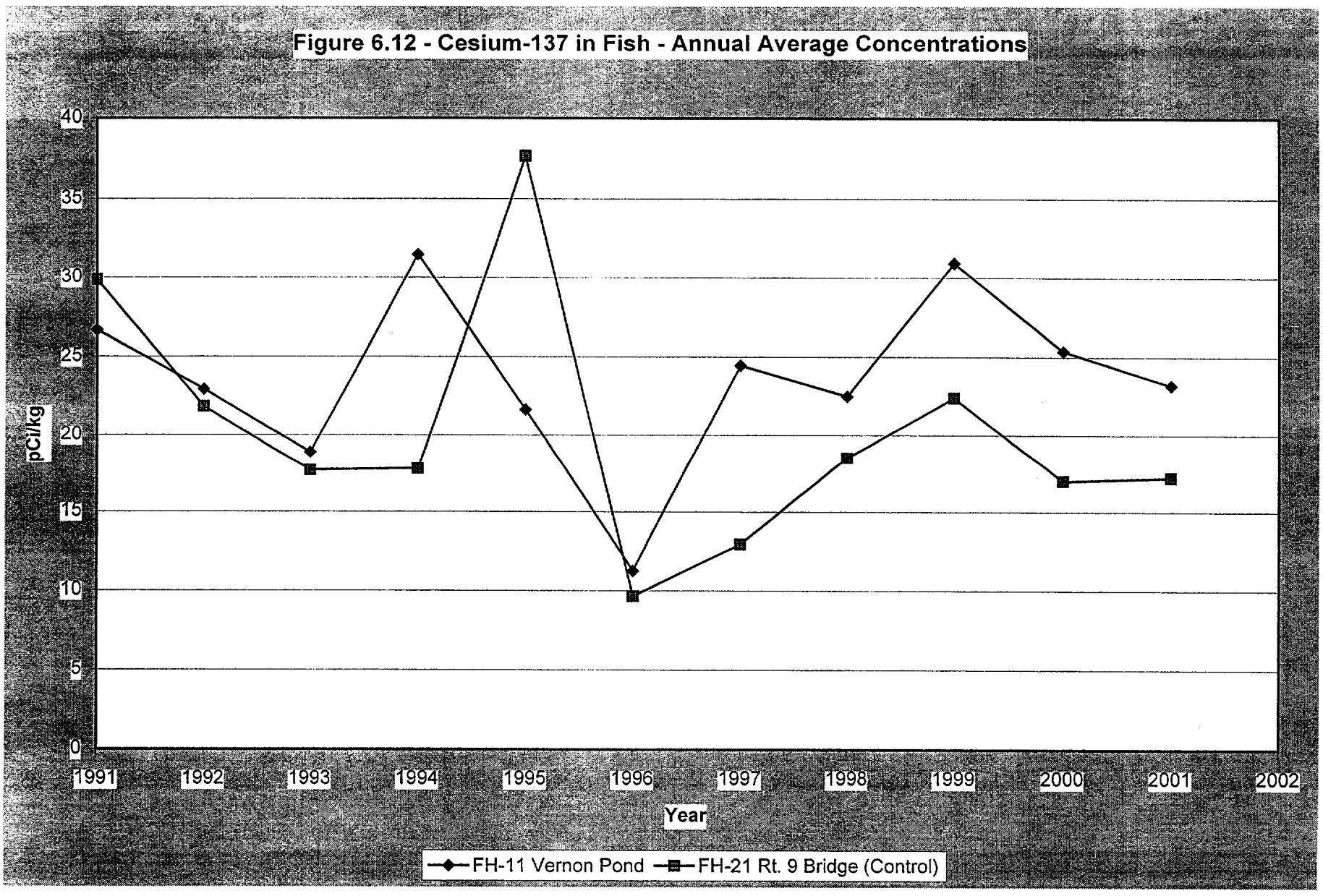


Figure 6.12 - Cesium-137 in Fish - Annual Average Concentrations
pCi/kg
40
35
30
25
20
15
10
5
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
FH-11 Vernon Pond
FH-21 Rt. 9 Bridge (Control)

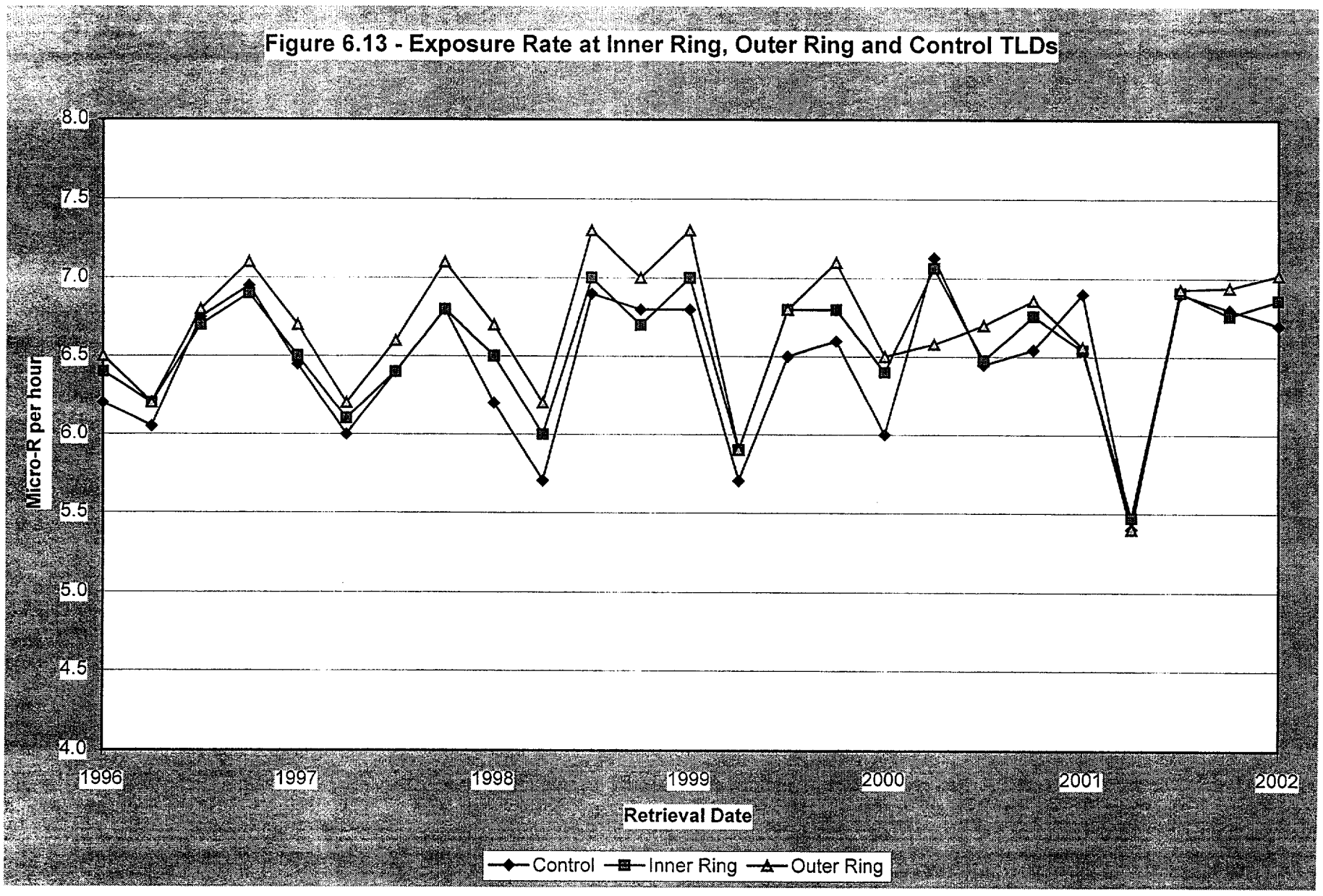


Figure 6.13 - Exposure Rate at Inner Ring, Outer Ring and Control TLDs
Micro-R per hour
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1996
1997
1998
1999
2000
2001
2002
Retrieval Date
Control
Inner Ring
Outer Ring

