Entergy

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May 7, 2004
BVY 04-44

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)
2003 Annual Radiological Environmental Operating Report

In accordance with Vermont Yankee Technical Specification 6.6.E, attached is a copy of the 2003 Annual Radiological Environmental Operating Report. This report contains a summary and analysis of the radiological environmental data collected for the calendar year 2003.

We trust that the information provided is adequate; however, should you have questions or require additional information, please contact me at (802) 258-4236.

Sincerely,

James M. DeVincentis
Manager, Licensing

Attachments

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.: 04-44 "2003 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

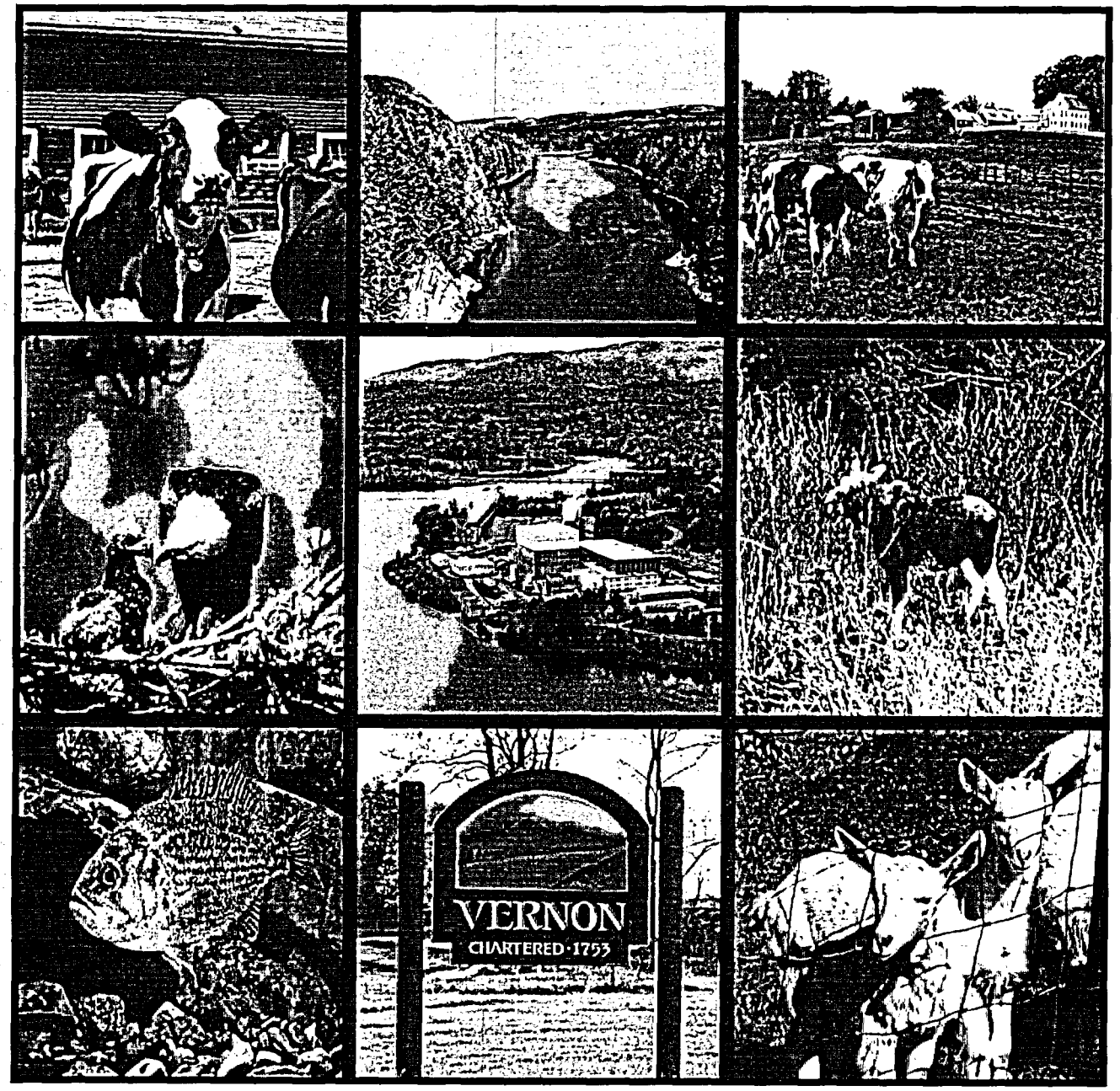
Docket No. 50-271
BVY 04-44

Attachment 1

Vermont Yankee Nuclear Power Station

2003 Annual Radiological Environmental Operating Report

ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE



2003 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

ENTERGY NUCLEAR NORTHEAST - VERMONT YANKEE
Vermont Yankee Nuclear Power Station

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Year 2003

Preparation coordinated by: _____ / 4/27/04
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Approved for Distribution: _____ / 4/29/04
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1. INTRODUCTION

This report summarizes the findings of the Radiological Environmental Monitoring Program (REMP) conducted by Entergy Nuclear Northeast Vermont Yankee (ENNVY), LLC in the vicinity of the Vermont Yankee Nuclear Power Station (VYNPS) in Vernon, Vermont during the calendar year 2003. 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 ENNVY Power Station site and its environs.

Section 4: Provides a description of the overall REMP program design. Included is a summary of the ENNVY Off-Site Dose Calculation Manual (ODCM) requirements for REMP sampling, tables listing all locations sampled or monitored in 2003 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 ENNVY 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 2003 environmental TLD measurements.

Section 6: Provides the results of the 2003 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 Teledyne Brown Engineering Laboratory (TBE-ES) and the Framatome ANP Environmental Thermoluminescent Dosimetry (TLD) Laboratory.

Section 8: Summarizes the requirements and the results of the 2003 Land Use Census.

Section 9: Gives a summary of the 2003 Radiological Environmental Monitoring Program.

2. BACKGROUND RADIOACTIVITY

Radiation or radioactivity potentially detected in the ENNVY 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 ENNVY plant. The third potential source of radioactivity is due to emissions from the ENNVY plant. For the purposes of the ENNVY 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 ENNVY 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 ENNVY 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 plant site 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 on the valley floor.

Construction of the single 552 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 ENNVY Power Station 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 ENNVY Chemistry Department conducts the radiological environmental monitoring program and collects all airborne, terrestrial and ground water samples. ENNVY maintains a contract with Normandeau Associates to collect all fish, river water and river sediment samples. In 2003, analytical measurements of environmental samples were performed at the Teledyne Brown Engineering (TBE) Laboratory in Knoxville, Tennessee. TLD badges are posted and retrieved by the ENNVY Chemistry Department, and are analyzed by the Framatome ANP Environmental Laboratory in Westborough, Massachusetts.

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 on a weekly frequency and to allow for the decay of radon daughter products, the analysis for gross beta radioactivity is delayed for more than 24 hours. The 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 from the plant stack 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 weekly 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 ENNVY 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 also performed on each sample. The monthly composite and grab samples are composited by location by the contracted environmental laboratory for a quarterly tritium (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 two downriver locations, several locations at the North Storm Drain Outfall and at the Route 9 Bridge over the Connecticut River 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 screen cylinder. This cylinder 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 (Framatome ANP) 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	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.

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 1-131	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 2003 ENNVY 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-10	Downstream River Station (3-3)	I	1.9	SSE
	SE-11	Discharge (Sta. 3-4)	I	0.6	SSE
	SE-21	Rte. 9 Bridge (Sta. 3-8)	C	11.8	NNW
	SE-12 thru 36	North Storm Drain Outfall	I	0.1	E

TABLE 4.2, cont.

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS (NON-TLD) IN 2003
ENNVY POWER STATION

Exposure Pathway	Station Code	Station Description	Zone[a]	Distance From Plant Stack(km)	Direction 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 2003
ENNVY 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 2003
ENNVY 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.

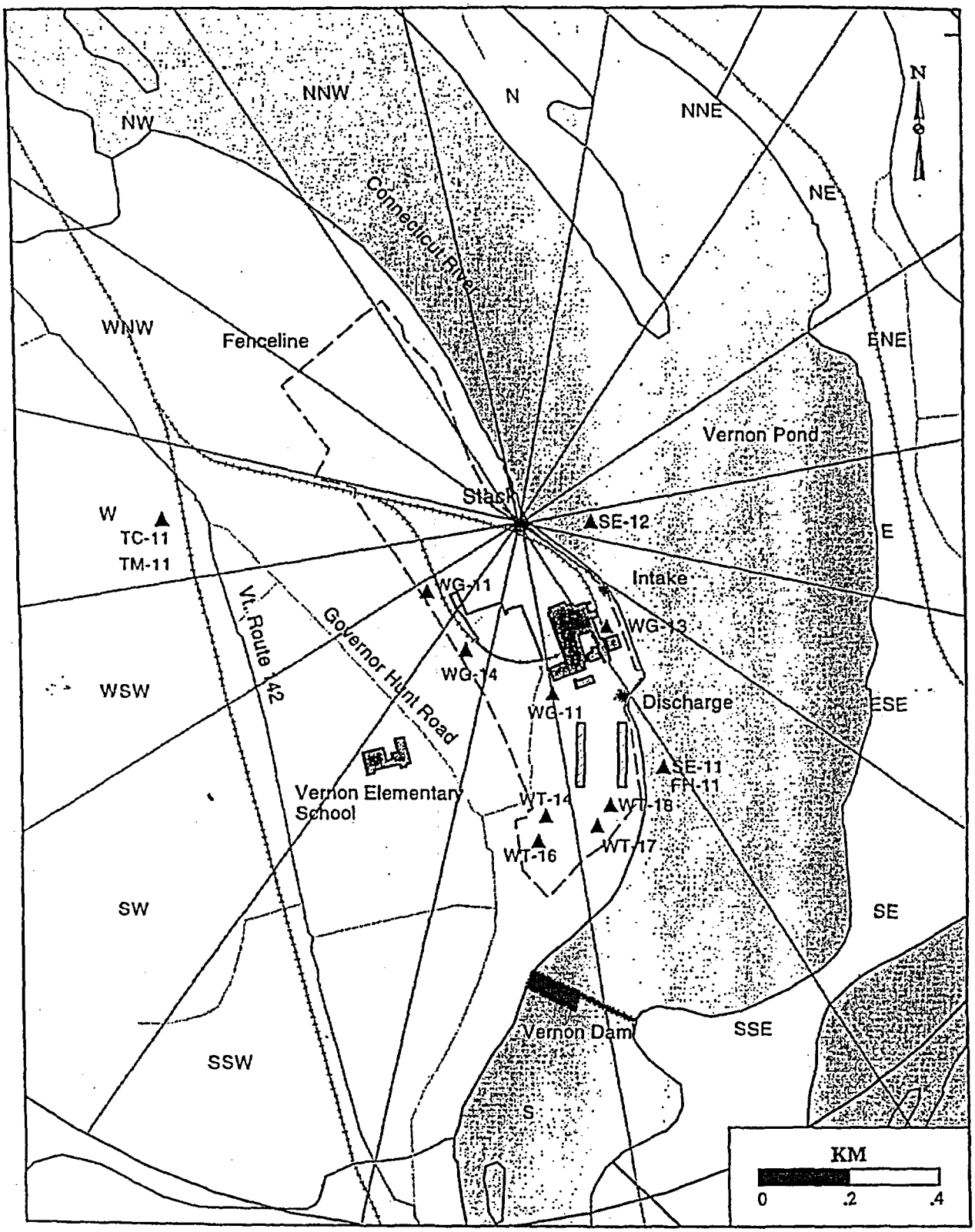

Figure 4-1 Environmental Sampling Locations in Close Proximity to the Plant

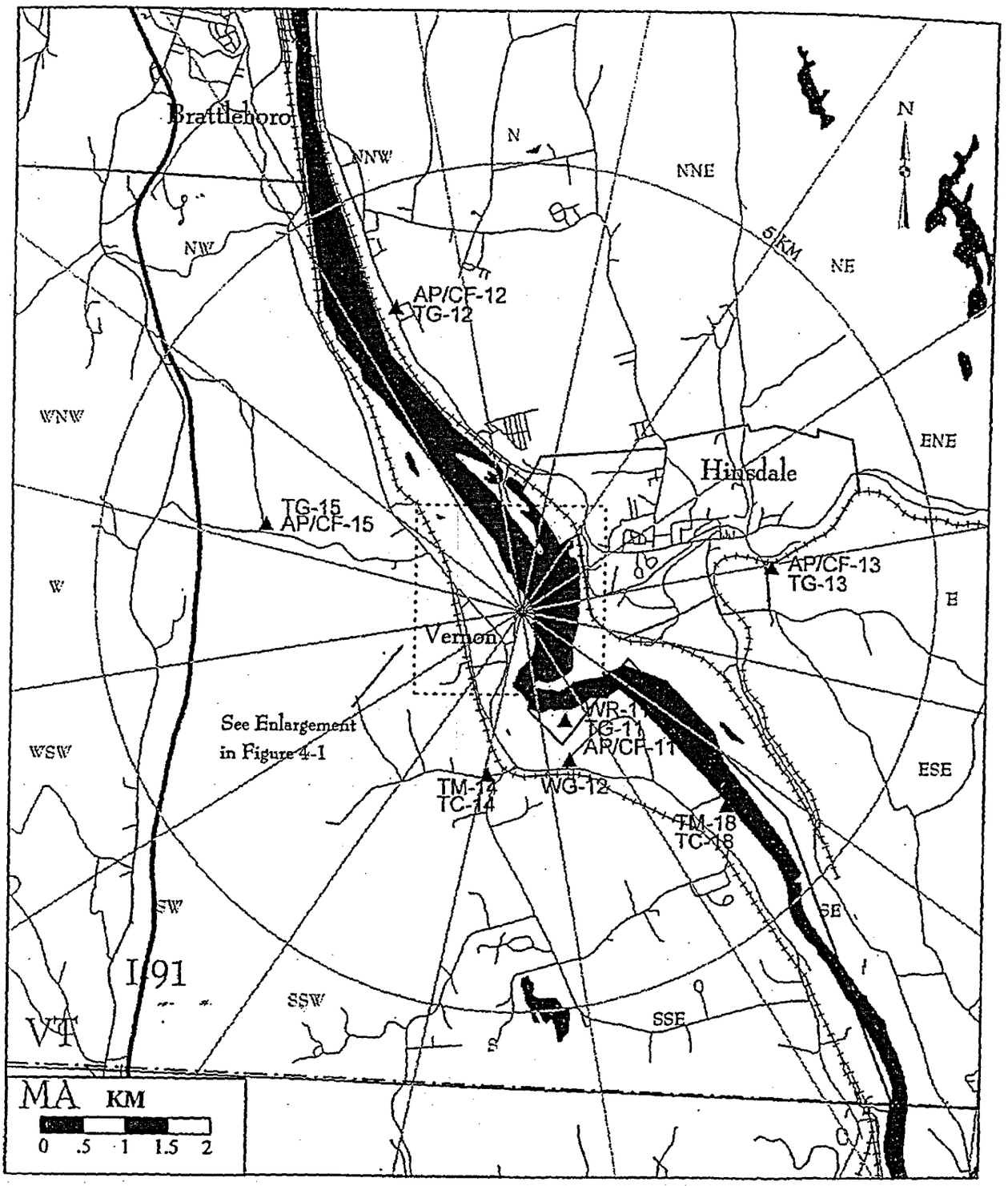

Figure 4-2 Environmental Sampling Locations

Within 5 Km of Plant

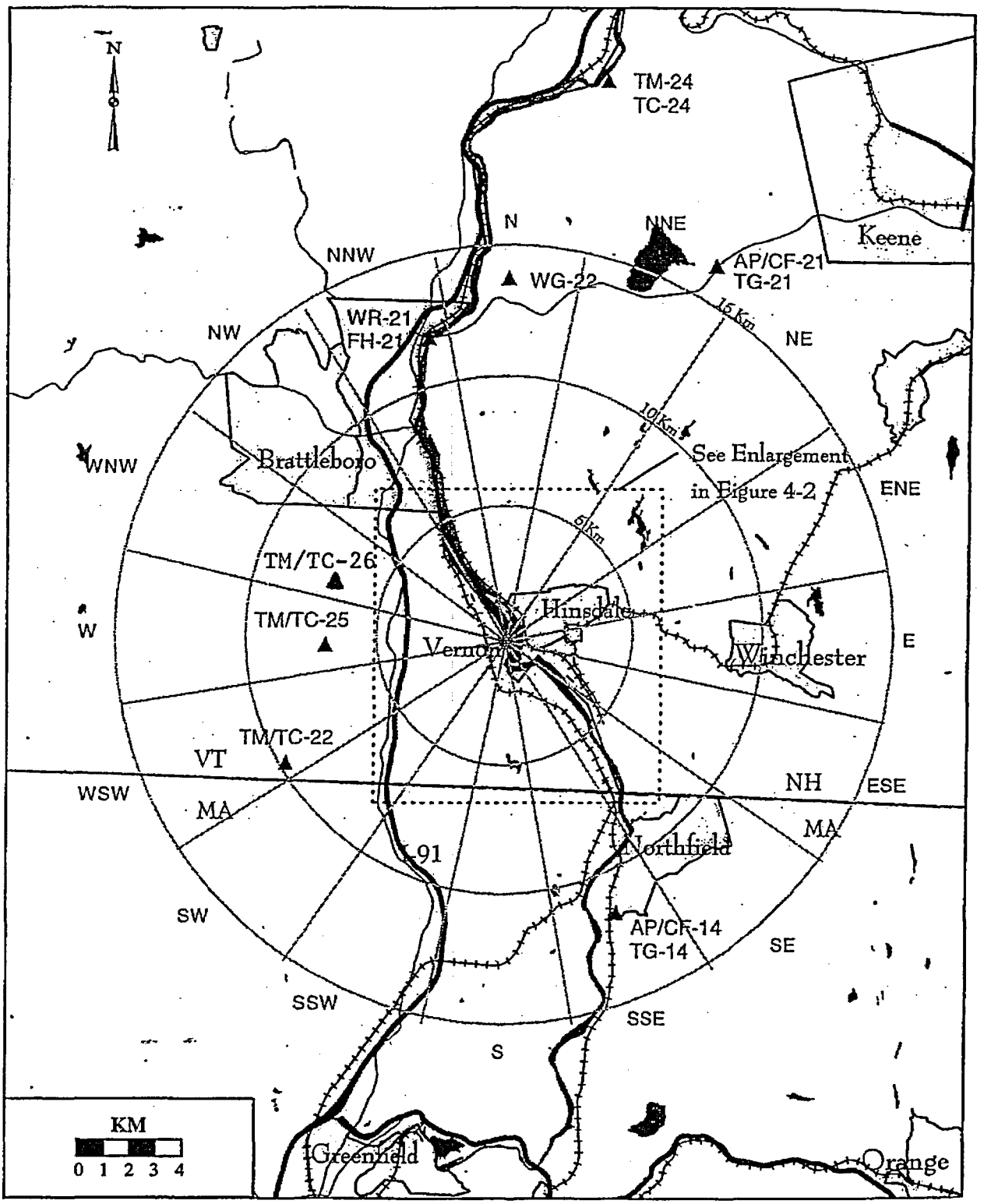

Figure 4-3 Environmental Sampling Locations

Greater than 5 Km from Plant

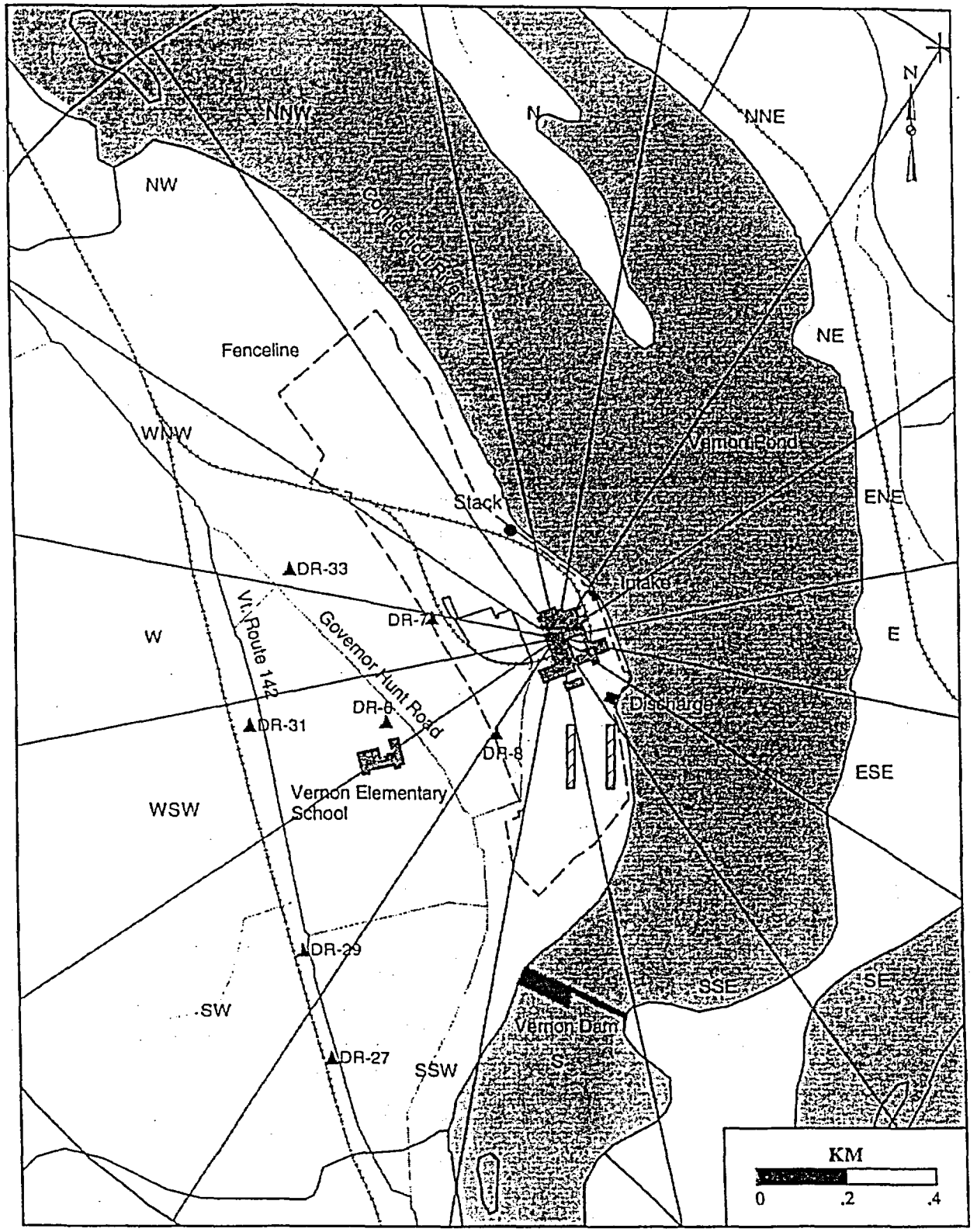

Figure 4-4 TLD Locations in Close Proximity to the Plant

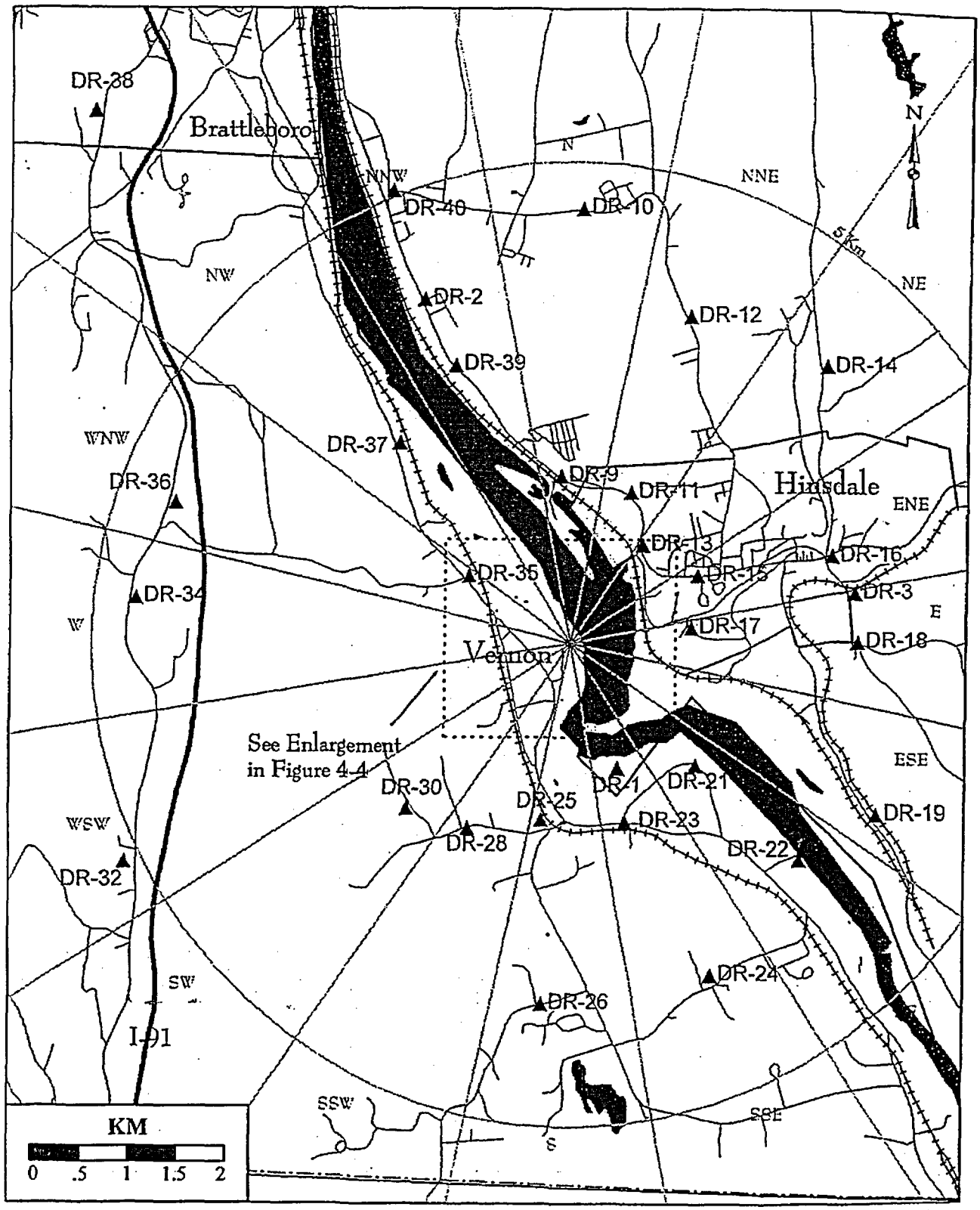

Figure 4-5 TLD Locations Within 5 Km of Plant

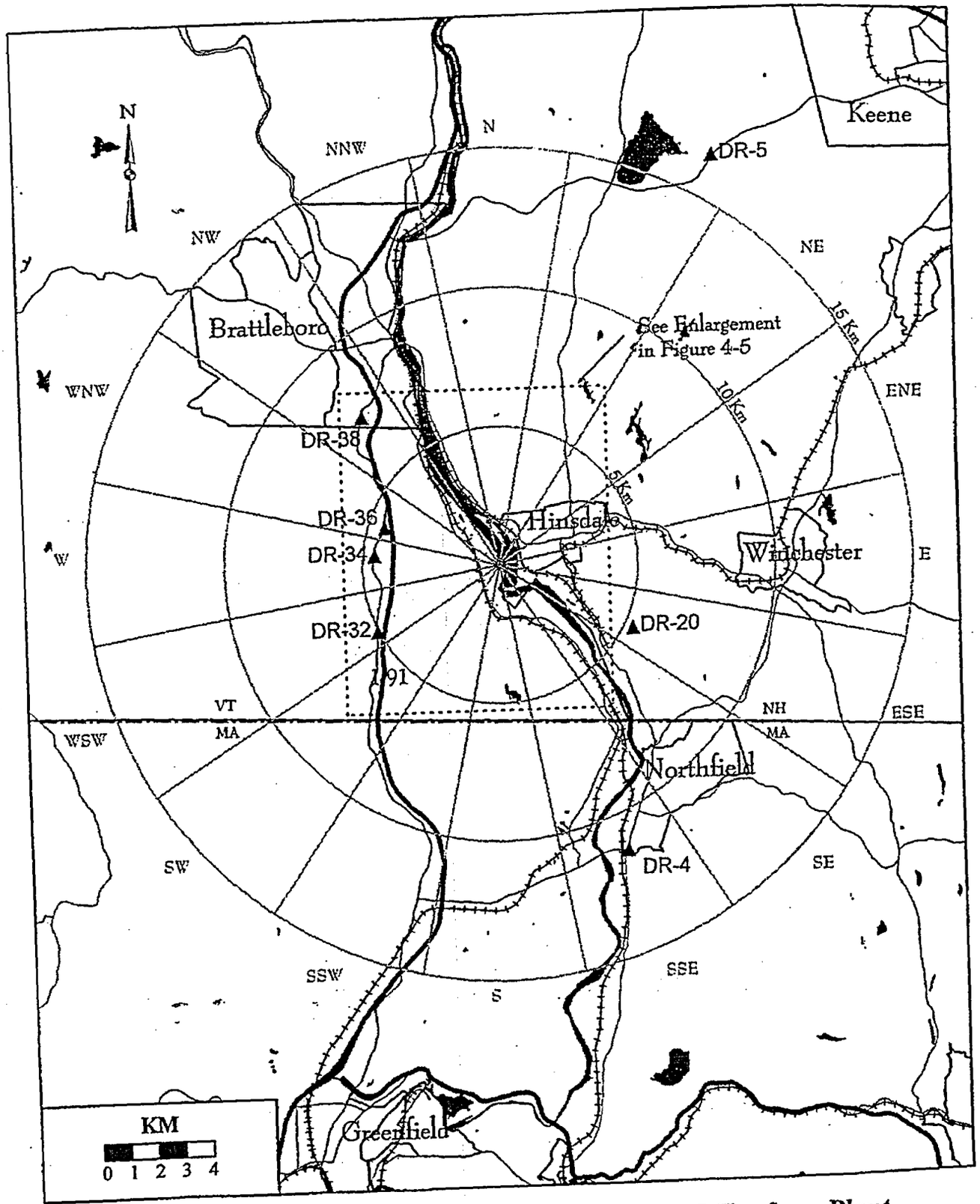

Figure 4-6 TLD Locations Greater Than 5 Km from Plant

5. RADIOLOGICAL DATA SUMMARY TABLES

This section summarizes the analytical results of the environmental samples that were collected during 2003. 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 2003, ENNVY contracted with one laboratory for primary analyses of the environmental samples. A second laboratory was used to cross-check the first laboratory for selected samples.

The left-most column of Table 5.1 describes the medium sampled. The second column of Table 5.1 contains the radionuclide of interest. The third column defines the total number of analyses for that radionuclide in the given medium in 2003. The fourth column provides 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 may not be met. This may be due to malfunctions in sampling equipment or lack of sufficient sample quantity which would then result in low sample volume. Delays in analysis at the laboratory could also be a factor. Such cases, if and when they should occur, would be addressed in Section 6.2. The fifth and sixth columns provide information on the mean, fraction of detectable measurements at specified locations and the range of data for indicator (which are within the range of influence of the plant and which could be affected by its operation) and control locations (which are beyond the influence of the plant). The seventh and eighth columns state the mean, fraction of detectable measurements and range for the identified highest annual mean location. The last column lists "Non-routine" measurements in the medium category.

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 radionuclide is also given.

Each single radioactivity measurement datum in this report is based on a single measurement of a sample. 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 ENNVY, a "positive measurement" is considered to be one whose concentration is greater than three times its associated standard deviation, is greater than or equal to the *a posteriori* LLD and satisfies the analytical laboratory's criteria for identification.