Figure 6.14 - Exposure Rate at Indicator TLDs, DR01-03

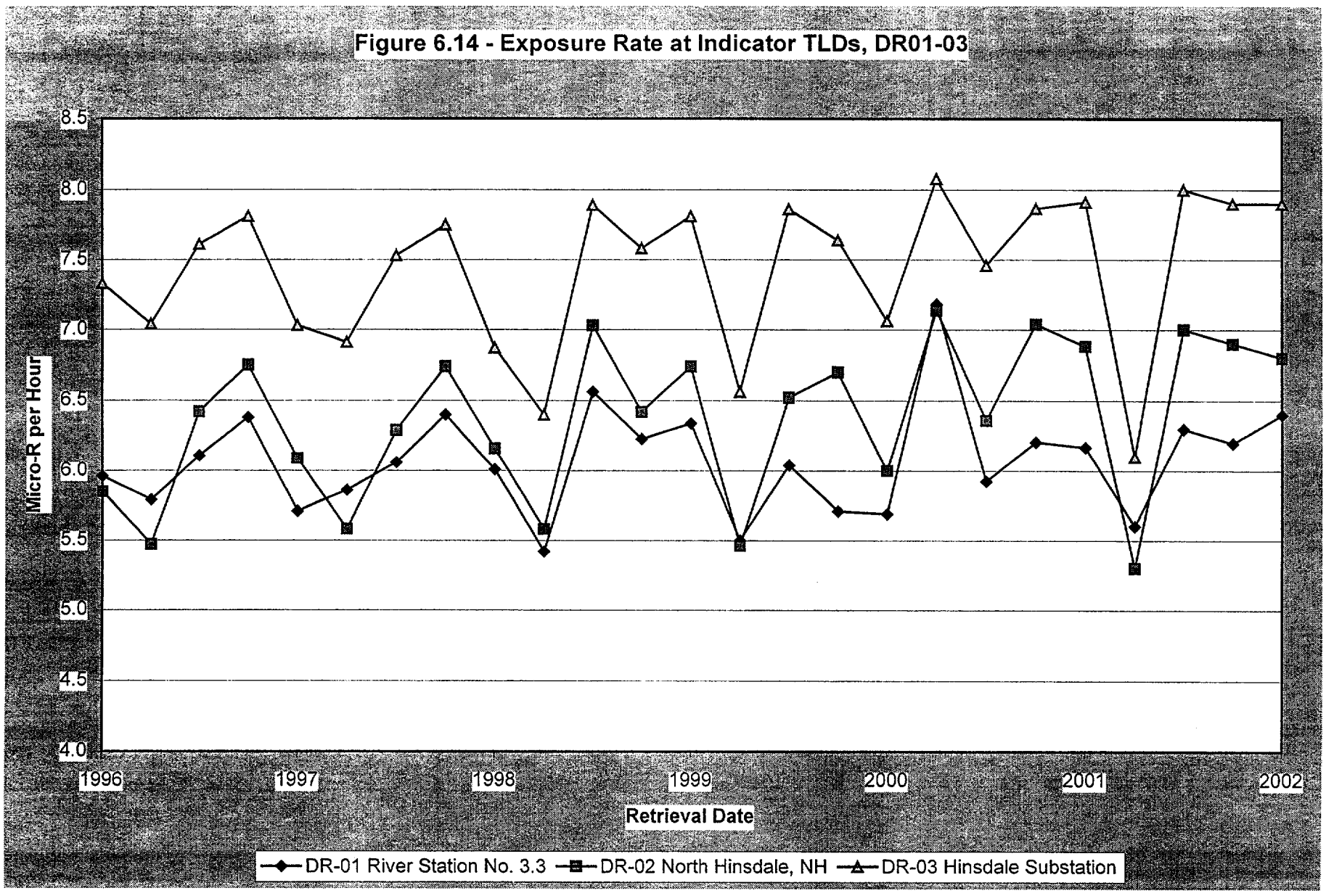


Figure 6.15 - Exposure Rate at Indicator TLDs, DR06 & DR50

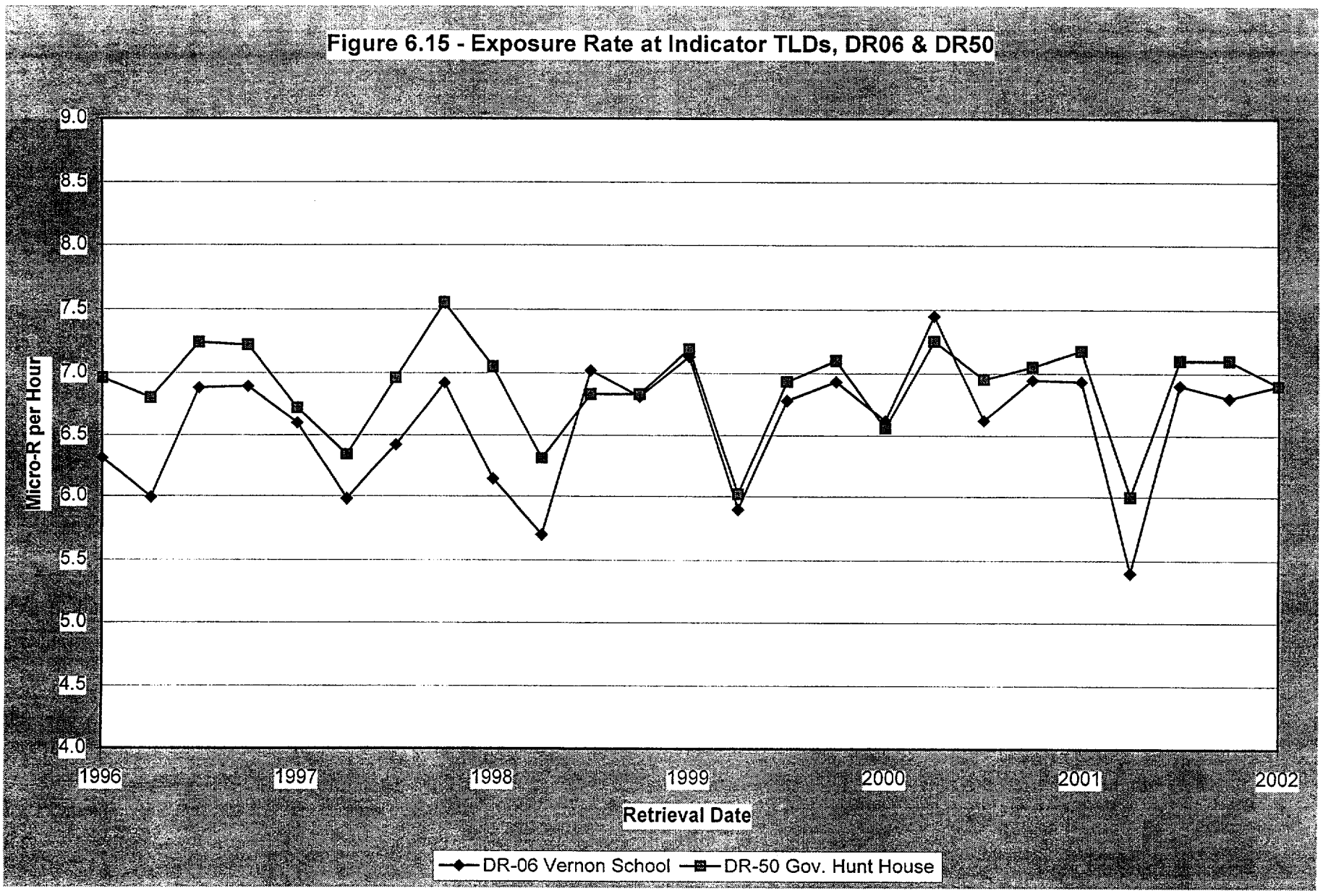


Figure 6.16 - Exposure Rate at Site Boundary TLDs DR07, 08, 41 & 42

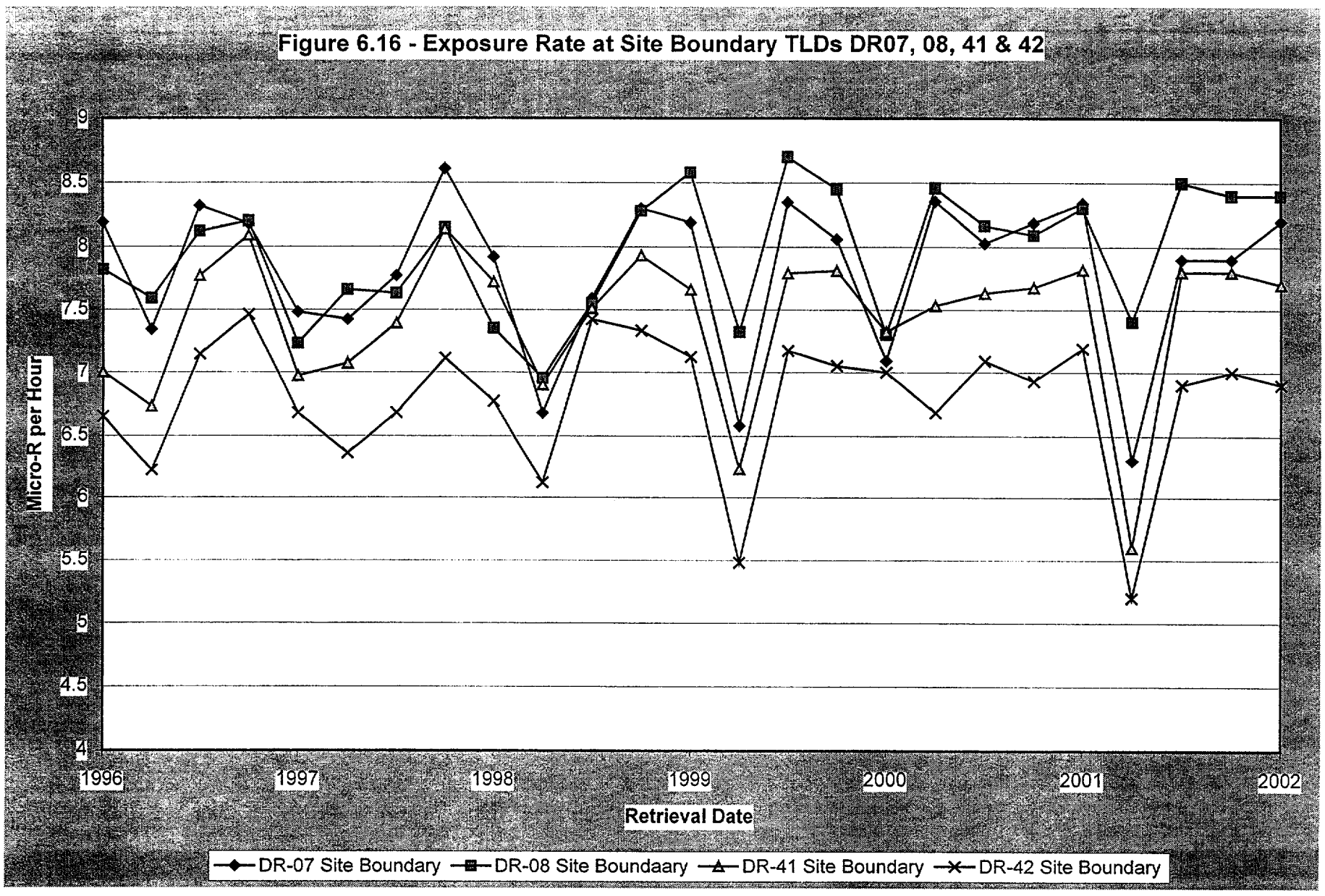


Figure 6.17 - Exposure Rate at Site Boundary TLDs DR43 thru 46

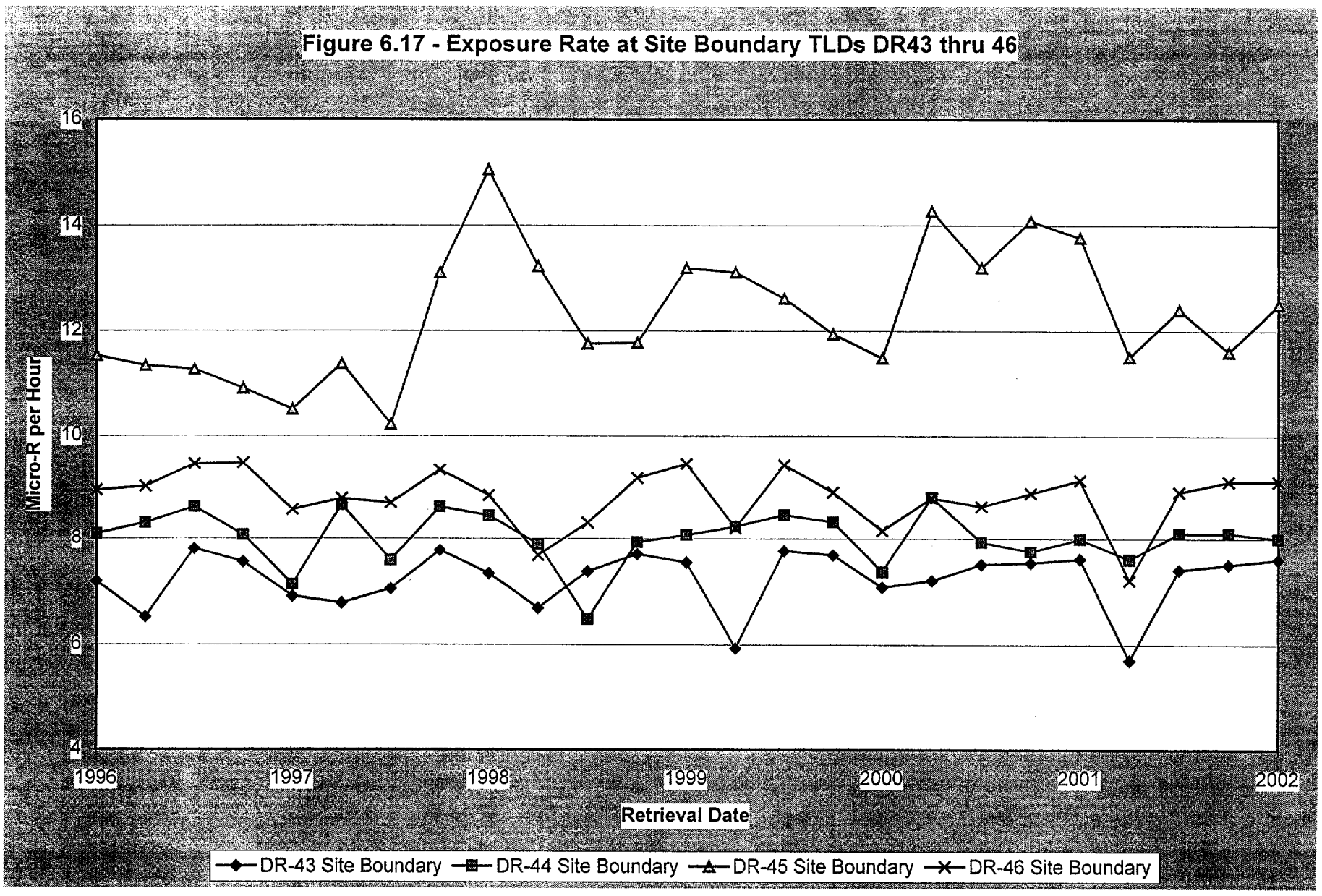


Figure 6.18 - Exposure Rate at Site Boundary TLDs DR47-49 & 51-53

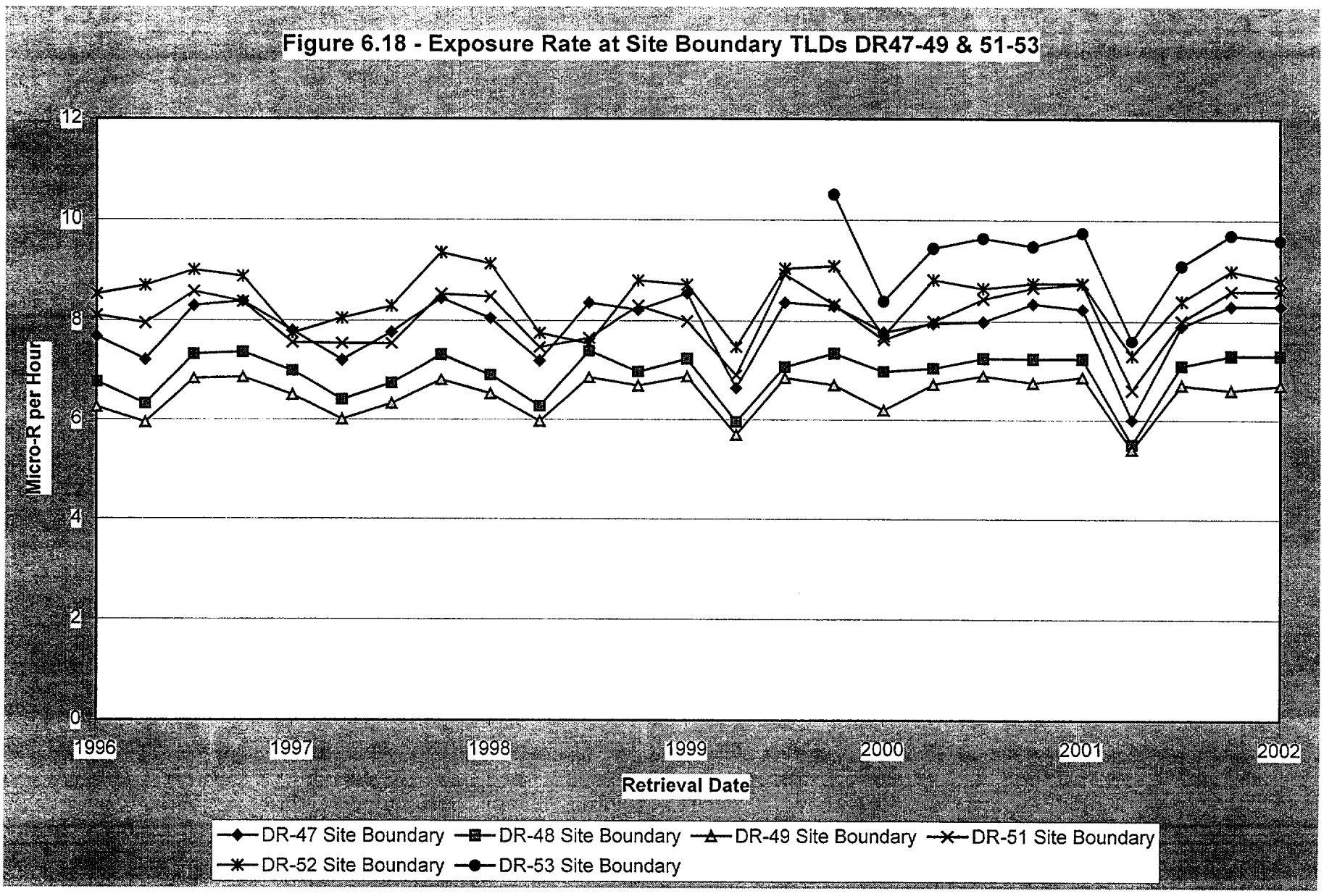


Figure 6.19 - Exposure Rate at Inner Ring TLDs DR09, 11, 13 & 15

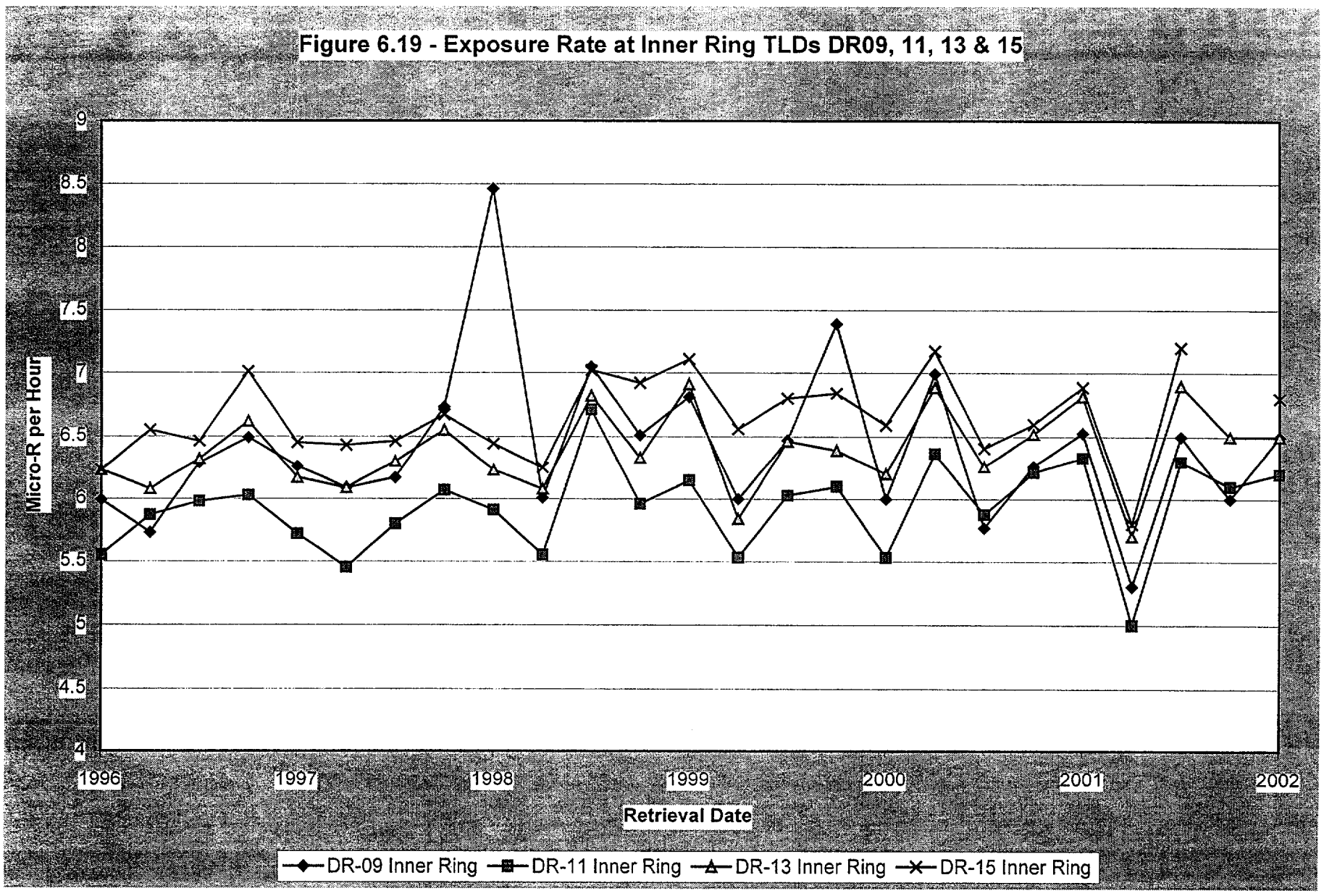


Figure 6.20 - Exposure Rate at Inner Ring TLDs DR17, 19, 21 & 23

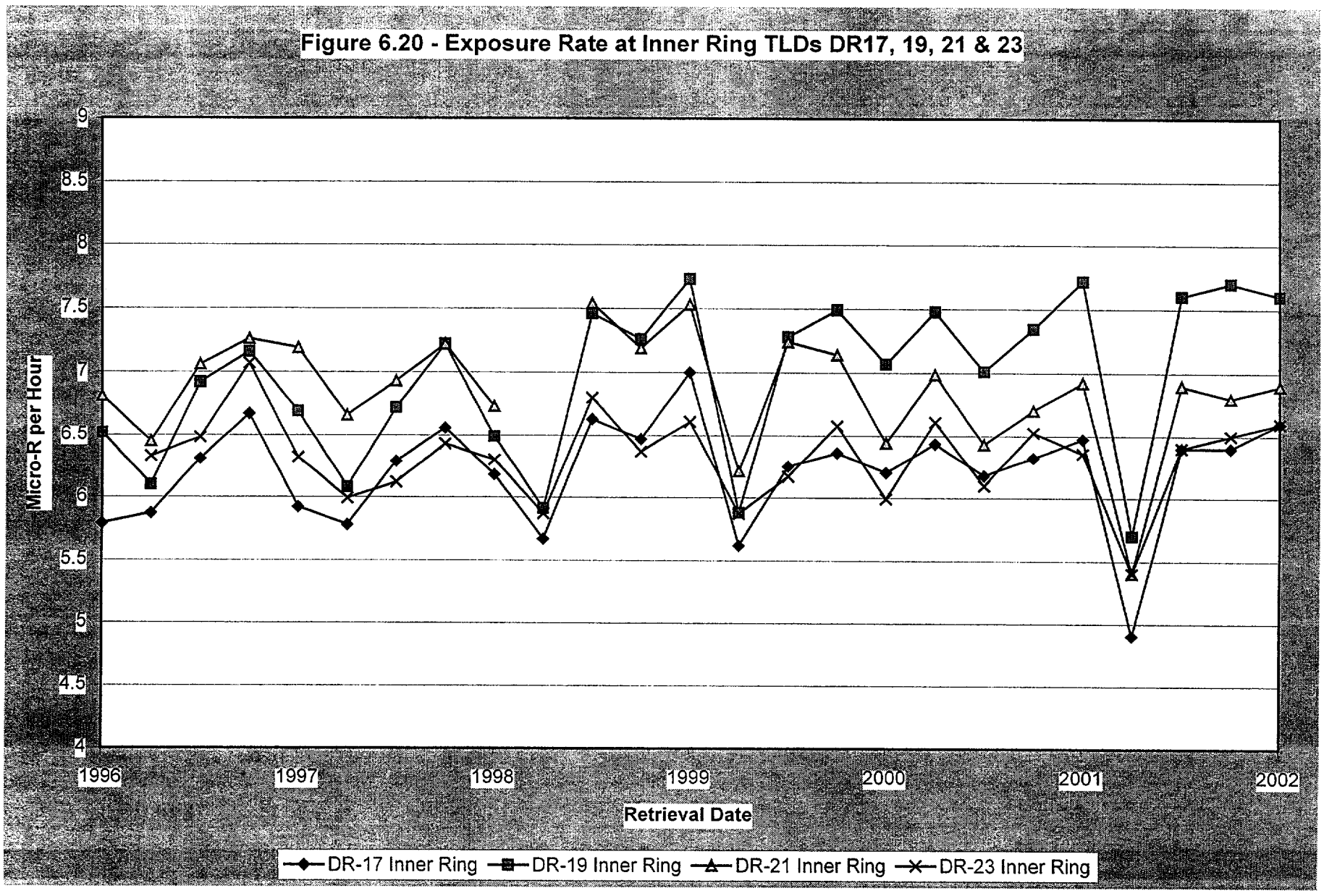
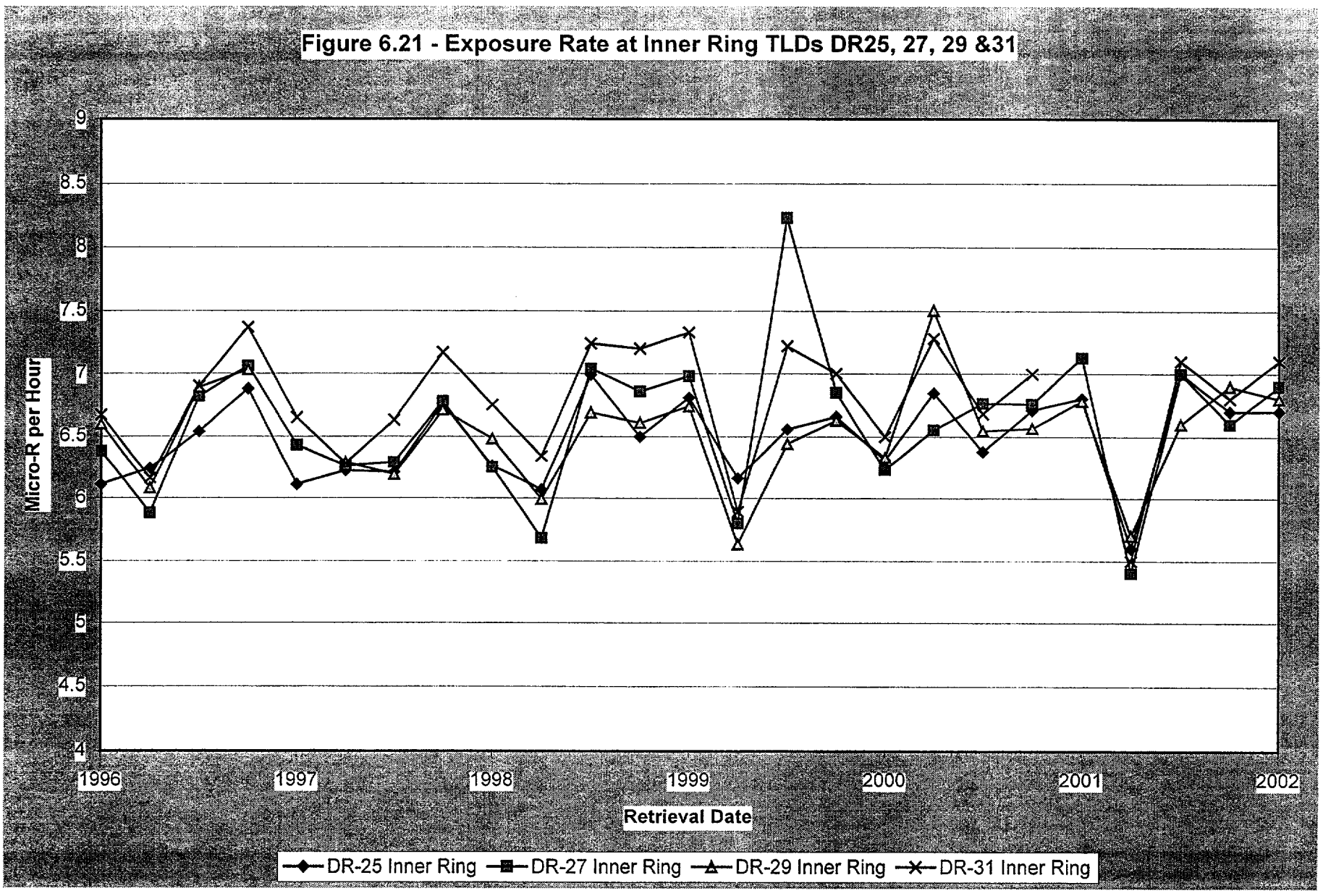