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, U-238, Zn-65 and Zr-95.

Data from direct radiation measurements made by TLDs are provided in Table 5.2. The complete listing of quarterly TLD data is provided in Table 5.3.

Radiological Environmental Program Summary

2003 Radiological Environmental Operating Report

ENNVY

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)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE (PCI/CU.METER)	GROSS BETA	371	0.01	0.0171 (318/318) (0.0062/0.058)	0.0167 (53/53) (0.0076/0.0343)	0.0178 (53/53) (0.0081/0.0488)	40 INDICATOR GOVERNOR HUNT HOUSE ON-SITE	0
	GAMMA SPEC	28						
	BE-7		N/A	0.0863 (24/24) (0.0660/0.103)	0.0925 (4/4) (0.0756/0.107)	0.0925 (4/4) (0.0756/0.107)	21 CONTROL SPOFFORD LAKE 16.4 MILES NNE OF SITE	0
	K-40		N/A	0.0017 (1/24) (-0.0101/0.0094)	-0.0004 (0/4) (-0.0135/0.0068)	0.0054 (0/4) (0.001/0.0094)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	CS-134		0.05	-0.0002 (0/24) (-0.0014/0.0001)	0.0000 (0/4) (-0.0002/0.0002)	0.0000 (0/4) (0.0000/0.0001)	14 INDICATOR NORTHFIELD, MA 11.6 MILES SSE OF SITE	0
	CS-137		0.06	0.0000 (0/24) (-0.0004/0.0003)	0.0000 (0/4) (-0.0001/0.0000)	0.0001 (0/4) (0.0000/0.0003)	13 INDICATOR HINSDALE SUBSTATION 3.1 MILES E OF SITE	0
	RA-226		N/A	0.0002 (0/24) (-0.0069/0.0054)	0.0016 (0/4) (0.0001/0.0036)	0.0024 (0/4) (0.0010/0.0054)	40 INDICATOR GOVERNOR HUNT HOUSE ON-SITE	0
	TH-232		N/A	-0.0001 (0/24) (-0.0020/0.0025)	-0.0003 (0/4) (-0.0011/0.0006)	0.0003 (0/4) (-0.0009/0.0025)	15 INDICATOR TYLER HILL ROAD 3.1 MILES WNW OF SITE	0
AIR IODINE (Charcoal) (PCI/CU.METER)	I-131	371	0.07	-0.0003 (0/318) (-0.0152/0.0138)	0.0005 (0/53) (-0.0144/0.0214)	0.0005 (0/53) (-0.0144/0.0214)	21 CONTROL SPOFFORD LAKE 16.4 MILES NNE OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RIVER WATER (PCI/LITER)	GROSS BETA	24	4	2.08 (5/12) (0.476/5.46)	1.43 (1/12) (0.272/2.53)	2.08 (5/12) (0.476/5.46)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	TRITIUM	8	3000	27.2 (0/4) (-60.1/80.4)	32.5 (0/4) (-10.1/79.5)	32.5 (0/4) (-10.1/79.5)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	GAMMA SPEC	24						
	MN-54		15	-0.314 (0/12) (-2.17/0.860)	-0.0359 (0/12) (-1.36/1.41)	-0.0359 (0/12) (-1.36/1.41)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CO-58		15	0.0073 (0/12) (-0.562/0.680)	-0.229 (0/12) (-1.64/1.45)	0.0073 (0/12) (-0.452/0.680)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	FE-59		30	-0.538 (0/12) (-3.45/1.80)	-0.885 (0/12) (-6.77/1.39)	-0.538 (0/12) (-3.45/1.80)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	CO-60		15	0.525 (0/12) (-0.734/1.67)	0.283 (0/12) (-1.33/2.72)	0.525 (0/12) (-0.734/1.67)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	ZN-65		30	-1.68 (0/12) (-6.18/1.72)	-0.965 (0/12) (-4.86/4.82)	-0.965 (0/12) (-4.86/4.82)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	ZR-95		15	-0.270 (0/12) (-1.11/0.599)	-0.359 (0/12) (-3.44/1.66)	-0.270 (0/12) (-1.11/0.599)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RIVER WATER (cont.) (PCI/LITER)	I-131		N/A	-0.982 (0/12) (-4.78/1.81)	0.356 (0/12) (-1.54/1.94)	0.356 (0/12) (-1.54/1.94)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CS-134		15	-1.05 (0/12) (-4.30/0.334)	-1.34 (0/12) (-9.34/1.24)	-1.05 (0/12) (-4.30/0.334)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	CS-137		18	0.106 (0/12) (-0.948/0.785)	0.0950 (0/12) (-2.35/1.24)	0.106 (0/12) (-0.948/0.785)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	BA-LA-140		15	-0.288 (0/12) (-1.88/1.16)	-0.803 (0/12) (-4.41/0.980)	-0.288 (0/12) (-1.88/1.16)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	RA226		N/A	-1.37 (0/12) (-35.0/28.7)	-11.2 (0/12) (-43.4/8.05)	-1.37 (0/12) (-35.0/28.7)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
	TH-232		N/A	-0.543 (0/12) (-4.16/3.73)	-2.32 (0/12) (-9.78/3.23)	-0.543 (0/12) (-4.16/3.73)	11 INDICATOR RIVER STATION NO. 3.3 1.9 MILES SSE OF SITE	0
GROUND WATER (PCI/LITER)	GROSS BETA	20	4	1.69 (15/16) (1.50/9.08)	1.40 (2/4) (0.260/2.17)	7.07 (4/4) (5.39/9.08)	11 INDICATOR PLANT WELL 0.2 MILES ON-SITE	0
	TRITIUM	20	3000	22.3 (0/16) (-94.1/144)	12.9 (0/4) (-62.9/68.9)	82.0 (0/4) (36.9/144)	13 INDICATOR COB WELL 0.3 MILES ON-SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROUND WATER (cont.) (PCI/LITER)	I-131	20	N/A	0.089 (0/16) (-0.250/0.403)	0.107 (0/4) (-0.165/0.294)	0.172 (0/4) (-0.213/0.403)	14 INDICATOR PLANT SUPPORT BLDG (PSB) WELL 0.3 MILES ON-SITE	0
	GAMMA SPEC	20						
	MN-54		15	-0.288 (0/16) (-2.44/1.58)	-0.483 (0/4) (-1.88/0.370)	-0.171 (0/4) (-0.971/1.10)	12 INDICATOR VERNON NURSING WELL 2.1 MILES SSE OF SITE	0
	CO-58		15	-0.152 (0/16) (-1.71/1.61)	-0.787 (0/4) (-2.59/1.04)	0.0583 (0/4) (-0.166/0.300)	13 INDICATOR COB WELL 0.3 MILES ON-SITE	0
	FE-59		30	0.195 (0/16) (-3.52/5.29)	-0.945 (0/4) (-3.72/0.588)	1.57 (0/4) (0.578/2.62)	11 INDICATOR PLANT WELL 0.2 MILES ON-SITE	0
	CO-60		15	-0.171 (0/16) (-2.58/2.20)	0.210 (0/4) (-1.58/2.22)	0.534 (0/4) (-2.51/2.20)	13 INDICATOR COB WELL 0.3 MILES ON-SITE	0
	ZN-65		30	-0.335 (0/16) (-10.3/3.44)	-4.83 (0/4) (-15.2/-0.761)	1.10 (0/4) (0.006/1.83)	11 INDICATOR PLANT WELL 0.2 MILES ON-SITE	0
	NB-95		N/A	0.985 (0/16) (-2.11/5.76)	-0.539 (0/4) (-2.92/1.14)	2.25 (0/4) (-1.93/5.76)	11 INDICATOR PLANT WELL 0.2 MILES ON-SITE	0
	ZR-95		15	-0.0445 (0/16) (-1.51/1.79)	-0.233 (0/4) (-2.22/3.08)	0.695 (0/4) (-0.475/1.79)	14 INDICATOR PLANT SUPPORT BLDG (PSB) WELL 0.3 MILES ON-SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