Figure 6.21 - Exposure Rate at Inner Ring TLDs DR25, 27, 29 &31



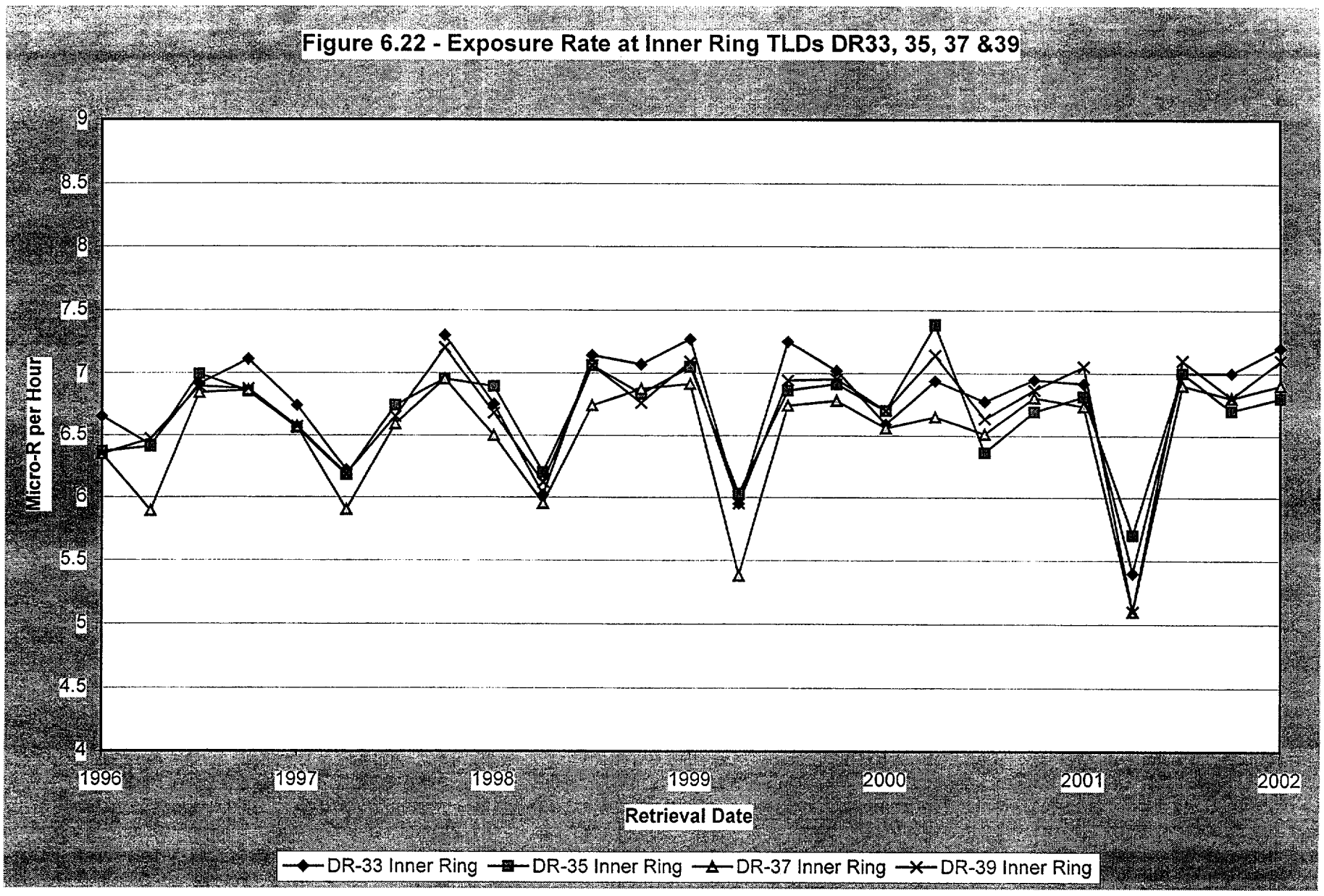


Figure 6.22 - Exposure Rate at Inner Ring TLDs DR33, 35, 37 &39
Micro-R per Hour
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
1996
1997
1998
1999
2000
2001
2002
Retrieval Date
DR-33 Inner Ring
DR-35 Inner Ring
DR-37 Inner Ring
DR-39 Inner Ring