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Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROUND WATER (cont.) (PCI/LITER)	CS-134		15	-1.02 (0/16) (-20.6/1.90)	-6.12 (0/4) (-23.8/0.756)	0.285 (0/4) (-0.885/1.43)	12 INDICATOR VERNON NURSING WELL 2.1 MILES SSE OF SITE	0
	CS-137		18	-0.487 (0/16) (-1.80/1.37)	-0.396 (0/4) (-1.20/0.681)	0.393 (0/4) (-0.149/1.32)	12 INDICATOR VERNON NURSING WELL 2.1 MILES SSE OF SITE	0
	BA-LA-140		15	-0.608 (0/16) (-4.04/4.50)	0.0123 (0/4) (-1.46/2.50)	0.953 (0/4) (-2.44/4.50)	13 INDICATOR COB WELL 0.3 MILES ON-SITE	0
	RA226		N/A	-8.34 (0/16) (-54.7/26.3)	1.09 (0/4) (-4.98/9.62)	1.09 (0/4) (-4.98/9.62)	22 CONTROL SKIBNIOWSKY WELL 13.7 MILES N OF SITE	0
	TH-232		N/A	-0.954 (0/16) (-10.5/5.35)	1.56 (0/4) (-3.11/4.91)	1.56 (0/4) (-3.11/4.91)	22 CONTROL SKIBNIOWSKY WELL 13.7 MILES N OF SITE	0
SEDIMENT (PCI/KG DRY)	GAMMA SPEC	32						
	BE-7		N/A	375 (7/30) (-213/2300)	362 (0/2) (74.1/650)	1176 (1/2) (52.0/2300)	17 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	K-40		N/A	17120 (30/30) (10900/25700)	12350 (2/2) (10700/14000)	22700 (2/2) (19700/25700)	12 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	MN-54		N/A	6.51 (0/30) (-26.4/57.2)	-4.05 (0/2) (-16.4/8.30)	27.5 (0/2) (20.2/34.8)	11 INDICATOR DISCHARGE (STA. 3-4) 0.6 MILES SSE OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

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Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (cont.) (PCI/KG DRY)	CO-60		N/A	10.8 (0/30) (-25.2/84.6)	3.87 (0/2) (-0.194/7.93)	46.5 (0/2) (8.44/84.6)	30 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	NB-95		N/A	8.88 (0/30) (-53.6/63.8)	14.3 (0/2) (11.2/17.4)	54.8 (0/2) (48.3/61.3)	10 INDICATOR DOWNSTREAM RIVER STATION (3-3) 1.9 MILES SSE OF SITE	0
	CS-134		150	-0.934 (0/30) (-27.8/26.8)	12.8 (0/2) (0.304/25.3)	12.8 (0/2) (0.304/25.3)	21 CONTROL RTE. 9 BRIDGE (STA. 3-8) 11.8 MILES NNW OF SITE	0
	CS-137		180	143 (26/30) (8.18/252)	51.5 (1/2) (34.1/68.9)	210 (2/2) (168/252)	12 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	BA-LA-140		N/A	-66.2 (0/30) (-390/80.9)	-56.6 (0/2) (-128/14.8)	27.0 (0/2) (-11.9/65.8)	13 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	RA-226		N/A	2107 (21/30) (666/3490)	1398 (1/2) (195/2600)	2480 (1/2) (2430/2530)	36 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	AC-228		N/A	1941 (26/30) (750/3270)	1364 (2/2) (808/1920)	2820 (2/2) (2710/2930)	35 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	TH-228		N/A	2354 (25/30) (917/4950)	1855 (1/2) (1800/1910)	3350 (2/2) (1750/4950)	30 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (cont.) (PCI/KG DRY)	TH-232		N/A	1214 (30/30) (555/1810)	978 (2/2) (706/1250)	1660 (2/2) (1510/1810)	12 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
	U-238		N/A	1145 (0/30) (-2870/4307)	377 (0/2) (-301/1055)	2834 (0/2) (1680/3988)	19 INDICATOR NORTH STORM DRAIN OUTFALL 0.1 MILES E OF SITE	0
TEST WELLS (PCI/LITER)	GROSS BETA	8	N/A	33.4 (8/8) (16.2/66.4)	N/A	56.2 (2/2) (45.9/66.4)	17 INDICATOR TEST WELL 203 ON-SITE	0
	TRITIUM	8	N/A	10.5 (0/8) (-63.9/90.6)	N/A	54.4 (0/2) (18.1/90.6)	16 INDICATOR TEST WELL 202 ON-SITE	0
	GAMMA SPEC	8						
	K-40		N/A	19.1 (1/8) (4.11/67.2)	N/A	47.2 (1/2) (27.2/67.2)	18 INDICATOR TEST WELL 204 ON-SITE	0
	MN-54		N/A	-0.651 (0/8) (-2.25/1.30)	N/A	0.507 (0/2) (-0.286/1.30)	18 INDICATOR TEST WELL 204 ON-SITE	0
	CO-58		N/A	-0.513 (0/8) (-1.75/0.840)	N/A	0.426 (0/2) (0.0120/0.840)	14 INDICATOR TEST WELL 201 ON-SITE	0
	FE-59		N/A	-0.679 (0/8) (-4.03/1.04)	N/A	0.935 (0/2) (0.830/1.04)	17 INDICATOR TEST WELL 203 ON-SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
TEST WELLS (cont.) (PCI/LITER)	CO-60		N/A	-0.211 (0/8) (-2.11/2.23)	N/A	1.79 (0/2) (1.35/2.23)	14 INDICATOR TEST WELL 201 ON-SITE	0
	NB-95		N/A	-0.237 (0/8) (-1.65/1.34)	N/A	0.310 (0/2) (-0.720/1.34)	18 INDICATOR TEST WELL 204 ON-SITE	0
	I-131		N/A	-0.617 (0/8) (-3.81/0.971)	N/A	-0.044 (0/2) (-0.897/0.810)	14 INDICATOR TEST WELL 201 ON-SITE	0
	CS-134		N/A	0.077 (0/8) (-0.750/1.05)	N/A	1.00 (0/2) (0.958/1.05)	17 INDICATOR TEST WELL 203 ON-SITE	0
	CS-137		N/A	-0.896 (0/8) (-1.94/0.929)	N/A	0.144 (0/2) (-0.642/0.929)	14 INDICATOR TEST WELL 201 ON-SITE	0
	BA-LA-140		N/A	-0.961 (0/8) (-3.07/1.12)	N/A	1.11 (0/2) (1.10/1.12)	14 INDICATOR TEST WELL 201 ON-SITE	0
MILK (PCI/LITER)	I-131	121	1	0.0495 (0/102) (-0.533/0.433)	0.106 (0/19) (-0.144/0.352)	0.106 (0/19) (-0.144/0.352)	24 CONTROL COUNTY FARM 21.6 MILES N OF SITE	0
	SR-89	26	N/A	0.926 (0/22) (-5.26/5.13)	2.14 (0/4) (1.36/2.69)	3.01 (0/4) (0.850/5.13)	11 INDICATOR MILLER FARM 0.8 MILES W OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (Cont.) (PCI/LITER)	SR-90	26	N/A	1.08 (13/22) (0.167/3.33)	0.789 (3/4) (0.127/1.24)	2.12 (4/4) (1.06/3.33)	25 INDICATOR DOWNEY-SPENCER 6.9 MILES W OF SITE	0
	GAMMA SPEC	121						
	BE-7		N/A	1.61 (0/102) (-18.4/24.4)	-1.68 (0/19) (-39.3/11.1)	3.65 (0/19) (-7.71/16.7)	25 INDICATOR DOWNEY-SPENCER 6.9 MILES W OF SITE	0
	K-40		N/A	1478 (102/102) (1230/1920)	1444 (19/19) (1350/1660)	1769 (19/19) (1510/1920)	25 INDICATOR DOWNEY-SPENCER 6.9 MILES W OF SITE	0
	CS-134		15	-1.22 (0/102) (-12.7/8.32)	-2.62 (0/19) (-11.5/0.715)	-0.608 (0/19) (-3.26/1.54)	18 INDICATOR BLODGETT FARM 3.6 MILES SE OF SITE	0
	CS-137		18	1.16 (5/102) (-3.03/8.45)	0.578 (0/19) (-0.680/2.75)	3.84 (5/19) (0.731/8.45)	25 INDICATOR DOWNEY-SPENCER 6.9 MILES W OF SITE	0
	BA-LA140		15	-0.556 (0/102) (-5.20/2.74)	-0.145 (0/19) (-2.59/3.11)	-0.145 (0/19) (-2.59/3.11)	24 CONTROL COUNTY FARM 21.6 MILES N OF SITE	0
	RA-226		N/A	-6.15 (0/102) (-121/183)	-6.73 (0/19) (-67.0/64.4)	8.99 (0/19) (-32.9/41.9)	26 INDICATOR CHENEY HILL FARM 7.5 MILES WNW OF SITE	0
	AC-228		N/A	0.219 (0/102) (-20.0/9.69)	0.014 (0/19) (-7.49/15.9)	5.08 (0/19) (-8.40/106)	18 INDICATOR BLODGETT FARM 3.6 MILES SE OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (Cont.) (PCI/LITER)	TH-228		N/A	-34.1 (0/102) (-241/118)	-32.4 (0/19) (-143/52.1)	-23.8 (0/19) (-96.2/83.7)	18 INDICATOR BLODGETT FARM 3.6 MILES SE OF SITE	0
	TH-232		N/A	-0.040 (0/102) (-15.3/21.4)	-0.090 (0/19) (-7.22/15.4)	2.46 (0/19) (-8.80/21.4)	14 INDICATOR BROWN FARM 2.2 MILES S OF SITE	0
SILAGE (PCI/KG)	I-131	5	60	8.08 (0/4) (2.34/12.2)	16.9 (0/1) N/A	16.9 (0/1) N/A	24 CONTROL COUNTY FARM 21.6 MILES N OF SITE	0
	GAMMA SPEC	5						
	BE-7		N/A	790 (4/4) (628/1090)	895 (1/1) N/A	1090 (1/1) N/A	18 INDICATOR BLODGETT FARM 3.6 MILES SE OF SITE	0
	K-40		N/A	5468 (4/4) (2490/12300)	4020 (1/1) N/A	12300 (1/1) N/A	22 INDICATOR FRANKLIN FARM 9.7 MILES WSW OF SITE	0
	CS-134		60	-6.68 (0/4) (-14.6/-2.29)	-2.86 (0/1) N/A	-2.29 (0/1) N/A	14 INDICATOR BROWN FARM 2.2 MILES S OF SITE	0
	CS-137		80	2.65 (0/4) (-5.04/11.7)	1.19 (0/1) N/A	11.7 (0/1) N/A	22 INDICATOR FRANKLIN FARM 9.7 MILES WSW OF SITE	0
	TH-232		N/A	7.22 (0/4) (-3.59/13.1)	3.63 (0/1) N/A	13.1 (0/1) N/A	18 INDICATOR BLODGETT FARM 3.6 MILES SE OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MIXED GRASS (PCI/KG)	I-131	28	60	6.46 (0/24) (-15.2/21.6)	3.82 (0/4) (-5.87/12.5)	12.3 (0/4) (-10.9/21.6)	12 INDICATOR N. HINSDALE, NH 3.6 MILES NNW OF SITE	0
	GAMMA SPEC	28						
	BE-7		N/A	2958 (24/24) (84.8/8050)	3472 (4/4) (947/6320)	4563 (4/4) (1380/7980)	12 INDICATOR N. HINSDALE, NH 3.6 MILES NNW OF SITE	0
	K-40		N/A	6368 (24/24) (2330/12500)	6708 (4/4) (4680/10000)	7568 (4/4) (4370/12500)	11 INDICATOR RIVER STA. NO. 3.3 1.9 MILES SSE OF SITE	0
	CS-134		60	-12.8 (0/24) (-60.8/4.95)	-12.3 (0/4) (-52.3/3.55)	-0.329 (0/4) (-6.72/3.47)	11 INDICATOR RIVER STA. NO. 3.3 1.9 MILES SSE OF SITE	0
	CS-137		80	9.69 (6/24) (-0.347/39.7)	4.57 (0/4) (1.31/6.15)	17.1 (2/4) (-0.286/34.9)	13 INDICATOR HINSDALE SUBSTATION 3.1 MILES E OF SITE	0
	AC-228		N/A	73.8 (2/24) (-28.7/713)	114 (0/4) (63.2/225)	192 (1/4) (-18.0/713)	15 INDICATOR TYLER HILL RD. 3.1 MILES WNW OF SITE	0
	TH-228		N/A	-255 (0/24) (-1230/437)	-98.8 (0/4) (-316/58.0)	181 (0/4) (103/285)	11 INDICATOR RIVER STA. NO. 3.3 1.9 MILES SSE OF SITE	0
	TH-232		N/A	28.1 (0/24) (-31.0/90.0)	19.2 (04) (6.62/47.8)	43.9 (0/4) (17.4/82.3)	40 INDICATOR GOVERNOR HUNT HOUSE ON-SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
FISH (PCI/KG)	GAMMA SPEC	4	N/A					
	K-40			2765 (2/2) (1590/3940)	3995 (2/2) (3660/4330)	3995 (2/2) (3660/4330)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	MN-54		130	-0.453 (0/2) (-1.27/0.365)	3.76 (0/2) (-4.08/11.6)	3.76 (0/2) (-4.08/11.6)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CO-58		130	-8.42 (0/2) (-14.2/-2.63)	5.97 (0/2) (-1.27/13.2)	5.97 (0/2) (-1.27/13.2)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	FE-59		260	-12.3 (0/2) (-17.4/-7.25)	-6.99 (0/2) (-22.3/8.32)	-6.99 (0/2) (-22.3/8.32)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CO-60		130	10.0 (0/2) (9.94/10.1)	-6.03 (0/2) (-16.1/4.05)	10.0 (0/2) (9.94/10.1)	11 INDICATOR VERNON POND 0.6 MILES SSE OF SITE	0
	ZN-65		260	-98.1 (0/2) (-127/-69.2)	-24.9 (0/2) (-36.2/-13.6)	-24.9 (0/2) (-36.2/-13.6)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CS-134		130	-6.83 (0/2) (-10.7/-2.96)	-2.38 (0/2) (-7.63/2.88)	-2.38 (0/2) (-7.63/2.88)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0
	CS-137		150	13.0 (0/2) (-1.16/27.1)	27.1 (0/2) (9.18/45.1)	27.1 (0/2) (9.18/45.1)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE 5-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE , 2003

Name of Facility: ENNVY **DOCKET NUMBER:** 50-271
Location of Facility: VERNON, VT **REPORTING PERIOD:** 2003

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSES PERFORMED	NUMBER OF ANALYSES PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (F) RANGE	CONTROL LOCATION MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
FISH (Cont.) (PCI/KG)	TH-232		N/A	-9.12 (0/2) (-17.1/-1.13)	60.1 (0/2) (5.15/115)	60.1 (0/2) (5.15/115)	21 CONTROL RT. 9 BRIDGE 11.8 MILES NNW OF SITE	0

FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

Environmental TLD Data

2003 Radiological Environmental Operating Report
ENNVY

Tables:

5.2 – Data Summary
5.3 - Measurements

TABLE 5.2

ENVIRONMENTAL TLD DATA SUMMARY
ENTERGY NUCLEAR NORTHEAST VERMONT YANKEE, VERNON, VT
(JANUARY - DECEMBER 2003)

INNER RING TLD	OUTER RING TLD	OFFSITE STATION WITH HIGHEST MEAN	CONTROL TLDs
MEAN*	MEAN*	STA.NO MEAN*	MEAN*
RANGE*	RANGE*	RANGE*	RANGE*
(NO. MEASUREMENTS)**	(NO. MEASUREMENTS)**	(NO. MEASUREMENTS)**	(NO. MEASUREMENTS)**
6.2 ± 0.4	6.2 ± 0.5	DR-36 7.1 ± 1.2	6.1 ± 0.4
4.1 - 7.7	4.1 - 7.8	5.3 - 7.8	4.5 - 7.2
84	64	4	8

SITE BOUNDARY TLD WITH HIGHEST MEAN	SITE BOUNDARY TLD
STA.NO. MEAN*	MEAN*
RANGE*	RANGE*
(NO. MEASUREMENTS)**	(NO. MEASUREMENTS)**
DR-45 12.2 ± 0.7	7.7 ± 1.52
11.3 - 12.8	4.1 - 12.8
4	56

* Units are in micro-R per hour.