Figure 6.23 - Exposure Rate at Outer Ring TLDs DR10, 12, 14 & 16

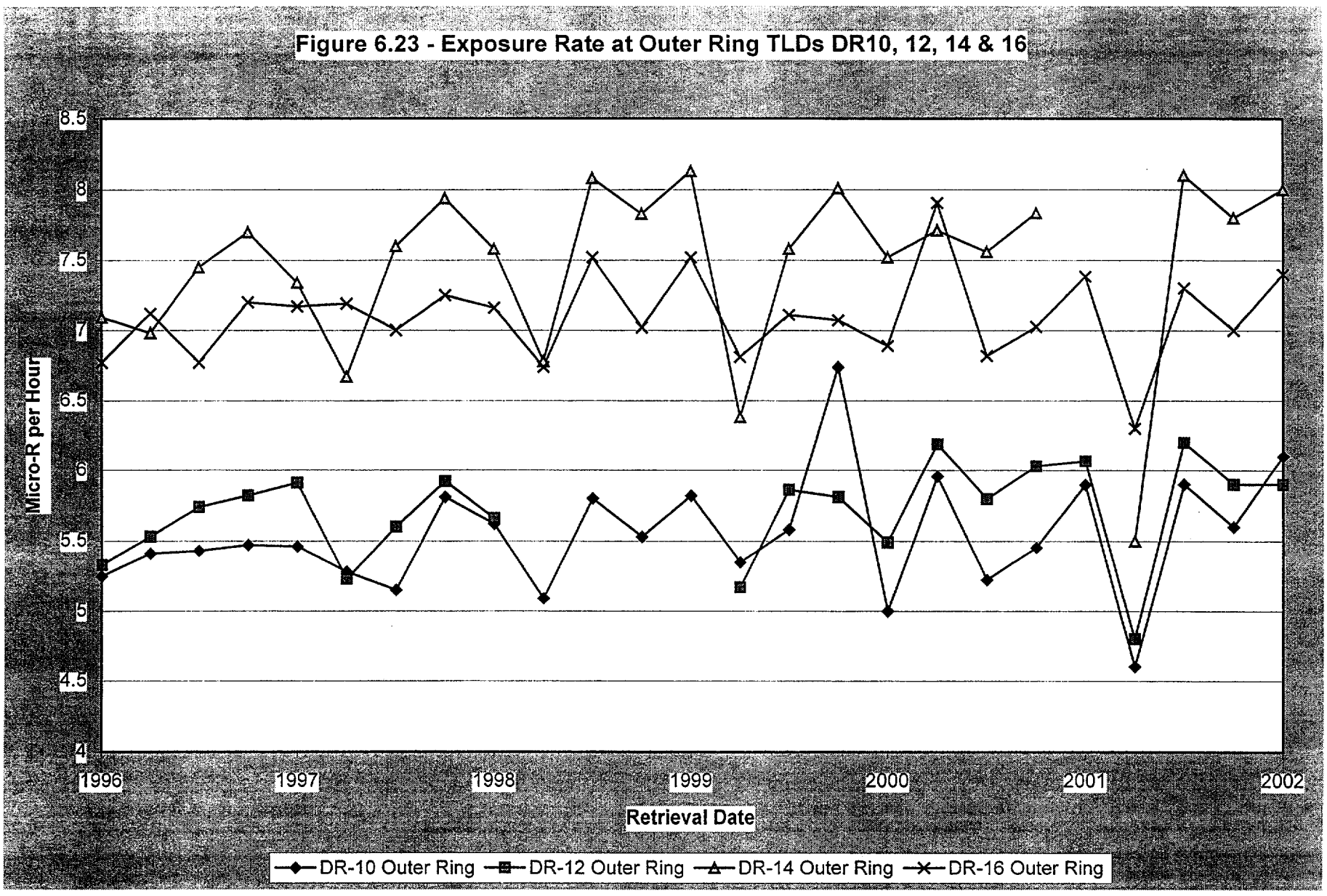


Figure 6.24 - Exposure Rate at Outer Ring TLDs DR18, 20, 22 & 24

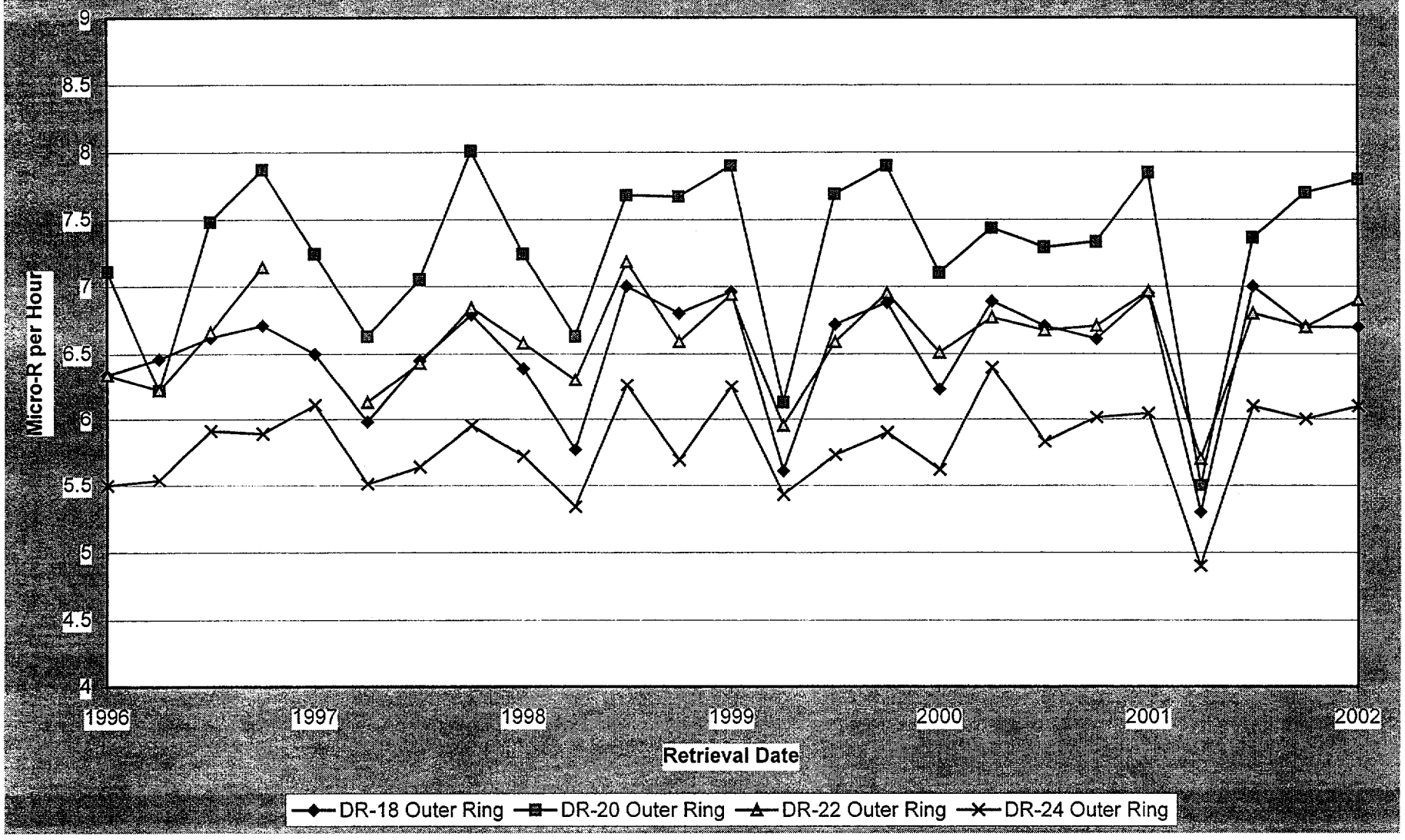


Figure 6.25 - Exposure Rate at Outer Ring TLDs DR26, 28, 30 & 32

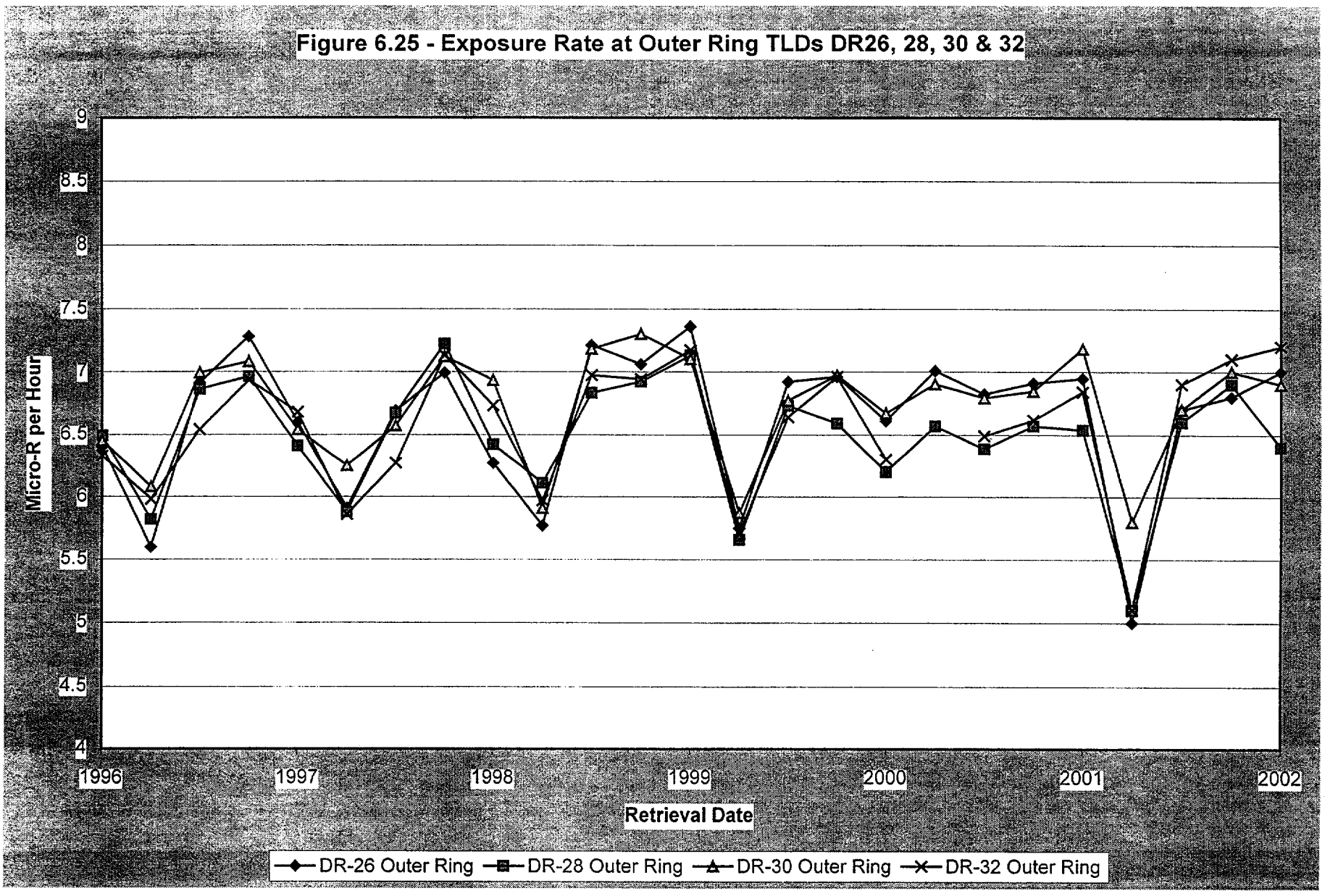


Figure 6.26 - Exposure Rate at Outer Ring TLDs DR 34, 36, 38 & 40

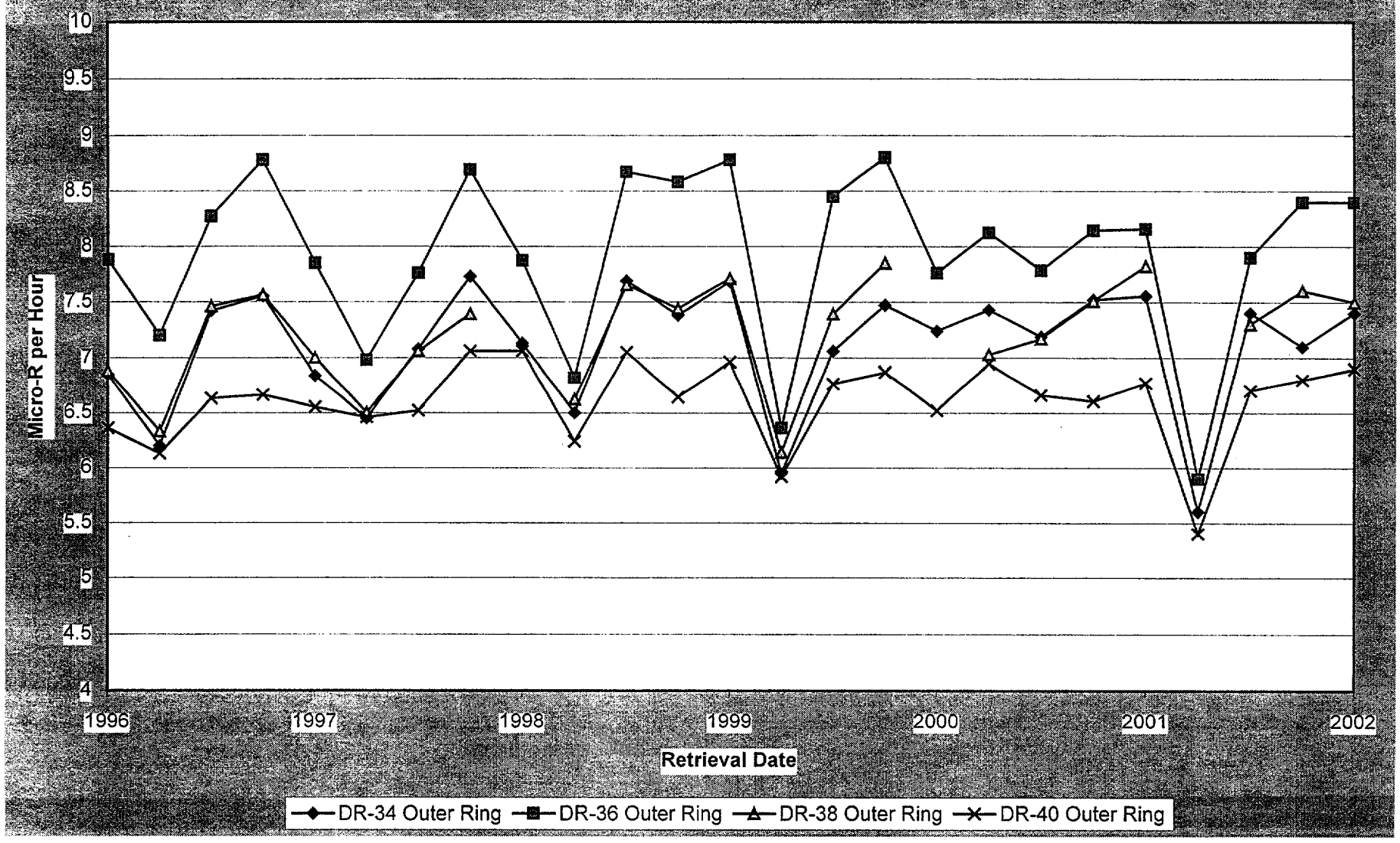
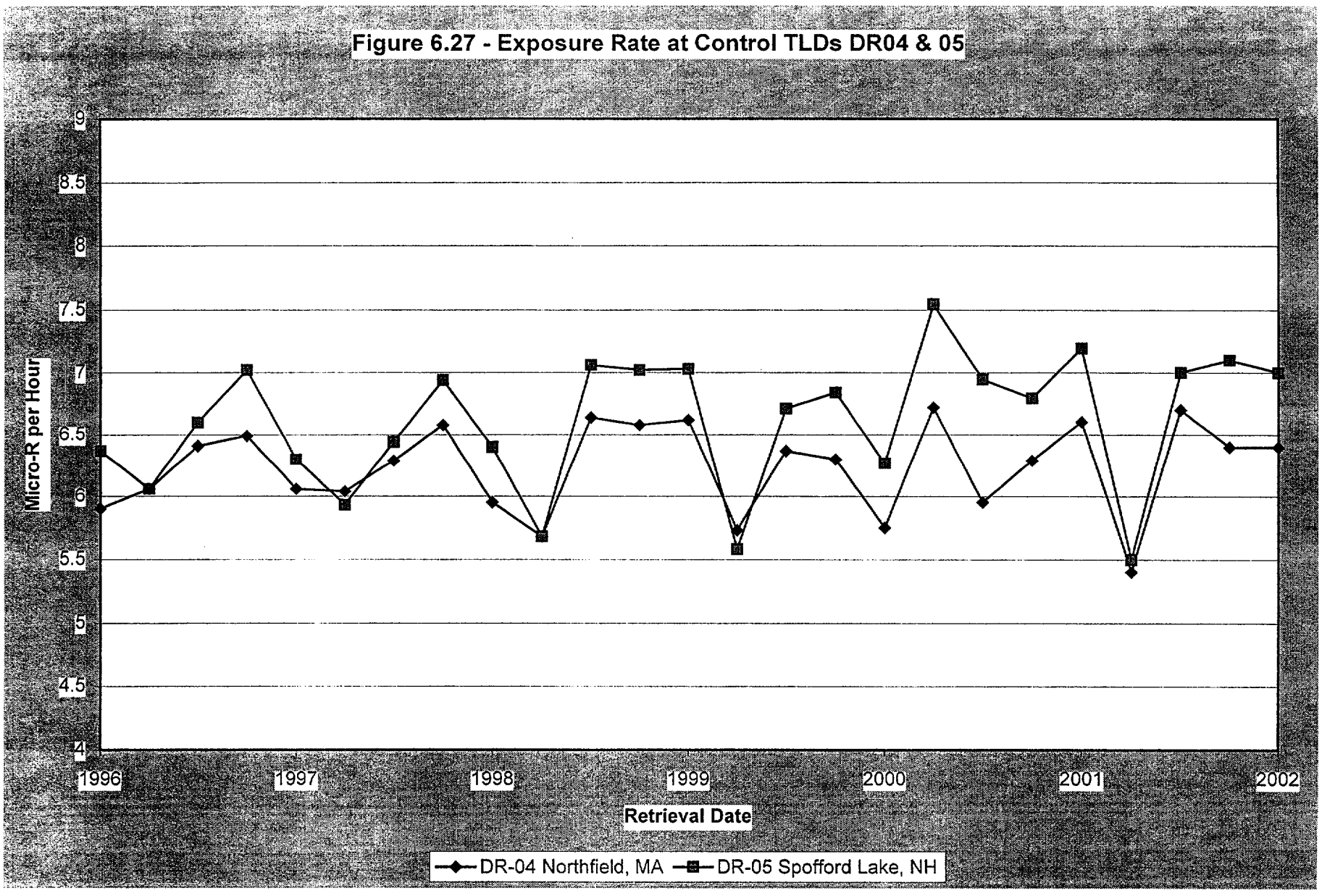


Figure 6.27 - Exposure Rate at Control TLDs DR04 & 05



7 QUALITY ASSURANCE PROGRAM

7.1 Duke Engineering and Services Laboratory (DE&S)

The quality assurance program at the Duke Engineering & Services Environmental Laboratory (DESEL) is designed to serve two overall purposes: 1) Establish a measure of confidence in the measurement process to assure the licensee, regulatory agencies and the public that analytical results are accurate and precise; and 2) Identify deficiencies in the sampling and/or measurement process to those responsible for these operations so that corrective action can be taken. Quality assurance is applied to all steps of the measurement process, including the collection, measurement and reporting of data, as well as the record keeping of the final results. Quality control, as part of the quality assurance program, provides a means to control and measure the characteristics of the measurement equipment and processes, relative to established requirements.

The DESEL employs a comprehensive quality assurance program designed to monitor the quality of analytical processing to ensure reliable environmental monitoring data. The program includes the use of controlled procedures for all work activities, a nonconformance and corrective action tracking system, systematic internal audits, audits by external groups, a laboratory quality control program, and a staff training program. Monitoring programs include the Intralaboratory Quality Control Program administered by the Laboratory QA Officer (used in conjunction with the National Institute of Standards and Technology Measurement Assurance Program, NIST MAP) and a third party interlaboratory program administered by Analytics, Inc. Together these programs are targeted to supply QC/QA sources at 5% of the client sample analysis load. In addition the Laboratory Quality Control Audit Committee administers a blind duplicate program conducted through client environmental monitoring programs.

This summary reports all interlaboratory known values or intralaboratory results received by DESEL on or before December 31, 2001.

7.1.1 Intralaboratory Quality Control Program

The DESEL QA Officer administers an extensive intralaboratory quality control program in which process check samples are submitted for analysis. These samples are submitted either in duplicate to evaluate the precision of a measurement process or are "spiked" with a known amount of radioactive material to assess the bias in the measurement. Table 7.1.1 contains the summary of the process check results for January to December 2001. Of the analyses, 99% passed the bias criteria and 100% of the results evaluated for precision were acceptable.

7.1.2 Third Party Intercomparison Program

The DESEL participates in a third party intercomparison program managed by Analytics Inc. to satisfy the requirement of the Environmental Technical Specification/ODCM. The DESEL Analytics program was originally used to augment the EPA Intercomparison Program that it now replaces. The current program is designed to be comparable to the pre-1996 EPA PE Program in terms of the number of

samples, matrices and nuclides. The results for the 4th quarter 2000 through the 3rd quarter 2001 are summarized in Table 7.1.2. Each sample is analyzed in triplicate and the results are evaluated against the acceptance criteria described in the DESEL Manual 100-Laboratory Quality Assurance Plan. The DESEL acceptance criteria is summarized at the end of Table 7.1.2. This acceptance protocol is used for all interlaboratory programs with no pre-set acceptance criteria. When results fall outside of the acceptance criteria, an investigation is initiated to determine the cause of the problem and if appropriate, corrective measures are taken.

Three Analytics results fell in the 'non-agreement' category and were under investigation for their failure at the time of this report.

7.1.3 Blind Duplicate Program

The Laboratory Quality Control Audit Committee (LQCAC) is comprised of representatives from several New England DESEL clients. Two of the primary functions of the LQCAC have been to conduct an annual audit of Laboratory operations and to coordinate the Blind Duplicate Quality Assurance Program. Under the Blind Duplicate Quality Assurance Program, samples are split from homogeneous environmental media by the client and sent to the DESEL for analysis. They are "blind" in that the identification of the matching sample is not identified to the Laboratory. The LQCAC analyses the results of the paired analyses to evaluate the precision of the Laboratory measurements.

Participating clients submitted a total of 31 paired samples in 2001. The measurements evaluated include twenty-five gamma emitting radionuclides, H-3, Sr-89, Sr-90, I-131 and gross-beta. All measurements are evaluated, whether the results are statistically positive or not, and whether the net concentration is positive or negative. During 2001, 99.4% of the results passed the acceptance criteria.

The samples submitted as part of this program are listed in Table 7.1.3.

7.1.4 Environmental TLD Quality Assurance Program

Performance documentation of the routine processing of the Panasonic environmental TLDs (thermoluminescent dosimeter) program at the DESEL is provided by the dosimetry quality assurance testing program. This program includes the National Voluntary Laboratory Accreditation Program, independent third party performance testing by Battelle Pacific Northwest Labs and internal performance testing conducted by the Laboratory QA Officer. Under these programs, dosimeters are irradiated to ANSI specified testing criteria and submitted for processing to the Dosimetry Services Group as "unknowns". The bias and precision of TLD processing is measured against this standard and is used to indicate trends and changes in performance. Instrumentation checks, although routinely performed by the Dosimetry Services Group and representing between 5-10% of the TLDs processed, are not presented in this report because they do not represent a true process check sample since the doses are known to the processor.

Eighty-four performance tests were conducted in 2001 by DESEL and the third party tester. Of these, 100% of the dosimeter evaluations met the acceptance criteria for bias (± 20.1%) and precision (±12.8%). Third Party QC results are summarized below.

Dosimeter Type	Number Tested	Free in Air	
		% passed bias criteria	% passed precision criteria
Panasonic Environmental	84	100	100

Summary of Third Party Testing

Dosimeter Type	Exposure Period	NVLAB Category	Free in Air	
			% (Bias ± SD)	|B| + S*
Panasonic Environmental	Q4/2000	IV, high energy	-1.7 ±0.08	0.025
"	Q1/2001	IV, high energy	8.8 ± 1.2	0.100
"	Q2/2001	IV, high energy	-2.9 ± 1.3	0.042
"	Q3/2001	IV, high energy	6.4 ± 1.3	0.079

Note: Results are expressed as the delivered exposure for environmental TLD. NVLAB Category IV, High energy photons (Cs-137 or Co-60).

* American National Standards Institute (ANSI) Performance Statistic as referenced in the Dosimetry Services Semi-Annual QA Status Report.

TABLE 7.1.1

DESEL RESULTS IN THE INTRALABORATORY PROCESS CONTROL PROGRAM

January - December 2001

Media Analysis	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
I. Air Particulate								
Alpha	9	0	0	0	9	0	0	0
Beta	3	3	3	0	9	0	0	0
Gamma	11	7	8	1	25	2	0	0
Sr89	0	0	2	3	3	0	2	0
Sr90	2	1	2	0	4	1	0	0
II. Milk								
Gamma	85	29	5	1	109	9	2	0
Iodine-LL	7	5	0	0	11	1	0	0
Sr89	0	0	0	0	3	0	0	0
Sr90	3	0	0	0	3	0	0	0
IV. Water								
Gross Alpha	2	4	0	0	6	0	0	0
Gross Beta	1	2	2	1	3	1	2	0
Gamma	36	16	5	3	48	7	3	2
Tritium	4	1	1	0	4	1	0	0
Iodine-LL	4	1	1	0	4	2	0	0
Strontium-89	3	0	0	0	3	0	0	0
Strontium-90	3	0	0	0	3	0	0	0
Am-241	1	0	2	0	2	1	0	0
Cm-243/4	0	1	2	0	3	0	0	0
Np-237	0	0	2	1	0	2	1	0
Pu-238	2	1	0	0	3	0	0	0
Pu-239	2	1	0	0	2	1	0	0
Radium 226	3	0	0	0	3	0	0	0
Radium-228	3	0	0	0	3	0	0	0
Total Number in Range	184	72	35	13	294	29	10	2
% of Total Processed	60.5	23.7	11.5	4.3	96.7	11.4	3.3	0.7
Sum of Analyses	304				304			

(1) Percent Bias Criteria by Bias Category
Bias Category = 1 > 0% and < = 5%
Bias Category = 2 > 5% and < = 10%
Bias Category = 3 > 10% and < = 15%, or within 2 sigma of known
Gross alpha and beta, Sr 89/90 > 10% and < = 25%
Transuranics > 10% and < = 20%
Bias Category = 4 Outside Criteria

(2) Percent Precision Criteria by Precision Category
Precision Category = 1 > 0% and < = 5%
Precision Category = 2 > 5% and < = 10%
Precision Category = 3 > 10% and < = 15%, or within 2 sigma of mean
Precision Category = 4 Outside Criteria

TABLE 7.1.2

DESEL 2001 ANALYTICS RADIOLOGICAL ENVIRONMENTAL CROSS-CHECK PERFORMANCE EVALUATION

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Value	Known Value	Ratio DESEL/ Analytics	Evaluation
E2477-162	4th/00	Filter	Sr-89	pCi	59.57	85	0.70	Non-Agreement *
E2477-162	4th/00	Filter	Sr-90	pCi	42.4	41	1.03	Agreement
E2478-162	4th/00	Filter	Gross Alpha	pCi	20.27	21	0.97	Agreement
E2478-162	4th/00	Filter	Gross Beta	pCi	136.07	114	1.19	Agreement
E2479-162	4th/00	Water	H-3	pCi/L	9656.67	10082	0.96	Agreement
E2480-162	4th/00	Milk	I-131	pCi/L	86.23	85	1.01	Agreement
E2480-162	4th/00	Milk	I-131LL	pCi/L	88.87	85	1.05	Agreement
E2480-162	4th/00	Milk	Ce-141	pCi/L	361.63	356	1.02	Agreement
E2480-162	4th/00	Milk	Cr-51	pCi/L	521.33	503	1.04	Agreement
E2480-162	4th/00	Milk	Cs-134	pCi/L	84.27	85	0.99	Agreement
E2480-162	4th/00	Milk	Cs-137	pCi/L	203.77	199	1.02	Agreement
E2480-162	4th/00	Milk	Co-58	pCi/L	79	76	1.04	Agreement
E2480-162	4th/00	Milk	Mn-54	pCi/L	161.5	152	1.06	Agreement
E2480-162	4th/00	Milk	Fe-59	pCi/L	92.6	82	1.13	Agreement
E2480-162	4th/00	Milk	Zn-65	pCi/L	147.63	148	1.00	Agreement
E2480-162	4th/00	Milk	Co-60	pCi/L	184.63	184	1.00	Agreement
E2592-162	1st/01	Water	I-131	pCi/L	88	90	0.98	Agreement
E2592-162	1st/01	Water	I-131LL	pCi/L	89	90	0.99	Agreement
E2592-162	1st/01	Water	Ce-141	pCi/L	100	94	1.06	Agreement
E2592-162	1st/01	Water	Cr-51	pCi/L	236	242	0.98	Agreement
E2592-162	1st/01	Water	Cs-134	pCi/L	120	129	0.93	Agreement
E2592-162	1st/01	Water	Cs-137	pCi/L	97	102	0.95	Agreement
E2592-162	1st/01	Water	Co-58	pCi/L	48	48	1.00	Agreement
E2592-162	1st/01	Water	Mn-54	pCi/L	103	101	1.02	Agreement
E2592-162	1st/01	Water	Fe-59	pCi/L	88	84	1.05	Agreement
E2592-162	1st/01	Water	Zn-65	pCi/L	187	186	1.01	Agreement
E2592-162	1st/01	Water	Co-60	pCi/L	144	147	0.98	Agreement
E2593-162	1st/01	Water	Gross Alpha	pCi/L	40	39	1.03	Agreement
E2593-162	1st/01	Water	Gross Beta	pCi/L	300	268	1.12	Agreement
E2598A-162	1st/01	Filter	Gross Alpha	pCi	30	30	1.00	Agreement
E2598A-162	1st/01	Filter	Gross Beta	pCi	229	211	1.18	Agreement
E2595-162	1st/01	Milk	I-131	pCi/L	78	77	1.01	Agreement
E2595-162	1st/01	Milk	I-131LL	pCi/L	74	77	0.96	Agreement
E2595-162	1st/01	Milk	Ce-141	pCi/L	166	162	1.02	Agreement
E2595-162	1st/01	Milk	Cr-51	pCi/L	455	418	1.09	Agreement
E2595-162	1st/01	Milk	Cs-134	pCi/L	217	223	0.97	Agreement

* CR 01-16 Issued, Sr-89:90 ratio below DESEL standard 1:1 requirement.