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

TABLE 5.3

ENNVY ENVIRONMENTAL TLD MEASUREMENTS
2003
(Micro-R per Hour)

Sta. No.	Description	1ST QUARTER DoseRate	S.D.	2ND QUARTER DoseRate	S.D.	3RD QUARTER DoseRate	S.D.	4TH QUARTER DoseRate	S.D.	ANNUAL AVE. DoseRate
DR-01	River Sta. No. 3.3	4.7	0.3	6.3	0.3	5.8	0.2	6.0	0.5	5.7
DR-02	N Hinsdale, NH	4.4	0.2	6.9	0.3	6.3	0.4	6.9	0.5	6.1
DR-03	Hinsdale Substation	5.6	0.3	7.7	0.3	7.4	0.3	7.4	0.5	7.0
DR-04	Northfield, MA	4.5	0.3	6.3	0.3	5.8	0.4	6.5	0.5	5.8
DR-05	Spofford Lake, NH	4.8	0.3	7.2	0.5	6.3	0.3	6.9	0.4	6.3
DR-06	Vernon School	5.0	0.5	6.8	0.3	6.4	0.3	6.8	0.5	6.3
DR-07	Site Boundary	5.5	0.3	7.8	0.3	7.4	0.3	8.5	0.5	7.3
DR-08	Site Boundary	6.2	0.3	8.6	0.4	8.2	0.5	8.3	0.5	7.8
DR-09	Inner Ring	4.6	0.2	6.2	0.3	5.7	0.3	6.1	0.4	5.7
DR-10	Outer Ring	4.1	0.3	5.7	0.2	5.3	0.2	5.6	0.4	5.2
DR-11	Inner Ring	4.4	0.3	5.9	0.3	6.0	0.2	6.1	0.4	5.6
DR-12	Outer Ring	4.2	0.4	6.0	0.3	5.6	0.2	6.1	0.4	5.5
DR-13	Inner Ring	5.0	0.3	6.6	0.4	6.1	0.2	6.6	0.5	6.1
DR-14	Outer Ring	5.1	0.3	7.6	0.3	7.2	0.2	7.6	0.5	6.9
DR-15	Inner Ring	5.5	0.3	6.8	0.3	6.4	0.3	6.9	0.4	6.4
DR-16	Outer Ring	5.7	0.4	7.0	0.3	6.8	0.3	7.5	0.5	6.7
DR-17	Inner Ring	4.1	0.3	6.4	0.3	5.9	0.3	6.3	0.4	5.7
DR-18	Outer Ring	4.8	0.3	6.7	0.3	6.3	0.3	6.7	0.5	6.1
DR-19	Inner Ring	5.0	0.4	7.4	0.5	7.1	0.4	7.3	0.5	6.7
DR-20	Outer Ring	4.8	0.3	7.6	0.4	7.3	0.3	7.4	0.5	6.8
DR-21	Inner Ring	4.4	0.3	6.7	0.3	6.5	0.3	6.8	0.5	6.1
DR-22	Outer Ring	4.6	0.3	6.9	0.3	6.5	0.3	6.8	0.5	6.2
DR-23	Inner Ring	5.1	0.3	6.4	0.3	6.3	0.3	6.5	0.4	6.1
DR-24	Outer Ring	4.3	0.2	5.9	0.2	5.7	0.2	6.0	0.5	5.5
DR-25	Inner Ring	4.8	0.4	6.8	0.3	6.5	0.3	6.7	0.4	6.2
DR-26	Outer Ring	4.2	0.4	7.2	0.2	6.8	0.3	6.9	0.5	6.3
DR-27	Inner Ring	4.3	0.3	6.6	0.3	6.4	0.4	6.8	0.4	6.0
DR-28	Outer Ring	4.4	0.3	6.7	0.3	6.1	0.2	6.7	0.4	6.0
DR-29	Inner Ring	5.0	0.3	7.2	0.3	6.8	0.3	7.2	0.5	6.5
DR-30	Outer Ring	4.9	0.4	7.1	0.2	6.6	0.3	6.5	0.4	6.3
DR-31	Inner Ring	4.6	0.3	7.0	0.3	6.7	0.2	7.0	0.5	6.4
DR-32	Outer Ring	4.4	0.3	6.3	0.4	6.3	0.2	6.5	0.4	5.9
DR-33	Inner Ring	4.9	0.2	7.1	0.3	6.7	0.3	7.1	0.6	6.5
DR-34	Outer Ring	4.6	0.3	7.0	0.4	6.6	0.2	7.1	0.5	6.3
DR-35	Inner Ring	4.8	0.3	6.9	0.3	6.5	0.2	6.8	0.5	6.2
DR-36	Outer Ring	5.3	0.3	7.7	0.3	7.6	0.2	7.8	0.5	7.1
DR-37	Inner Ring	4.3	0.3	6.8	0.3	6.5	0.3	7.7	0.6	6.3
DR-38	Outer Ring	5.1	0.4	7.4	0.3	7.0	0.2	7.6	0.5	6.8
DR-39	Inner Ring	4.4	0.3	6.9	0.3	6.5	0.3	7.0	0.4	6.2
DR-40	Outer Ring	4.8	0.3	6.7	0.4	6.4	0.2	6.8	0.5	6.2

TABLE 5.3 (continued)

ENNVY ENVIRONMENTAL TLD MEASUREMENTS
2003
(Micro-R per Hour)

Sta. No.	Description	1ST QUARTER DoseRate	S.D.	2ND QUARTER DoseRate	S.D.	3RD QUARTER DoseRate	S.D.	4TH QUARTER DoseRate	S.D.	ANNUAL AVE. DoseRate
DR-41	Site Boundary	5.1	± 0.3	8.1	± 0.6	7.4	± 0.2	7.7	± 0.6	7.1
DR-42	Site Boundary	4.1	± 0.3	7.3	± 0.3	6.8	± 0.3	7.1	± 0.5	6.3
DR-43	Site Boundary	5.0	± 0.3	7.6	± 0.3	7.3	± 0.2	7.5	± 0.5	6.9
DR-44	Site Boundary	7.3	± 0.4	8.4	± 0.3	7.8	± 0.3	8.7	± 0.6	8.1
DR-45	Site Boundary	11.3	± 0.7	12.7	± 0.7	12.0	± 0.9	12.8	± 0.9	12.2
DR-46	Site Boundary	6.3	± 0.3	9.0	± 0.3	8.4	± 0.4	9.4	± 0.6	8.3
DR-47	Site Boundary	5.2	± 0.4	7.9	± 0.3	7.7	± 0.3	7.9	± 0.6	7.2
DR-48	Site Boundary	4.6	± 0.3	7.5	± 0.3	7.0	± 0.3	7.3	± 0.5	6.6
DR-49	Site Boundary	4.4	± 0.2	6.6	± 0.4	6.3	± 0.2	6.7	± 0.5	6.0
DR-50	Governor Hunt House	5.0	± 0.3	7.2	± 0.3	6.9	± 0.3	7.4	± 0.5	6.6
DR-51	Site Boundary	5.2	± 0.3	8.5	± 0.4	8.0	± 0.4	8.8	± 0.5	7.6
DR-52	Site Boundary	6.7	± 0.6	8.9	± 0.3	8.7	± 0.4	8.9	± 0.6	8.3
DR-53	Site Boundary	6.7	± 0.4	9.7	± 0.4	9.1	± 0.4	9.8	± 0.7	8.8

6. ANALYSIS OF ENVIRONMENTAL RESULTS

6.1 Sampling Program Deviations

Off-site Dose Calculation Manual Table 3.5.1, Note a., allows for deviations "...if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons." In 2003, three 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 milk sample for quarterly composite analysis, are considered typical with respect to what is normally anticipated for any radiological environmental monitoring program. The specific deviations for 2003 were:

a) Failure of the water pump supplying river water to the Downstream River Station River Water Composite sampler (Station #WR-11). The pump was discovered to be only sporadically operating on April 15th and was replaced and restored to service on April 23rd, 2003. During the period that the pump was out of service, compensatory river water samples were collected on a daily basis and utilized as part of the monthly composite sample from this station. This failure was documented in ER-2003-0854.

b) Failure of an air sample station to collect required air samples at Station AP/CF 11 was discovered during the weekly air sample collection on May 27th, 2003. The air sample station power supply was interrupted due to age-related equipment failure in the station cabinet. Power was temporarily provided from the outer cabinet supply and a new station cabinet was installed at this location. Air samples are collected on a weekly basis and it was determined that only ten percent of the normal sample was collected at this station during the weekly sample period. No further problems of this type were experienced at air sample stations for the remainder of the year. This failure was documented in ER-2003-1132.