TABLE 7.1.2 (continued)

DESEL 2001 ANALYTICS RADIOLOGICAL ENVIRONMENTAL CROSS-CHECK PERFORMANCE EVALUATION

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Value	Known Value	Ratio DESEL/ Analytics	Evaluation
E2595-162	1st/01	Milk	Cs-137	pCi/L	173	176	0.98	Agreement
E2595-162	1st/01	Milk	Co-58	pCi/L	86	82	1.05	Agreement
E2595-162	1st/01	Milk	Mn-54	pCi/L	185	175	1.06	Agreement
E2595-162	1st/01	Milk	Fe-59	pCi/L	151	146	1.03	Agreement
E2595-162	1st/01	Milk	Zn-65	pCi/L	328	322	1.02	Agreement
E2595-162	1st/01	Milk	Co-60	pCi/L	252	254	0.99	Agreement
E2597-162	1st/01	Water	Am-241	pCi/L	5.6	6.0	0.93	Agreement
E2597-162	1st/01	Water	Pu-238	pCi/L	7.2	7.5	0.96	Agreement
E2597-162	1st/01	Water	Pu-239	pCi/L	5.5	5.5	1.00	Agreement
E2597-162	1st/01	Water	Np-237	pCi/L	9.6	7.9	1.22	Non-Agreement (1)
E2597-162	1st/01	Water	Cm-244	pCi/L	5.6	6.3	0.89	Agreement
E2594-162	1st/01	Water	Ra-226	pCi/L	51	50	1.02	Agreement
E2594-162	1st/01	Water	Ra-228	pCi/L	63	63	1.00	Agreement
E2670-162	2nd/01	Milk	I-131	pCi/L	63	69	0.91	Agreement
E2670-162	2nd/01	Milk	I-131LL	pCi/L	66	69	0.96	Agreement
E2670-162	2nd/01	Milk	Ce-141	pCi/L	165	163	1.01	Agreement
E2670-162	2nd/01	Milk	Cr-51	pCi/L	228	224	1.02	Agreement
E2670-162	2nd/01	Milk	Cs-134	pCi/L	131	134	0.98	Agreement
E2670-162	2nd/01	Milk	Cs-137	pCi/L	128	121	1.06	Agreement
E2670-162	2nd/01	Milk	Co-58	pCi/L	97	96	1.01	Agreement
E2670-162	2nd/01	Milk	Mn-54	pCi/L	154	150	1.03	Agreement
E2670-162	2nd/01	Milk	Fe-59	pCi/L	91	88	1.03	Agreement
E2670-162	2nd/01	Milk	Zn-65	pCi/L	180	182	0.99	Agreement
E2670-162	2nd/01	Milk	Co-60	pCi/L	138	135	1.03	Agreement
E2666-162	2nd/01	Filter	Ce-141	pCi/L	91	96	0.95	Agreement
E2666-162	2nd/01	Filter	Cr-51	pCi/L	130	132	0.98	Agreement
E2666-162	2nd/01	Filter	Cs-134	pCi/L	74	79	0.94	Agreement
E2666-162	2nd/01	Filter	Cs-137	pCi/L	77	71	1.08	Agreement
E2666-162	2nd/01	Filter	Co-58	pCi/L	57	57	1.00	Agreement
E2666-162	2nd/01	Filter	Mn-54	pCi/L	99	88	1.13	Agreement
E2666-162	2nd/01	Filter	Fe-59	pCi/L	58	51	1.14	Agreement
E2666-162	2nd/01	Filter	Zn-65	pCi/L	118	107	1.10	Agreement
E2666-162	2nd/01	Filter	Co-60	pCi/L	77	79	0.97	Agreement
E2669-162	2nd/01	Water	H-3	pCi/L	7007	7494	0.94	Agreement
E2667-162	2nd/01	Filter	Sr-89	pCi	89	84	1.06	Agreement
E2667-162	2nd/01	Filter	Sr-90	pCi	75	64	1.17	Agreement
E2806-162	3rd/01	Water	I-131	pCi/L	63	60	1.05	Agreement

(1) - Np-237 failed high due to glassware contamination. CR 01-41 issued.

TABLE 7.1.2 (continued)

DESEL 2001 ANALYTICS RADIOLOGICAL ENVIRONMENTAL CROSS-CHECK PERFORMANCE EVALUATION

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Value	Known Value	Ratio DESEL/ Analytics	Evaluation
E2806-162	3rd/01	Water	I-131LL	pCi/L	62	60	1.04	Agreement
E2806-162	3rd/01	Water	Ce-141	pCi/L	96	88	1.09	Agreement
E2806-162	3rd/01	Water	Cr-51	pCi/L	275	265	1.04	Agreement
E2806-162	3rd/01	Water	Cs-134	pCi/L	113	116	0.97	Agreement
E2806-162	3rd/01	Water	Cs-137	pCi/L	234	232	1.01	Agreement
E2806-162	3rd/01	Water	Co-58	pCi/L	132	128	1.03	Agreement
E2806-162	3rd/01	Water	Mn-54	pCi/L	153	149	1.03	Agreement
E2806-162	3rd/01	Water	Fe-59	pCi/L	66	62	1.06	Agreement
E2806-162	3rd/01	Water	Zn-65	pCi/L	184	184	1.00	Agreement
E2806-162	3rd/01	Water	Co-60	pCi/L	195	193	1.01	Agreement
E2805-162	3rd/01	Water	Gross Alpha	pCi/L	84	78	1.08	Agreement
E2805-162	3rd/01	Water	Gross Beta	pCi/L	175	205	0.85	Agreement
E2808-162	3rd/01	Filter	Gross Alpha	pCi	51	50	1.02	Agreement
E2808-162	3rd/01	Filter	Gross Beta	pCi	136	133	1.02	Agreement
E2809-162	3rd/01	Milk	I-131	pCi/L	90	91	0.99	Agreement
E2809-162	3rd/01	Milk	I-131LL	pCi/L	91	91	1.00	Agreement
E2809-162	3rd/01	Milk	Ce-141	pCi/L	131	121	1.08	Agreement
E2809-162	3rd/01	Milk	Cr-51	pCi/L	374	366	1.02	Agreement
E2809-162	3rd/01	Milk	Cs-134	pCi/L	157	160	0.98	Agreement
E2809-162	3rd/01	Milk	Cs-137	pCi/L	323	319	1.01	Agreement
E2809-162	3rd/01	Milk	Co-58	pCi/L	182	177	1.03	Agreement
E2809-162	3rd/01	Milk	Mn-54	pCi/L	211	205	1.03	Agreement
E2809-162	3rd/01	Milk	Fe-59	pCi/L	87	86	1.01	Agreement
E2809-162	3rd/01	Milk	Zn-65	pCi/L	261	254	1.03	Agreement
E2809-162	3rd/01	Milk	Co-60	pCi/L	274	266	1.03	Agreement
E2807-162	3rd/01	Water	Sr-89	pCi/L	87	85	1.02	Agreement
E2807-162	3rd/01	Water	Sr-90	pCi/L	61	59	1.03	Agreement
E2810-162	3rd/01	Milk	Sr-89	pCi/L	121	75	1.61	Non-Agreement (2)
E2810-162	3rd/01	Milk	Sr-90	pCi/L	49	50	0.98	Agreement

(2) - Sr-89 failed high, investigation ongoing. CR 02-01 issued.

TABLE 7.1.3

SUMMARY OF BLIND DUPLICATE SAMPLES SUBMITTED TO THE DESEL

January - December 2001

TYPE OF SAMPLE	NUMBER OF PAIRED SAMPLES SUBMITTED
Milk	8
Ground Water	2
Surface Water	14
Algae	2
Mussels	4
Food Product	1
TOTAL	31

ANALYSIS TYPE	FAILURES / TOTAL ANALYSES
Gamma	4/775
Gross Beta	1/ 5
I-131 low level	0 / 8
Sr-89	0 / 4
Sr-90	0 / 4
H-3	0 / 5
TOTAL	5 / 801

7.2 Teledyne Brown Engineering Laboratory –Environmental Services (TBE-SE)

7.2.1 Operational Quality Control Scope

7.2.1.1 Inter-laboratory

The TBE-ES Laboratory QC Program is designed to monitor the quality of analytical processing associated with environmental bioassay, effluent (10CFR Part 50), and waste characterization (10CFR Part 61) samples.

Quality Control of environmental radioanalyses involves the internal process control program and independent third party programs administered by Analytics, Inc and Environmental Resource Associates (ERA).

The last year that EPA provided drinking water Performance Evaluation (PE) samples for analysis was 1998. Anticipating the elimination of the EPA's Interlaboratory Cross-Check Program, TBE-ES instituted a replacement cross-check program that is managed by Analytics, Inc and ERA. The overall scope of the Analytics and ERA replacement programs was designed to be comparable with the pre-1996 US EPA PE Program in terms of sample number, matrices and nuclides. On May 20, 2001, NIST NVLAP granted accreditation to ERA's Proficiency Testing Program, which completed the process of replacing the US EPA EMSL-LV Nuclear Radiation Assessment Division program discontinued in 1998. The number of samples evaluated by media type between air filters, water and milk was modified from the post-1996, predominantly drinking water-based EPA Program. This considered an enhancement to the Cross-Check program since it better reflects the clients' radiological environmental Monitoring Program (REMP) media mix presently processed by TBE-ES

TBE-ES participates in the Quality Assessment Program (QAP) administered by the Department of Energy (DOE) Environmental Measurements Laboratory (EML) and the DOE Mixed Analyte Performance Evaluation Program (MAPEP). The MAPEP is a set of performance evaluation samples (e.g. Water, soil, air filters, etc.) designed to evaluate the ability and quality of analytical facilities performing sample measurements which contain hazardous and radioactive (mixed) analytes. TBE-ES also participates in the New York State Department of Health Environmental Laboratory Approval Program (NYELAP).

Quality Control for radioanalyses during this reporting period was divided among internal process check samples, third party process checks prepared by Analytics, Inc. (which was submitted by users or secured directly by TBE-ES for QC purposes), ERA, DOE's EML, MAPEP, NYELAP and the Bioassay Environmental Radioactivity Cross Check Program (BERCCP).

7.2.1.2 Intra-laboratory

The internal Quality Control program is designed to include QC functions such as instrumentation checks (to ensure proper instrument response), blank samples (to which no analyte radioactivity has been added), instrumentation backgrounds, duplicates, as well as overall staff qualification analyses and process controls. Both process control and qualification analyses samples seek to mimic the media type of those samples submitted for analyses by the various laboratory clients. These process controls (or process checks)

are either actual samples submitted in duplicate in order to evaluate the accuracy of laboratory measurements, or blank samples which have been "spiked" with a known quantity of a radioisotope that is of interest to laboratory clients. These QC samples which represent either "single" or "double-blind" unknowns, are intended to evaluate the entire radiochemical and radiometric process.

To provide direction and consistency in administering the quality assurance program, TBE-ES has developed and follows an annual quality control and audit assessment schedule. The plan describes the scheduled frequency and scope of Quality Assurance and Control considered necessary for an adequate QA/QC program conducted throughout the year. The magnitude of the process control program combines both internal and external sources targeted at 5% of the routine sample analysis load.

7.2.1.3 QA Program (Internal and External Audits)

During each reporting period at least one internal assessment is conducted in accordance with the pre-established TBE-ES Quality Control and Audit Assessment Schedule. In addition, the laboratory may be audited by prospective customers during a pre-contract audit, and/or by existing clients who wish to conduct periodic audits in accordance with their contractual arrangements. The Nuclear Utilities Procurement Issues Committee (NUPIC) conducts audits of TBE-ES as a function of a Utilities Radiological Environment Measurement Program (REMP).

Since relocating from Westwood, New Jersey to Knoxville, Tennessee, the laboratory has hosted the NUPIC, Vermont Yankee Nuclear Power Station, Nebraska Public Power, BWX Technologies, the State of Tennessee, Westinghouse, Inc. the National Laboratory Accreditation Program (NELAP), Boeing Rocketdyne and others for onsite audits. These audits were each comprehensive reviews of TBE-ES's Quality and Technical programs used to assess the laboratory's ability to produce accurate and defensible data for our clients. No significant deficiencies, which would adversely impact data quality, were identified during any of these audits. Administrative findings identified during these inspections are usually addressed promptly, according to client specifications.

7.2.2 Analytical Services Quality Control Synopsis

7.2.2.1 Results Summary

7.2.2.1.1 Environmental Services Quality Control

During this annual reporting period, thirty-five nuclides associated with eight media types were analyzed by means of the Laboratory's internal process control, Analytics, DOE, ER, NYELAP and Bioassay Cross Check quality control programs. Media types representative of client company analyses performed during this reporting period were selected. The results for these programs are presented in Attachment A. Below is a synopsis of the media types evaluated:

- Air Filter
- Charcoal (Air Iodine)
- Gas
- Milk
- Sediment/Soil
- Urine
- Vegetation
- Water

7.2.2.1.2 Analytics Environmental Cross-Check Program

During this semi-annual period, the Analytics Cross-Check Program provided environmental samples for bias and precision checks.

7.2.2.1.3 Summary of Participation in the Department of Energy (DOE) Monitoring Programs

During this reporting period, a combination of four different media types and twenty-one different radionuclides were analyzed against the DOE Quality Assessment Program (DOE QAP 9909). There were two "non-agreement" evaluations reported for total Uranium in filters. Upon review of the reported filter matrix, it was determined that the reported evaluation units were incorrect. When the correct units of Bq/filter were calculated and compared, the results were acceptable. Thirteen warnings were issued for several radionuclides and matrices as shown in the attached tables.

TBE-ES participated in the semi annual Mixed Analyte Performance Evaluation Program (MAPEP) for liquid analyses (MAPEP-00-W8). All seven analytes evaluated were acceptable. For soil analysis, (MAPEP-01-S8) all eight analytes evaluated were acceptable.

7.2.2.1.4 Summary of Participation in the NYELAP

During this reporting period, water media for three nuclides were analyzed for the NYELAP. Two results were acceptable and one result was not acceptable. A Non Conformance Report investigation determined that a calculation error had occurred. When corrected the results were within warning limits.

7.2.2.1.5 Summary of participation in the ERA Program

During this reporting period, a water media of thirteen nuclides was analyzed under ERA criteria. All results were acceptable.

7.2.2.1.6 Summary of participation in the BERCCP

During this reporting period, one media type and two nuclides were analyzed utilizing BERCCP criteria. All results were acceptable.

7.2.2.2 Intra-Laboratory Process Control Program

The TBE-ES Laboratory's internal process control program evaluated 1158 individual samples.

Of the 1158 internal process control analyses evaluated, 34 spikes failed the laboratory's QC acceptance criteria of 70% - 130% recovery. Non Conformance Reports were issued to investigate the cause and determine corrective action for identified failures.

7.2.2.2.1 Analytical Blanks

During this reporting period, all but one of the 579 environmental analytical blanks analyzed reported no statistically positive activity.

7.2.2.2.2 Instrument Backgrounds

One hundred percent of the backgrounds processed between January and December 2001 reported no statistically significant positive activity.

7.2.2.2.3 Control Charts

Control Charts for gamma instrumentation are prepared and maintained.

7.2.2.2.4 Duplicates

All forty-five duplicate sets analyzed were within client requirements.

Table 7.2.1
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Ratio TBE/Analytics	Evaluation
March, 2001	E2584-93	Milk	I-131	pCi/L	75	77	0.97	A
			Ce-141	pCi/L	166	162	1.03	A
			Cr-51	pCi/L	433	418	1.04	A
			Cs-134	pCi/L	212	223	0.95	A
			Cs-137	pCi/L	165	176	0.94	A
			Co-58	pCi/L	81	82	0.99	A
			Mn-54	pCi/L	172	175	0.98	A
			Fe-59	pCi/L	151	146	1.03	A
			Zn-65	pCi/L	314	322	0.98	A
			Co-60	pCi/L	254	254	1.00	A
May, 2001	A14428-55	Water	Sr-89	uCi/mL	2.50E-03	2.95E-03	0.85	A
			Sr-90	uCi/mL	2.00E-04	2.27E-04	0.88	A
	A14429-55	Water	Gr-Alpha	uCi/mL	1.70E-04	1.45E-04	1.17	A
	A14434-55	Water	Fe-55	uCi/mL	2.40E-04	2.53E-04	0.95	A
June, 2001	2707	Charcoal	I-131	pCi	104.5	81	1.29	W
	2708	Charcoal	I-131	pCi	84.8	72	1.18	A
	2709	Charcoal	I-131	pCi	99.6	92	1.08	A
August, 2001	E2755-396	Milk	Mn-54	pCi/L	131	124	1.06	A
			Co-58	pCi/L	68	68	1.00	A
			Fe-59	pCi/L	53	50	1.06	A
			Co-60	pCi/L	134	132	1.02	A
			Zn-65	pCi/L	172	162	1.06	A
			I-131	pCi/L	76	86	0.88	A
			Cs-134	pCi/L	141	128	1.10	A
			Cs-137	pCi/L	126	120	1.05	A
			Ce-141	pCi/L	72	76	0.95	A
August, 2001	E2757-396	AP Filter	Ce-141	pCi	79	74	1.07	A
			Cr-51	pCi	100	90	1.11	A
			Cs-134	pCi	109	125	0.87	A
			Cs-137	pCi	140	116	1.21	W
			Co-58	pCi	72	66	1.09	A
			Mn-54	pCi	161	134	1.20	A
			Fe-59	pCi	51	49	1.04	A
			Zn-65	pCi	200	158	1.27	W
			Co-60	pCi	148	128	1.16	A
August, 2001	E2756A-396	Charcoal	I-131	pCi	87	93	0.94	A

Table 7.2.1(cont.)
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Ratio TBE/Analytics	Evaluation
September, 2001	A14734-148	Liquid	Sr-89	Total uCi	1.30E-03	1.55E-03	0.84	A
			Sr-90	Total uCi	1.00E-04	1.12E-04	0.89	A
September, 2001	A14735-148	Gas	Xe-133	Total uCi	0.606	0.585	1.04	A
			Kr-85	Total uCi	8.53	8.42	1.01	A
September, 2001	A14736-148	Charcoal	I-131	Total uCi	0.483	0.495	0.98	A
September, 2001	A14737-148	Air Filter	Ce-141	Total uCi	4.99E-02	5.25E-02	0.95	A
			Cr-51	Total uCi	1.68E-01	1.85E-01	0.91	A
			Cs-134	Total uCi	2.47E-02	2.97E-02	0.83	A
			Cs-137	Total uCi	5.18E-02	5.73E-02	0.90	A
			Co-58	Total uCi	4.60E-02	4.75E-02	0.97	A
			Mn-54	Total uCi	3.96E-02	4.02E-02	0.99	A
			Fe-59	Total uCi	2.99E-02	2.92E-02	1.02	A
			Zn-65	Total uCi	5.22E-02	5.12E-02	1.02	A
			Co-60	Total uCi	4.71E-02	4.83E-02	0.98	A
September, 2001	E2772-396	Milk	I-131	pCi/L	100	91	1.10	A
			Ce-141	pCi/L	126	121	1.04	A
			Cr-51	pCi/L	349	366	0.95	A
			Cs-134	pCi/L	147	160	0.92	A
			Cs-137	pCi/L	321	319	1.01	A
			Co-58	pCi/L	190	177	1.07	A
			Mn-54	pCi/L	205	205	1.00	A
			Fe-59	pCi/L	85	86	0.99	A
			Zn-65	pCi/L	246	254	0.98	A
			Co-60	pCi/L	261	266	0.98	A
September, 2001	E2773-396	Charcoal	I-131	68.6	68.6	67	1.02	A
September, 2001	E2774-396	Air Filter	Ce-141	pCi	118	116	1.02	A
			Cr-51	pCi	362	351	1.03	A
			Cs-134	pCi	135	153	0.88	A
			Cs-137	pCi	350	307	1.14	A
			Co-58	pCi	184	170	1.08	A
			Mn-54	pCi	230	197	1.17	A
			Fe-59	pCi	100	82	1.22	W
			Zn-65	pCi	305	244	1.25	W
			Co-60	pCi	267	255	1.05	A

Table 7.2.1(cont.)
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Ratio TBE/Analytics	Evaluation
September, 2001	A14738-148	Liquid	Gr-Alpha	Total uCi	5.80E-04	4.67E-04	1.24	A
September, 2001	A14286-148	Liquid	Gr-Alpha	uCi/cc	1.70E-04	1.45E-04	1.17	A
			H-3	uCi/cc	2.92E-03	1.77E-03	1.65	A
December, 2001	E2980-396	Milk	Sr-89	pCi/L	75	85	0.96	A
			Sr-90	pCi/L	44	59	0.75	W
			Fe-55	pCi/L	108	99	1.09	A
December, 2001	E-2981-396	Milk	I-131	pCi/L	50	61	0.82	A
			Ce-141	pCi/L	352	379	0.93	A
			Cr-51	pCi/L	468	497	0.94	A
			Cs-134	pCi/L	173	199	0.87	A
			Cs-137	pCi/L	312	318	0.98	A
			Co-58	pCi/L	92	90	1.02	A
			Mn-54	pCi/L	148	149	0.99	A
			Fe-59	pCi/L	101	102	0.99	A
			Zn-65	pCi/L	192	206	0.93	A
			Co-60	pCi/L	322	353	0.93	A
December, 2001	E-2983-396	Air Filter	Ce-141	pCi	185	181	1.02	A
			Cr-51	pCi	190	237	0.80	A
			Cs-134	pCi	74	95	0.78	W
			Cs-137	pCi	163	152	1.07	A
			Co-58	pCi	46	43	1.07	A
			Mn-54	pCi	80	71	1.13	A
			Fe-59	pCi	57	49	1.16	A
			Zn-65	pCi	119	99	1.2	A
			Co-60	pCi	165	169	0.98	A
December, 2001	E-2982-396	Charcoal	I-131	pCi	89	92	0.93	A

Table 7.2.2
DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value	Known Value	Ratio TBE/EML	Evaluation
March, 2001	QAP 103	Air Filter	Mn-54	Bq/filter	6.96	6.52	1.07	A
			Co-60	Bq/filter	19.4	19.44	1.00	A
			Cs-134	Bq/filter	2.59	2.83	0.92	A
			Cs-137	Bq/filter	9.52	8.76	1.09	A
			Pu-238	Bq/filter	0.23	0.215	1.07	A
			Pu-239	Bq/filter	0.17	0.136	1.25	W
			Am-241	Bq/filter	0.93	0.486	1.91	W
			Gr-Alpha	Bq/filter	3.33	3.97	0.84	A
			Gr-Beta	Bq/filter	2.26	2.58	0.88	W
			Sr-90	Bq/filter	7.46	7.1	1.05	A
March, 2001	QAP 103	Soil	K-40	Bq/kg	464.8	468	0.99	A
			Cs-137	Bq/kg	1696	1740	0.97	A
			Pu-239/40	Bq/kg	24.32	25.6	0.95	A
			Sr-90	Bq/kg	80.8	69	1.17	A
March, 2001	QAP 103	Vegetation	K-40	Bq/kg	728	603	1.21	A
			Co-60	Bq/kg	34	30.4	1.12	A
			Cs-137	Bq/kg	1005	842	1.19	A
			Pu-239	Bq/kg	10.54	9.58	1.10	A
			Am-241	Bq/kg	7.03	6.17	1.14	A
			Cm-244	Bq/kg	2.26	3.69	0.61	W
			Sr-90	Bq/kg	1283	1330	0.96	A
March, 2001	QAP 103	Water	Co-60	Bq/L	100.3	98.2	1.02	A
			Cs-137	Bq/L	75.8	73	1.04	A
			Gr-Alpha	Bq/L	1600	1900	0.84	A
			Gr-Beta	Bq/L	1200	1297	0.93	A
			Pu-238	Bq/L	1.78	1.58	1.13	W
			Pu-239	Bq/L	1.99	1.64	1.21	W
			Am-241	Bq/L	2.2	1.67	1.32	W
May, 2001			Sr-90	Bq/L	4.57	4.4	1.04	A
			H-3	Bq/L	61.0	79.3	0.77	W

Table 7.2.2(cont.)
DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 2 OF 3)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value	Known Value	Ratio TBE/EML	Evaluation
June, 2001	QAP 2009	Air Filters	Mn-54	Bq/filter	49.5	43.2	1.15	A
			Co-57	Bq/filter	15.2	14.5	1.05	A
			Co-60	Bq/filter	8.79	8.43	1.04	A
			Cs-137	Bq/filter	8.26	7.41	1.11	A
			Gr-Alpha	Bq/filter	2.31	2.35	0.98	A
			Gr-Beta	Bq/filter	1.79	1.52	1.18	A
June, 2001	QAP 2009	Soil	K-40	Bq/Kg	839.2	713	1.18	A
			Cs-137	Bq/Kg	1164	1020	1.14	A
			Pb-212	Bq/Kg	95.5	79.3	1.20	A
			Bi-214	Bq/Kg	84.0	83.3	1.01	A
			Pb-214	Bq/Kg	92.9	86.3	1.08	A
			Ac-228	Bq/Kg	84.8	80.2	1.06	A
			U-234	Bq/Kg	117	157	0.75	W
			U-238	Bq/Kg	122	163	0.75	W
June, 2001	QAP 2009	Vegetation	K-40	Bq/Kg	827.4	639	1.29	W
			Co-60	Bq/Kg	34.4	32.8	1.05	A
			Cs-137	Bq/Kg	949.4	867	1.10	A
June, 2001	QAP 2009	Water	Co-60	Bq/L	75.7	73.7	1.03	A
			Cs-137	Bq/L	69.3	67.0	1.03	A
			U-234	Bq/L	0.39	0.481	0.81	W
			U-238	Bq/L	0.32	0.368	0.87	W
September, 2001	QAP 0109	Air Filters	Mn-54	Bq/filter	97.1	81.15	1.197	A
			Co-60	Bq/filter	18.8	17.5	1.074	A
			Sr-90	Bq/filter	2.56	3.481	0.735	W
			Cs-134	Bq/filter	12.7	12.95	0.981	A
			Cs-137	Bq/filter	20.8	17.1	1.216	W
			Pu-238	Bq/filter	0.0595	0.071	0.838	W
			Pu-239	Bq/filter	0.287	0.2291	1.253	W
			Am-241	Bq/filter	0.089	0.088	1.011	A
			Gr-Alpha	Bq/filter	5.42	5.362	1.011	A
			Gr-Beta	Bq/filter	12.0	12.77	0.94	A

Table 7.2.2(cont.)
DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Media	Nuclide	Units	Reported Value	Known Value	Ratio TBE/EML	Evaluation
September, 2001	QAP 0109	Soil	K-40	Bq/kg	673.0	623.33	1.080	A
			Sr-90	Bq/kg	29.6	30.596	0.967	A
			Cs-137	Bq/kg	680.5	612.33	1.111	A
			Pu-239	Bq/kg	7.42	8.948	0.829	W
September, 2001	QAP 0109	Vegetation	K-40	Bq/kg	1090.0	898.67	1.213	A
			Co-60	Bq/kg	39.8	35.3	1.127	A
			Sr-90	Bq/kg	1253.0	1612.8	0.777	A
			Cs-137	Bq/kg	1235.0	1030.0	1.199	A
			Pu-239	Bq/kg	11.6	11.022	1.052	A
September, 2001	QAP 0109	Water	H-3	Bq/L	212.3	207.0	1.026	A
			Co-60	Bq/L	207.3	209.0	0.992	A
			Ni-63	Bq/L	50.7	45.25	1.1	A
			Sr-90	Bq/L	4.76	3.729	1.276	W
			Cs-137	Bq/L	47.7	45.133	1.057	A
			Pu-238	Bq/L	1.21	1.0882	1.112	W
			Pu-139	Bq/L	1.86	1.628	1.143	W
			Am-241	Bq/L	0.763	0.7597	1.004	A
			Gr-Alpha	Bq/L	1333.0	1150.0	1.159	W
			Gr-Beta	Bq/L	8533.0	7970.0	1.071	A

Table 7.2.3
ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value	Known Value	Ratio TBE/EML	Evaluation
February, 2001	Rad-29	Liquid	Co-60	pCi/L	95.5	91.1	1.05	A
			Cs-134	pCi/L	60.5	59.8	1.01	A
			Cs-137	pCi/L	48	45	1.07	A
September, 2001	Rad-38	Liquid	Ba-133	pCi/L	35.5	36	0.99	A
			Co-60	pCi/L	47.6	46.8	1.02	A
			Cs-134	pCi/L	15.5	15.9	0.97	A
			Cs-137	pCi/L	206	197	1.05	A
			Zn-65	pCi/L	35.4	36.2	0.98	A
August, 2001	Rad-39	Liquid	Total U	pCi/L	60.3	52.9	1.14	A
			Ra-226	pCi/L	14.7	15.4	0.95	A
September, 2001	Rad-40	Liquid	Sr-89	pCi/L	26.4	31.2	0.85	A
			Sr-90	pCi/L	28.2	25.9	1.09	A
August, 2001	Rad-41	Liquid	Gr-Alpha	pCi/L	15.2	17.8	0.85	A
			Gr-Beta	pCi/L	52.0	53.0	0.98	A
September, 2001	Rad-42	Liquid	H-3	pCi/L	2370	2730	0.87	A
December, 2001	12130109	Liquid	I-131	pCi/L	3.77	4.38	0.86	A

Table 7.2.4
MAPEP ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Acceptance Range	Evaluation
March, 2001	00-W8	Liquid	Mn-54	Bq/L	3.04	2.87	2.01 - 3.73	A
			Co-57	Bq/L	92.4	95.5	66.85 - 124.15	A
			Co-60	Bq/L	2.20	2.19	1.53 - 2.85	A
			Zn-65	Bq/L	4.65	4.59	3.21 - 5.97	A
			Cs-134	Bq/L	260	283	198.1 - 367.9	A
			Cs-137	Bq/L	91.5	94.4	66.08 - 122.72	A
			Zn-65	Bq/L	4.65	4.59	3.21 - 5.97	A
November, 2001	01-S8	Soil	Mn-54	Bq/kg	217	203	142.1-263.9	A
			Co-57	Bq/kg	97.2	103	72.10-133.9	A
			Co-60	Bq/kg	1280	1270	889-1651	A
			Zn-65	Bq/kg	408.3	382	267.4-496.6	A
			Cs-134	Bq/kg	87.4	91.1	63.77-118.43	A
			Cs-137	Bq/kg	1233	1240	868-14612	A
			Ni-63	Bq/kg	569	550	385-715	A
	01-S8	Soil	Sr-90	Bq/kg	170	209	146.3-271.7	A

Table 7.2.5
NYELAP ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Acceptance Range	Evaluation
May, 2001	4218	Water	Gr-Alpha	pCi/L	33.8	41	20.5 - 61.5	A
			Gr-Beta	pCi/L	73.9	68	47.6 - 88.4	A

Table 7.2.6
BIOASSAY ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value	Ratio TBE/WZ	Evaluation
July, 2001		Urine	Cs-137	pCi/g	48.2	46.8	1.03	A
			Cs-137	pCi/g	91.3	93.6	0.98	A
			Cs-137	pCi/g	613	612	1.00	A
			Co-60	pCi/g	39.6	38.1	1.04	A
			Co-60	pCi/g	79.6	77.1	1.03	A
			Co-60	pCi/g	544	560	0.97	A

8. Land Use Census

VYNPS Off-site Dose Calculation Manual 3/4.5.2 requires that a Land Use Census be conducted annually between the dates of June 1 and October 1. The Census identifies the locations of the nearest milk animal and the nearest residence in each of the 16 meteorological sectors within a distance of five miles of the plant. It also identifies the nearest milk animal (within three miles of the plant) to the point of predicted highest annual average D/Q value due to elevated releases from the plant stack in each of the three major meteorological sectors. The 2001 Land Use Census was conducted in August of 2001 in accordance with the ODCM.

Following the collection of field data and in compliance with Off-site Dose Calculation Manual (ODCM) Section 10.1, a dosimetric analysis is performed to compare the census locations to the "critical receptor" identified in the ODCM. This critical receptor is the location that is used in the Method 1 screening dose calculations found in the ODCM (i.e. the dose calculations done in compliance with ODCM Surveillance 4.3.3). If a Census location has a 20% greater potential dose than that of the critical receptor, this fact must be announced in the annual Radioactive Effluent Release Report for that period. A re-evaluation of the critical receptor would also be done at that time. For the 2001 Census, no such locations were identified.

Pursuant to ODCM 3.5.2.a, a dosimetric analysis is performed, using site specific meteorological data, to determine which milk animal locations would provide the optimal sampling locations. If any location has a 20% greater potential dose commitment than at a currently sampled location, the new location is added to the routine environmental sampling program in replacement of the location with the lowest calculated dose (which is eliminated from the program). The 2001 Land Use Census did not identify any locations, meeting the criteria of ODCM Table 3.5.1, with a greater potential dose commitment than at currently sampled locations. No changes to the Radiological Environmental Monitoring Program (REMP) were required based on the Land Use Census. The ranking of all farms included in the Land Use Census yielded a new farm, Ameral/McGovern that ranked number two out of numbers 1, 3, 4, 5, 7 and 9. A recommendation was made to add this farm to the collection program if possible. The farm owners were contacted and were agreeable to allowing Vermont Yankee to collect milk samples from their dairy, however, at this time, no sample has been collected due to bulk tank equipment malfunctions. A new bulk tank is due to be installed in the spring/summer of 2002 and, following successful test collections, the farm will be added to the ODCM as a required sample location.

The results of the 2001 Land Use Census are included in this report in compliance with ODCM 4.5.2 and ODCM 10.2. The locations identified during the Census may be found in Table 8.1.

TABLE 8.1

2001 LAND USE CENSUS LOCATIONS*

SECTOR	NEAREST RESIDENCE Km (Mi)	NEAREST MILK ANIMAL Km (Mi)
N	1.5 (0.9)	----
NNE	1.4 (0.9)	5.5 (3.4) Cows
NE	1.3 (0.8)	----
ENE	1.0 (0.6)	----
E	0.9 (0.6)	----
ESE	2.8 (1.8)	----
SE	2.0 (1.2)	3.6 (2.2) Cows**
SSE	2.1 (1.3)	----
S	0.5 (0.3)	2.2 (1.4) Cows**
SSW	0.5 (0.3)	----
SW	0.4 (0.3)	8.2 (5.1) Cows
WSW	0.5 (0.3)	9.6 (6.0) Goats
W	0.6 (0.4)	0.8 (0.5) Cows
WNW	1.1 (0.7)	7.5 (4.7) Cows
NW	2.6 (1.6)	----
NNW	2.6 (1.6)	----

* Sectors and distances are relative to the plant stack as determined by a Global Positioning System survey conducted in 1997.

** Location of nearest milk animal within 3 miles of the plant to the point of predicted highest annual average D/Q value in each of the three major meteorological sectors.

9. SUMMARY

During 2001 as in all previous years of plant operation, a program was conducted to assess the levels of radiation or radioactivity in the Vermont Yankee Nuclear Power Station environment. Over 800 samples were collected (including TLDs) over the course of the year, with a total of over 2700 radionuclide or exposure rate analyses performed. The samples included ground water, river water, sediment, fish, milk, silage, mixed grass, storm drain sediment, and storm drain water. In addition to these samples, the air surrounding the plant was sampled continuously and the radiation levels were measured continuously with environmental TLDs.

Three of the objectives of the Radiological Environmental Monitoring Program (REMP) are:

- To provide an early indication of the appearance or accumulation of any radioactive material in the environment caused by the operation of the station.
- To provide assurance to regulatory agencies and the public that the station's environmental impact is known and within anticipated limits.
- To verify the adequacy and proper functioning of station effluent controls and monitoring systems. .

Low levels of radioactivity from three sources (discussed below) were detected in samples collected off-site as a part of the radiological environmental monitoring program. Most samples had measurable levels of K-40, Be-7, Th-232 or radon daughter products. These are the most common of the naturally-occurring radionuclides. Many samples (particularly milk, river water, mixed grass, and sediment) had fallout radioactivity from atmospheric nuclear weapons tests conducted primarily from the late 1950s through 1980. Several samples from onsite locations (from the plant storm drain system) had low levels of radioactivity resulting from emissions from the Vermont Yankee plant. In all cases, the possible radiological impact was negligible with respect to exposure from natural background radiation. In no case did the detected levels exceed the most restrictive federal regulatory or plant license limits for radionuclides in the environment.

10. REFERENCES

1. USNRC Radiological Assessment Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program," Revision 1, November 1979.

2. NCRP Report No. 94, *Exposure of the Population in the United States and Canada from Natural Background Radiation,* National Council on Radiation Protection and Measurements, 1987.

3. *Ionizing Radiation: Sources and Biological Effects,* United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), 1982 Report to the General Assembly.

4. Kathren, Ronald L., *Radioactivity and the Environment - Sources, Distribution, and Surveillance,* Harwood Academic Publishers, New York, 1984.

5. Till, John E. and Robert H. Meyer, ed., *Radiological Assessment - A Textbook on Environmental Dose Analysis,* NUREG/CR-3332, U.S. Nuclear Regulatory Commission, Washington, D.C., 1983.

6. NUREG/CR-3130, *Influence of Leach Rate and Other Parameters on Groundwater Migration,* February 1983.

Appendix A

Review and Explanation of Questionable Data Listed in the Year 2000 VYNPS Annual Radiological Environmental Operating Report

During the preparation of data for inclusion in the year 2000 Vermont Yankee Annual Radiological Environmental Operating Report, it was determined that a small subset of data was questionable, based upon known plant release information and the thirty year history of environmental monitoring in the Vermont Yankee environs. This data was listed in the year 2000 report as "Questionable" and a commitment was made to review the data and provide a summary of this review as part of the year 2001 report.

This appendix provides Table 1, a listing of the questionable data as it appeared in the year 2000 report, and Table 2, a review of each questionable datum by the environmental laboratory.

In summary, the large majority of questionable data was eventually determined to be erroneous and the nuclides previously specified as detected, now classified as not detected. The remaining data that is determined to be accurate appears to be possibly linked to cross-contamination of samples during the sample prep process at the vendor lab. The vendor laboratory is involved in analysis of samples from many different sources.

In any event, the presence of these radionuclides in the Vermont Yankee environment has not been confirmed by resample.

Appendix A, Table 1

Questionable Data Eliminated from Year 2000 Table 5.1 Summary

Media	Station	Week	Year	Test	Activity	1 Std Dev	MDC	
TM	11	31	2000	CO-57	1.66E+01	1.46E+00	4.35E+00	*
		31	2000	EU-154	3.08E+01	3.11E+00	9.07E+00	*
		31	2000	ZR-95	1.83E+01	4.01E+00	9.62E+00	*
TM	14	25	2000	NB-95	3.50E+00	1.00E+00	3.00E+00	
		25	2000	NP-239	4.40E+03	9.00E+02	3.00E+03	*
		25	2000	ZR-95	6.50E+00	2.00E+00	7.00E+00	*
TM	16	33	2000	MO-99	2.90E+01	7.50E+00	3.00E+01	
TM	16	38	2000	CR-51	3.96E+03	1.30E+03	3.75E+03	
TM	22	29	2000	MO-99	1.30E+01	4.00E+00	1.00E+01	Duplicate at 1st lab - ND
TM	22	31	2000	CO-60	4.87E+00	1.24E+00	4.16E+00	Duplicate at 1st lab - ND
TM	24	33	2000	CO-60	3.30E+00	1.05E+00	4.00E+00	Control location
		33	2000	MO-99	6.30E+01	1.70E+01	6.00E+01	Control location
TM	26	27	2000	MO-99	1.40E+02	3.55E+01	1.00E+02	
AP	15	2nd Qtr	2000	CO-60	9.80E-04	1.95E-04	8.00E-04	
WG	11	32	2000	CS-137	3.21E+00	9.30E-01	3.05E+00	Duplicate at both labs - N
			2000	MO-99	1.94E+04	4.51E+03	5.72E+03	Duplicate at both labs - N
WG	12	32	2000	CS-137	6.42E+00	1.13E+00	3.81E+00	
			2000	CO-60	5.86E+00	1.03E+00	3.27E+00	
WG	14	32	2000	CS-137	1.73E+01	1.87E+00	6.45E+00	
			2000	EU-154	1.59E+01	2.43E+00	8.03E+00	*
			2000	AG-110M	1.02E+01	1.84E+00	5.98E+00	*
			2000	CO-57	8.87E+00	1.17E+00	3.93E+00	*
			2000	CO-60	3.01E+01	2.28E+00	7.96E+00	
			2000	SE-75	3.86E+01	6.45E+00	6.31E+00	*
WG	22	32	2000	CS-137	7.79E+00	1.39E+00	4.71E+00	Control location
SE	14	17	2000	CO-57	8.57E+01	1.97E+01	5.62E+01	*
			2000	EU-154	1.53E+02	3.50E+01	9.99E+01	*
SE	18	17	2000	CO-57	9.11E+01	2.05E+01	5.89E+01	*
			2000	EU-154	2.07E+02	3.66E+01	1.07E+02	*
SE	24	17	2000	NB-95	1.18E+02	3.42E+01	1.17E+02	
SE	25	17	2000	CO-57	1.02E+02	1.86E+01	5.46E+01	*
			2000	EU-154	1.67E+02	3.38E+01	9.79E+01	*
			2000	NB-95	1.58E+02	4.35E+01	1.42E+02	
SE	35	17	2000	CO-57	8.88E+01	1.74E+01	5.07E+01	*
SE	39	17	2000	NB-95	1.85E+02	5.55E+01	1.86E+02	
SE	44	17	2000	CO-57	8.38E+01	1.74E+01	5.05E+01	*
			2000	EU-154	1.52E+02	3.13E+01	9.05E+01	*
SE	49	17	2000	NB-95	1.73E+02	5.10E+01	1.71E+02	
SE	50	17	2000	CE-141	5.33E+02	1.54E+02	4.86E+02	
WR	11	33	2000	CS-134	1.16E+01	2.57E+00	7.71E+00	
			2000	ZN-65	3.34E+01	8.05E+00	2.55E+01	
WR	21	29	2000	CO-57	1.55E+01	1.64E+00	4.86E+00	*Control location
			2000	EU-154	2.92E+01	3.30E+00	9.68E+00	*Control location
WR	21	33	2000	CS-134	1.81E+01	2.90E+00	8.93E+00	Control location
FH	11	19	2000	CO-57	4.10E+01	4.50E+00	2.00E+01	*
			2000	CO-60	3.60E+02	1.50E+01	6.00E+01	
			2000	NP-239	8.90E+07	3.00E+06	1.00E+07	*
			2000	ZR-95	4.90E+01	1.50E+01	5.00E+01	*
WT	14	14	2000	MO-99	1.30E+02	3.10E+01	1.00E+02	
WW	10	23	2000	ZR-95	7.20E+00	2.10E+00	7.00E+00	* Storm drain water
				CS-137	2.60E+00	8.5E-01	3.00E+00	
				MO-99	9.40E+02	2.60E+02	9.00E+02	
				NB-95	3.10E+00	9.50E-01	3.00E+00	
WW	10	31	2000	MO-99	2.40E+02	6.50E+01	2.00E+02	Storm drain water
WW	12	15	2000	MO-99	3.70E+04	6.50E+03	2.00E+04	Storm drain water

ND means not detected

*** Not detected in reactor coolant in 2000**

Questionable Data Eliminated from Year 2000 Table 5.1 Summary-continued

Media	Station	Week	Year	Test	Activity	1 Std Dev	MDC	
WW	12	36	2000	MO-99	7.80E+00	2.30E+00	8.00E+00	Storm drain water
SE	95	18	2000	NB-95	9.10E+01	2.70E+01	9.00E+01	Storm drain sediment
SE	95	27	2000	CE-141	1.63E+03	3.57E+02	2.02E+03	Storm drain sediment
				ZR-95	6.94E+01	6.55E+00	3.07E+01	*
SE	98	31	2000	NB-95	3.60E+01	9.00E+00	3.00E+01	Storm drain sediment
			2000	ZR-95	1.00E+02	2.00E+01	7.00E+01	*
SE	99	15	2000	NB-95	3.50E+01	5.50E+00	2.00E+01	Storm drain sediment
				ZR-95	1.40E+02	1.00E+01	4.00E+01	*

*** Not detected in reactor coolant in 2000** **ND means not detected**

In all cases, these isotopes in the above table have not been detected in prior years in these sample media.

Appendix A, Table 2 - CALENDAR YEAR 2000: VERMONT YANKEE NON-REPORTABLE DATA

VY #	Analyte	Explanation
TM113100	CO-57	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 below). No photopeak was identified, consequently Co-57 is NOT DETECTED. The forced activity is -2.51 +/- 2.21 pCi/L (95% C.L.) with an MDA of 5.93 pCi/L.
	EU-154	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 below). No photopeak was identified, consequently Eu-154 is NOT DETECTED. The forced activity is -5.25 +/- 4.63 pCi/L (95% C.L.) with an MDA of 12.4 pCi/L.
	ZR-95	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 below). No photopeak was identified, consequently Zr-95 is NOT DETECTED. The forced activity is 2.92 +/- 6.46 pCi/L (95% C.L.) with an MDA of 9.62 pCi/L.
TM142500	NB-95	Nb-95 has only one photon to quantify its activity @ 765.86 keV. The photon energy was not identified on the gamma-ray raw data printout, thus the nuclide is considered "NOT DETECTED". The MDA calculated for this photon energy is 3.49 pCi/L, and the forced activity calculation gives a value just below the MDA, 3.46 +/- 1.95 pCi/L (95%C.L.)
	NP-239	Np-239, with a half-life of 2.36 days, has several photon energies (I.e. 103.8 keV, 106.1 keV, and 277.6 keV. Only the 277.6 keV photon was indicated on the gamma-ray raw data printout. If present, the 103.8 & 106.1 keV photon energies should have also been indicated. In addition, the 1 sigma error value for the 277.6 keV photon is greater than 30% of the net activity. The elapsed time interval between sampling and counting was ~ 16 days, approximately 7.2 half-lives of Np-239 providing a decrease through decay of two orders of magnitude. Np-239 is considered to be NOT DETECTED although the forced activity calculation of 4420 +/- 1820 pCi/L (95% C.L.) exceeds the MDA value of 3170 pCi/L.
	ZR-95	Zr-95 has two photon energies that may be used for quantification, 724.2 and 756.7 keV. Neither of these energies were indicated on the gamma-ray raw data printout. The nuclide is considered to be NOT DETECTED. The estimated MDA for Zr-95 using the most abundant photon energy (756.7 keV) is 7.12 pCi/L and the forced activity calculated value is 6.48 +/- 4.02 pCi/L (95% C.L.), a value below the estimated MDA.
TM163300	MO-99	The main photon energy for Mo-99 is 140.5 keV and is not identified in the gamma raw data printout; therefore, it is considered NOT DETECTED. The MDA is estimated to be 25.1 pCi/L and the forced activity is 29.3 +/- 14.8 pCi/L (95% C.L.)
TM163800	CR-51	This sample was collected 9/20/00 and counted 3/15/01, giving an elapsed time interval between collection and counting of 176 days or 6.35 half-lives. Through radioactive decay, any activity associated with Cr-51 would diminish by two orders of magnitude from that originally present and would indeed be unlikely to be detected at environmental levels. Examination of the gamma-ray spectra did not reveal a Cr-51 photo peak occurring @ 320.1 keV. There was, however, a small unidentified peak occurring at 318.7 keV. The estimated MDA was 3750 pCi/L and the forced activity calculated value was 3957 +/- 2446 pCi/L (95% C.L.). The higher forced activity value occurred due to the Cr-51 region of interest (ROI) overlapping into the photon energy @ 318.7 keV. As stated on the raw data printout, Cr-51 is NOT DETECTED.

Appendix A, Table 2 - CALENDAR YEAR 2000: VERMONT YANKEE NON-REPORTABLE DATA

VY #	Analyte	Explanation
TM222900	MO-99	Mo-99 (2.75 d half-life) decaying to its metastable daughter, Tc-99m (6 hr half-live), has a primary photon energy at 140.5 keV. Additional photon energies due to Mo-99 occur at 181.1 & 739.6 keV, but with much lower intensity. Only the photon energy at 140.5 keV was indicated on the gamma-ray raw data analysis printout and it had a 1 sigma error value of +/- 48%. The estimated MDA was 13.4 pCi/L and the calculated forced activity was 13.3 +/- 7.87 (95% C.L.). Mo-99 should be considered to be NOT DETECTED.
TM223100	CO-60	The sample was counted at the Westwood, NJ laboratory on a detector having a trace of Co-60 in the background. The peak search routine using a sensitivity of 3.00 and a 95% confidence rejection criteria did not list Co-60 on the gamma-ray raw data printout; therefore, Co-60 is considered NOT DETECTED. The estimated MDA for the photon energy @ 1173.2 was 4.52 pCi/L and for the 1332.5 keV photon was 4.16 pCi/L. The forced activity calculation for each of the respective energies was 3.85 pCi/L and 4.87 pCi/L. The higher forced activity calculation is due to the presence of background Co-60.
TM243300	CO-60	Examination of the gamma-ray analysis raw data printout indicates no photon energies associated with Co-60; therefore, this radionuclide is NOT DETECTED. The MDA for Co-60 is estimated to be 3.78 pCi/L and the forced activity calculation is 3.31 +/- 2.14 pCi/L (95% C.L.).
	MO-99	Examination of the gamma-ray analysis raw data printout indicates no photon energies associated with Mo-99; therefore, this radionuclide is NOT DETECTED. The MDA for Mo-99 is estimated to be 57.1 pCi/L and the forced activity calculation is 63.3 +/- 33.7 (95% C.L.).
TM262700	MO-99	Examination of the gamma-ray analysis raw data printout indicates no photon energies associated with Mo-99; therefore, this radionuclide is NOT DETECTED. The estimated MDA for Mo-99 is 122 pCi/L and the forced activity calculation provides 143 +/- 71.3 pCi/L (95% C.L.)
AP15_2ndQ	CO-60	Co-60 has two photon energies, one at 1173.2 and the other at 1332.5 keV. Both peaks are present on the hardcopy printout, with the 1173 peak having a one sigma uncertainty of 36.6% and the 1332.5 keV peak uncertainty of 21.5%. Based on the presence of both photon eneries, the Co-60 value is 1.019E-03 +/- 4.389E-04 pCi/m^3 and the MDA value is 7.59E-04 pCi/m^3. Co-60 is detected.
WG113200	CS-137	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 below). Cs-137 is NOT DETECTED. MDA is 3.61 pCi/L and the forced activity calculated value is -1.71 +/- 2.08 pCi/L (95% C.L.).
	MO-99	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 below). Mo-99 is NOT DETECTED. MDA is 7350 pCi/L and the forced activity calculated value is -1446 +/- 5229 pCi/L (95% C.L.).

Appendix A, Table 2 - CALENDAR YEAR 2000: VERMONT YANKEE NON-REPORTABLE DATA

VY #	Analyte	Explanation
WG123200	CO-60	The Canberra Gamma-ray spectrometry software includes a feature for reporting an estimate of the minimum detectable activity (MDA) which uses a selected region where a particular gamma-ray energy occurs in the absence of a peak, or uses the region of interest underlying a peak, if one is present. In addition, the software also includes a feature for statistically distinguishing non-significant gamma-ray energy photopeaks in the Compton continuum. This is referred to as critical level testing. This feature allows the operator to select the desired confidence interval (i.e. the 95% confidence level) to statistically omit reporting false-positive or non-significant peaks present in the spectrum. When this test is invoked, the observed signal (i.e. peak) must exceed some critical level to be accepted as a valid peak. Peak areas not exceeding this critical level will be ignored. However, when this feature is invoked, if the peak is not accepted as significant, the forced activity calculation utilizes the same peak region of interest, and calculates a value based on the total underlying counts in the spectrum before correcting for background. This forced activity value may then be larger than the estimated detection level value, indicating that the activity may have been present above the MDA value. The use of critical peak test has now been disengaged, and some spectra originally reduced using this feature require reprocessing to obviate the above problem. This is one of the values that needs correction. Co-60 is considered NOT DETECTED. The calculated activity for Co-60 is 0.538 +/- 1.88 pCi/L (95% C.L.) with an MDA of 4.60 pCi/L.
	CS-137	See discussion above for Co-60. Cs-137 is NOT DETECTED. The calculated activity for Cs-137 is 0.744 +/- 2.05 pCi/L (95% C.L.) with an MDA of 5.11 pCi/L.
WG143200	CS-137	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Cs-137 is NOT DETECTED. The calculated activity for Cs-137 is 0.822 +/- 3.11 pCi/L (95% C.L.) with an MDA of 7.92 pCi/L.
	EU-154	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Eu-154 is NOT DETECTED. The calculated activity for Eu-154 is 0.584 +/- 4.29 pCi/L (95% C.L.) with an MDA of 11.5 pCi/L.
	AG-110m	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Ag-110m is NOT DETECTED. MDA = 5.98 pCi/L with a forced activity of 0.233 +/- 1.11 (95% C.L.)
	C0-57	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Co-57 is NOT DETECTED. MDA = 5.54 pCi/L with a forced activity of 0.269 +/- 2.24 pCi/L (95% C.L.)
	C0-60	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Co-60 is considered NOT DETECTED. MDA = 8.65 pCi/L with a calculated activity of 1.02 +/- 3.95 pCi/L (95% C.L.)
WG143200	SE-75	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Se-75 is NOT DETECTED. MDA = 6.31 pCi/L with a forced activity of -4.82 +/- 4.54 pCi/L (95% C.L.)
WG223200	CS-137	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Cs-137 is NOT DETECTED. The calculated activity for Cs-137 is 0.685+/- 2.37 pCi/L (95% C.L.) with an MDA of 6.23 pCi/L.

Appendix A, Table 2 - CALENDAR YEAR 2000: VERMONT YANKEE NON-REPORTABLE DATA

VY #	Analyte	Explanation
SE141700	CO-57	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Co-57 is NOT DETECTED. MDA = 79.9 pCi/kg with a forced activity of -7.10 +/- 22.6 pCi/kg (95% C.L.)
	EU-154	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). Eu-154 is NOT DETECTED. MDA = 144 pCi/kg with a forced activity of -12.8 +/- 40.6 pCi/kg (95% C.L.)
SE181700	CO-57	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). The result fell below the estimated MDA. Final reported values are 1.96 +/- 24.0 pCi/Kg (95% C. L.) with the MDA = 80.5 pCi/Kg. Co-57 is NOT DETECTED.
	EU-154	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). The result fell below the estimated MDA. Eu-154 is NOT DETECTED. Final reported values are 3.51 +/- 43.1 pCi/Kg with an MDA of 144 pCi/Kg.
SE241700	NB-95	There is no Nb-95 peak detected at 765.2 keV on the gamma-ray printout; therefore, Nb-95 is NOT DETECTED. The MDA is 0.117 pCi/unit and the forced calculated activity is 0.118 +/- 0.0683 pCi/unit (95% C.L.) The forced calculated activity is higher than the MDA due to the presence of a Bi-214 peak at 768 keV adjacent to the Nb-95 region of interest
SE251700	CO-57	A gamma-ray photon was present @ 122/123 keV on the spectrum along with a 136 keV photon energy associated with C0-57. When reprocessed, only the 122 keV photon was indicated on the printout. The activity reported is (2.98 +/-42.8)E-03 pCi/g (95% C.L.) The MDA value is 4.76 E-02 pCi/g, a value considerably larger than the reported activity, consequently Co-57 is considered NOT DETECTED.
	EU-154	Two photon energies associated with Eu-154 were present: 123 keV and 1274 keV. Both energies indicated approximately the same activity values present: 0.166 & 0.160 pCi/g. A photon energy @ 1004 was not present. The reported activity is 0.160 +/- 0.065 pCi/g. The MDA estimated value is 0.0836 pCi/g. Therefore, since the reported value exceeds the MDA value and the peaks were identified, Eu-154 is considered DETECTED. We assume that this nuclide is the result of analytical cross contamination since this nuclide is not measured in any effluent at Vermont Yankee.
SE251700	NB-95	Nb-95 has one photon energy useful for quantification at 765.8 keV and was not present in the spectrum. The MDA estimated value is 0.142 pCi/g and the forced activity calculated value is (-1.60 +/- 2.84)E-02 pCi/g. Nb-95 is considered NOT DETECTED.
SE351700	CO-57	Sample was reprocessed with the 95% significance test removed (See discussion for Co-60 in WG123200 above). The result fell below the estimated MDA. Final reported values is (-4.08 +/- 4.10)E-02 pCi/g (95% C. L.) with the MDA = 7.02E-02 pCi/g. Co-57 is NOT DETECTED.
SE391700	NB-95	Nb-95 has only one photon to quantify it's activity @ 765.86 keV. The photon energy was not identified on the gamma-ray raw data printout, thus the nuclide is considered "NOT DETECTED". An adjacent peak at 768.4 keV from Bi-214 likely interferes with the region of interest for the calculated forced activity producing a value of nearly the same activity.

Appendix A, Table 2 - CALENDAR YEAR 2000: VERMONT YANKEE NON-REPORTABLE DATA

VY #	Analyte	Explanation
SE441700	CO-57	Co-57 has two photon energies appropriate for quantifying its presence: one at 122.1 keV and the other at 136.5 keV. Only the 122.1 keV energy was present. The sample was reprocessed without invoking the 95% Critical test, and the Co-57 value reported was (1.47+/- 2.27)E-02 pCi/g (95% C.L.). The estimated MDA is 6.43E-02 pCi/g. Therefore, Co-57 is consisered NOT DETECTED.
	EU-154	Eu-154 has several photon energies and only the 123.1 keV photon was present. The sample was reprocessed without invoking the 95% Critical test, and the Eu-154 reported value is (2.63 +/- 4.07)E-02 pCi/g (95% C.L.). The estimated MDA is 1.13E-01 pCi/g; consequently Eu-154 is consisered NOT DETECTED.
SE491700	NB-95	The sample was reprocessed without invoking the 95% Critical test. The MDA estimated value for Nb-95 is 1.71E-01 pCi/g and the forced activity calculated value is 2.80 +/- 5.02 pCi/g (95% C. L.). Nb-95 is considered NOT DETECTED.
SE501700	CE-141	Ce-141 has only one useful gamma-ray energy for quantification at 145.4 keV and there is not a well defined peak on the spectrum. In addition, there is no peak identified on the hard copy printout for this energy. The estimated MDA is 0.486 pCi/unit and the forced activity calculated is 0.533 +/-0.308 pCi/unit (95% C.L.). That the forced activity is higher than the MDA may be due to a nearby energy line ~143 keV which apparently overlaps into the Ce-141 region of interest producing a higher forced activity. Ce-141 should be considered NOT DETECTED.
WR113300	CS-134	The spectra was reanalyzed and the follwing data was obtained: Cs-134 photopeak was absent, consequently Cs-134 is NOT DETECTED. The MDA is 8.65 pCi/L and the forced activity is 0.190 +/- 5.90 pCi/L (95% C.L.).
WR113300	ZN-65	Zn-65 has a photon energy @ 1115.5 keV which is not observed in the spectra, consequently it is NOT DETECTED. However, a diffuse peak @ 1119.3 keV was present, associated with Bi-214. The MDA for Zn-65 is 25.5 keV and the forced activity is calculated to be 33.4 +/- 16.1 pCi/L. The forced activity is higher than the MDA value due to the decay correction for Zn-65 (1.92) as well as the region of interest for the forced activity overlapping into the Bi-214 peak region.
WR212900	CO-57	The sample was reprocessed without invoking the 95% Critical test. The estimated MDA for Co-57 is 6.39 pCi/L and the forced activity calculated value is (7.3 +/- 23.2)E-01 pCi/L (95% C.L.); consequently Co-57 is considered NOT DETECTED.
	EU-154	Eu-154 had a forced activity value of 1.75 +/- 3.77 pCi/L (95% C.L.) and the estimeated MDA is 12.7 pCi/L. Consequently, Eu-154 is considered NOT DETECTED.
WR213300	CS-134	The spectrum was examined for Cs-134 and no photon energy @ 604.7 keV was present. The spectrum was reprocessed and Cs-134 was NOT DETECTED. The estimated MDA value is 9.37 pCi/L and the forced activity calculated value is -5.26 +/-6.62 pCi/L.
FH111900	CO-57	Co-57 has two photon energies, @ 122.1 keV and 136.5 keV. A peak is reported on the gamma ray raw data printout @ 120.67 keV, within 2 keV tolerance for identification of Co-57. However, there is no 136.5 keV photon indicated. The 120 keV peak has 873 net counts, and if Co-57 were present, the expected counts for the 136.5 keV photon energy would be ~ 100 counts. Since this energy is not reported, the Co-57 is considered NOT DETECTED.

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VY #	Analyte	Explanation
	CO-60	Co -60 has two photon energies available for quantification: 1173.2 and 1332.5 keV. Neither of these are indicated on the gamma-ray raw data printout, thus Co-60 is considered NOT DETECTED. The MDA for Co-60 is 56.4 pCi/Kg and the forced activity calculated value is 361 +/- 25.3 pCi/Kg (95% C.L.). The sensitivity threshold for peak acceptance was set at 5 and there may likely be Co-60 in the background giving an elevated forced activity calculation.
	NP-239	Np-239, with a half-life of 2.36 days, has several photon energies (I.e. 103.8 keV, 106.1 keV, and 277.6 keV. Only the 277.6 keV photon was indicated on the gamma-ray raw data printout. There is also an interfering natural photon energy at 277.3 keV from Tl-208. With its short half-life, Np-239 would have decayed for 16 half-lives. For these reasons, Np-239 is considered NOT DETECTED.
	ZR-95	Zr-95 has two photon energies available for quantification, 724.2 keV & 756.7 keV. Neither of these two peaks are indicated on the gamma-ray raw data printout, thus Zr-95 is considered NOT DETECTED. The MDA is 52.0 pCi/Kg and the forced activity calculated is 49.2 +/- 29.5 pCi/Kg (95% C.L.).
WT141400	MO-99	Mo-99 (2.75 d half-life) decaying to its metastable daughter, Tc-99m (6 hr half-live), has a primary photon energy at 140.5 keV for quantification. This energy is not present in the gamma-ray raw data printout consequently it is considered NOT DETECTED. The calculated MDA is 106 pCi/L and the forced activity calculation is 127 +/- 61.8 pCi/L (95% C.L.).
WW102300	ZR-95	Zr-95 has two gamma photons suitable for quantification, one @ 724.2 keV and the other @ 756.7 keV with photon intensities of 44.1% and 54.5% , respectively. Only the photon energy @ 724.2 keV was detected giving a value of 6.74 +/- 5.69 pCi/unit (95% C.L.). The MDA calculated as 7.44 pCi/unit. With only one line identified, 3 sigma exceeding the net activity, and the net activity less than the MDA, all indicate NON DETECTION.
	CS-137	The Cs-137 photon energy @ 661.6 keV was not identified consequently Cs-137 is considered NOT DETECTED though a calculated MDA of 2.95 pCi/unit and a forced activity of 2.63 +/- 1.70 pCi/unit (95% C.L.) is provided.
	MO-99	Mo-99 (2.75 d half-life) decaying to its metastable daughter, Tc-99m (6 hr half-live), has a primary photon energy at 140.5 keV for quantification. This energy is not present in the gamma-ray raw data printout consequently it is considered NOT DETECTED. The MDA was calculated as 883 pCi/unit and the forced activity calculation provided a value of 936 +/- 519 pCi/unit (95% C.L.).
	NB-95	Nb-95 has only one photon to quantify it's activity @ 765.86 keV. The photon energy was not identified on the gamma-ray raw data printout, thus the nuclide is considered "NOT DETECTED". An adjacent peak at 768.4 keV from Bi-214 likely interferes with the region of interest for the calculated forced activity. The calculated MDA is 3.31 pCi/unit and the forced activity is 3.07 +/- 1.89 pCi/unit (95% C.L.).
WW103100	MO-99	Mo-99 has a primary photon energy at 140.5 keV which is not present in the gamma-ray analysis raw data printout. There is a photon energy listed @ 138.31 keV, just out of the range for the 2.00 keV acceptance tolerance to be identified as Mo-99. The one sigma uncertainty associated with this photon energy is +/- 72.7%. Thus, Mo-99 is considered NOT DETECTED. The MDA for Mo-99 is 221 pCi/L and the forced calculated activity is 236 +/- 131 pC/L (95% C.L.)

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VY #	Analyte	Explanation
WW121500	MO-99	Mo-99 has one primary photon energy for identification and quantification @ 140.5 keV. There are a few lesser intense photon energies available for confirmation @ 181.0, 366.4 and 739.6 keV. Examination of the gamma-ray raw data printout reveals a photon energy @ 139.11 keV within the 2.0 keV energy tolerance for acceptance as Mo-99. Associated with the photon energy were 505 counts accumulated over a counting period of 4222 minutes. There were no other counts associated with the other Mo-99 photon energies. The elapsed time between sample collection and counting was approximately 38 days, allowing for nearly 14 half-lives decay. Decay over ten half-lives reduces activity to 0.1% of its original amount, thus it is extremely unlikely that any detectable Mo-99 would be present after 14 half-lives. Consequently, Mo-99 is considered NOT DETECTED even though the calculated forced activity exceeds the MDA.
WW123600	MO-99 ZR-95	The data provided for this sample was for Zr-95; not Mo-99. Examination of the Zr-95 data provided the following: Zr-95 has two photon energies useful for quantification: one @ 724.2 keV and the other at 756.7 keV. Neither of these two energies were listed as identified on the gamma-ray analysis printout. Therefore, Zr-95 should be considered as NOT DETECTED. The estimated MDA for Zr-95 is 7.94 pCi/unit and the forced activity is 7.75 +/- pCi/unit.
SE951800	NB-95	A photon energy of 765.8 keV is indicated on the gamma-ray analysis printout corresponding to Nb 95. The quantified value is (8.45 +/- 6.47)E-02 pCi/gm. The percent one sigma error is 38.3% and the MDA is 9.48E-02 pCi/gm, consequently Nb-95 is considered NOT DETECTED. The reported forced activity value is (9.06+/-5.39)E-02 pCi/gm. The spectral data resides on the ND6600 equipment which is out of service and cannot be polled, consequently it is unavailable for examination. The forced activity is likely higher than the quantified value doe to the nearby overlapping region of interest of Bi-214 at 768.4 keV.
SE952700	CE-141	Ce-141 has only one useful gamma-ray energy for quantification at 145.4 keV. Examination of the spectra indicated a gamma-ray energy peak at 143.8 keV assoicated with U-235 and not Ce-141. When reprocessed the activity is (1.63 +/- .714)E03 pCi/unit and the MDA is 2.02 E03 pCi/unit. Ce 141 is considered NOT DETECTED.
	ZR-95 ZN-65	The data provided for this sample was for Zn-65 not Zr-95. Examination of the Zn-65 data provided: Zn-65 has only one photon energy suitable for identification and quantification at 1115.5 keV. Examination of the spectra indicates a peak at this energy with 311 net peak counts. The calculated activity is(6.94 +/- 1.31)E01 pCi/unit and the estimated MDA is 30.7 pCi/unit. Zn-65 is considered DETECTED.
SE983100	NB-95	Examination of the gamma-ray printout indicates that the energy calibration may be low--the gamma energy corresponding to the 511 annihilation peak is at 508.42 keV and the Bi-214 photon energy @ 609.3 keV is given as 607.04 keV. Likewise the 911.2 keV and 969.0 keV photon energies associated with Ac-228 occurs at 909.34 and 967.43 keV. NB-95 has one gamma-ray energy available for identification and quantification @ 765.9 keV. The gamma-ray printout indicates a photon energy @ 767.10 keV, and given the low energy calibration, would more likely correspond to 769.4 keV and is therfore not likely Nb-95. Nb-95 is considered as NOT DETECTED.

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VY #	Analyte	Explanation
	ZR-95	The energies associated with Zr-95 are 724.2 & 756.& keV, but only one is listed on the printout for Zr-95 @ 725.01 keV and is unlikely from Zr-95 due to the low energy calibration. That is, the photon energy at 725.01 should likely be closer to an energy corresponding to 727.3 keV (609.3-607.0=2.3+725.02=727.3 keV). In addition there is no indication of the other Zr-95 photon energy @ 756.7 keV. Therefore, Zr-95 is NOT DETECTED.
SE991500	NB-95	Examination of the gamma-ray analysis printout indicates a photon energy @ 767.09, within the 2 keV energy tolerance of acceptance of Nb-95 @ 765.8 keV. But Bi-214, a natural gamma emmitter associated with Ra-226 daughters has a photon energy @ 768.4 keV, which unless corrected for, could be identified as Nb-95. Because of the presence of Ra-226, it is likely that the photon energy at 767.09 is associated with Bi-214 and, therefore, Nb-95 is NOT DETECTED.
	ZR-95	Zr-95 has two photon energies useful for identification and quantification, 724.2 and 756.7 keV. There is a photon energy listed on the printout @ 726.14 just within the 2 keV acceptance range for Zr-95. There is no indication of the other Zr-95 photon energy @ 756.7 keV being present. A photon energy for Bi-212, a natural radionuclide, occurs @ 727.3 keV and could overlap into the forced activity calculation for Zr-95 given an elevated value greater than the MDA value. Therefore, Zr-95 is considered NOT DETECTED.