c) A milk sample collected from County Farm (Station #TM-24) on July 16th, 2003 was sent to the environmental laboratory for immediate analysis of gamma-emitting nuclides and low-level Iodine-131. This part of the analysis was completed as scheduled. A portion of the sample was then retained by the laboratory for quarterly Strontium 89 and Strontium 90 analysis. During the process of combining County Farm samples from the third quarter, 2003, the lab technician discovered that the sample from July 16th was missing. The vendor laboratory issued a non-conformance report and contacted ENNVY. ENNVY documented this missing sample in CR-2003-2517. Quarterly analysis of milk samples for strontium content is not required by ENNVY Technical Specifications or the ENNVY Offsite Dose Calculation Manual (ODCM). These analyses are performed as program enhancements. No other instances of missing samples have been reported at the vendor laboratory prior to or following this event.

d) The following data indicates the percentage of time that each air sampling station operated during year 2003. The data was based on a comparison of the readings from an electric timer at each station and the clock time of sample collection. This data indicates that any power interruptions did not result in a significant loss of data for the airborne contaminant sampling program. Second quarter performance of Station 11 was impacted by the failure of electrical power to the air sample pump as referenced in Section 6.1.b) above. This outage is reflected in the percentages listed below. Other minor power interruptions are expected due to minor maintenance repairs and short duration electrical outages occurring during the year.

AP/CF #	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
11	100%	93%	100%	100%
12	100%	100%	100%	100%
13	100%	100%	100%	100%
14	99%	98%	100%	100%
15	100%	100%	100%	100%
21	100%	100%	100%	100%
40	100%	100%	100%	100%

6.2 Comparison of Achieved LLDs with Requirements

Table 4.5.1 of the ENNVY 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 may not be achieved due to a situation such as a low sample volume caused by sampling equipment malfunction or limited sample availability. In such a case, ODCM 10.2 requires a discussion of the situation. At the contracted environmental laboratory, the target LLD for the majority of analyses is 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 ENNVY 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 2003, all sample analyses performed for the REMP program achieved an *a posteriori* LLD less than the corresponding LLD requirement.

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 2003, no analytical result exceeded a corresponding reporting level requirement in Table 3.5.2 of the ODCM.

6.4 Changes in Sampling Locations

The ENNVY 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 2003.

This year ENNVY 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 had not previously been included in this report.

6.5 Data Analysis by Media Type

The 2003 REMP data for each media type is discussed below. Whenever a specific measurement result is presented, it is given as the concentration in the units of the sample (volume or weight). 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 now plotted as reported, without regard to whether the value is "detectable" or "non-detectable." In previous years, we had converted values that were less than the MDC to zero.

6.5.1 Airborne Pathways

6.5.1.1 Air Particulates (AP)

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 fourth 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 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. 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 distinct annual cycle, with the minimum concentration in the second quarter, and the maximum concentration in the first quarter. It can 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 ENNVY operations.

There were four 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 28 of 28 filter sets analyzed. K-40 was detected only once out of 28 analyzed. Ra-226 and Th-232 were not detected in the 28 filter sets analyzed.

6.5.1.2 Charcoal Cartridges (CF)

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 fourth year that the results for the on-site air iodine sampling station, Governor Hunt House (CF-40) have been included.

6.5.2 Waterborne Pathways

6.5.2.1 River Water (WR)

Aliquots of river water were automatically collected periodically from the Connecticut River downstream from the plant discharge area and hydro station, location WR-11, with the exception of the two events of short duration when the sampling equipment was out of service (see Section 6.1). 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 five out of 12 indicator samples and one 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 location was within variations experienced in previous years.

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 (WG)

Quarterly ground water (deep wells supplying drinking water to the plant and selected offsite locations) samples were collected from four indicator locations (only one is required by ENNVY ODCM) and one control location during 2003. 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 15 out of 16 indicator samples and in 2 out of 4 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 those detected in previous years. No gamma-emitting radionuclides or tritium were detected in any of the samples.

6.5.2.3 Sediment (SE)

Semi-annual river sediment grab samples were collected from two indicator locations and one control location during 2003. 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 2003, 13 locations were sampled at SE-12 during each of the semi-annual collections. Two samples were collected at SE-11 during the year. Two samples were collected at the control location, SE-21. As would be expected, naturally-occurring Potassium-40 (K-40) was detected in all of the samples. Radium-226 (Ra-226) was detected in 22 of 32 samples. Thorium-228 (Th-228) was detected in 26 of 32 samples analyzed. Thorium-232 (Th-232) was detected all 32 samples analyzed. Cesium-137 (Cs-137) was detected in 26 out of 30 of the indicator samples and in one of the two control location 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. No Cobalt-60 (Co-60) was detected this year in these sediments samples. Co-60 has been 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. It has been identified in previous years.

6.5.2.4 Test Wells (WT)

During 1996, sampling was initiated at test wells around the outer edges of an area in the south portion of the ENNVY site where septic sludge is spread. This sampling continued through 2003. 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 2003, 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 16.2 to 66.4 pCi/kg. K-40 was also detected in 1 of the 8 samples. No other radionuclides were identified from these samples in 2003.

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 ENNVY. 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 ENNVY 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 2003 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 2003 for a total of 21 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 2003 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 2003. Low levels of gross beta activity were detected in 23 out of 24 samples analyzed at concentrations that are typical of any environmental water sample. Tritium (H-3) was detected in only one of the 24 samples analyzed to 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 2003 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 ENNVY 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	21/21	1.5 E 3	(0.59 – 4.02) E 3	MH-12 (SE-95)
K-40	21/21	1.1 E 4	(0.88 – 1.28) E 4	MH-12A (SE-92)
Th-232	21/21	5.3 E 2	(4.07 – 7.74) E 2	MH-12A (SE-92)
Th-228	21/21	1.5 E 3	(0.69 – 2.23) E 3	MH-12A (SE-92)
Mn-54	3/21	1.9 E 1	(0.13 – 6.36) E 1	MH-12 (SE-95)
Ra-226	14/21	1.2 E 3	(0.69 – 2.04) E 3	MH-12A (SE-92)
Cs-134	2/21	1.6 E 0	(-1.99 – 3.16) E 1	MH-12 (SE-95)
Cs-137	16/21	2.9 E 2	(-0.08 – 11.7) E 2	MH-12 (SE-95)
Zn-65	3/21	4.7 E 0	(-5.58 – 6.36) E 1	MH-12 (SE-95)
Ag-110m	0/21	7.4 E-1	NA	MH-12 (SE-95)
Ac-228	20/21	9.7 E 2	(0.57 – 1.90) E 3	MH-12 (SE-95)
Ce-144	0/21	-6.4 E 0	NA	MH-12 (SE-95)
Nb-95	0/21	7.8 E 0	NA	MH-12A (SE-92)
Co-60	9/21	1.6 E 2	(-0.13 – 7.00) E 2	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
Be-7	0/24	5.5 E 0	NA	MH-14 (WW-10)
Gross Beta	23/24	4.6 E 0	(2.0 – 8.8) E 0	MH-12A (WW-12)
Cs-134	0/24	-1.7 E 0	NA	MH-14 (WW-10)
Cs-137	0/24	-2.9 E-1	NA	MH-14 (WW-10)
K-40	0/24	-1.3 E 1	NA	MH-12A (WW-12)
Mo-99	0/24	-1.1 E 1	NA	MH-12A (WW-12)
Nb-95	0/24	2.4 E-2	NA	MH-12A (WW-12)
Ra-226	0/24	4.3 E 0	NA	MH-14 (WW-10)
Th-232	0/24	1.4 E 0	NA	MH-12A (WW-12)
H-3	1/24	3.2 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).

6.5.2.6 Air Compressor Condensate and Manhole Sampling Results

The presence of tritium in station air compressor condensate and manholes (Storm Drain System) has been identified since 1995 (ER_95-0704). An evaluation has been performed (S.R.1592) which states "...leakage of tritium found in the storm drains (manholes) to ground water beneath the site will be transported by natural ground water gradient to the Connecticut River. However, at the current measured concentrations and postulated leak rate from the storm drains, the offsite dose impact is not significant (<2.4E-5 mrem/year)." Data provided in Table 6.3 will be filed under the requirements of 10CFR50.75(g) and is presented here in response to ER_95-0704_04 commitments.

Table 6.3
Summary of Air Compressor Condensate and Manhole Water Tritium Concentrations*

Sample Location	No. Detected**	Mean (microcuries/ml)	Range (microcuries/ml)
Air Compressor Condensate	5/5	1.20E-05	(0.67– 2.33) E-5
Manhole 11H	7/7	1.67E-6	(0.63 – 7.50) E-6
Manhole 13	5/10	4.84 E-6	(2.90 – 7.50) E-6
Manhole 8	0/8	None Detected	None Detected
Manhole 14	0/51	None Detected	None Detected

* Reported per ER_950704_04.

** The fraction of sample analyses yielding detectable measurements

6.5.3 Ingestion Pathways

6.5.3.1 Milk (TM)

Milk samples from cows or goats at several local farms were collected monthly during 2003. Twice-per-month 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. Also expected was Sr-90. Sr-90 was detected in 13 out of 22 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 5 of 121 samples in 2003. 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 ENNVY plant. There is also little actual difference in concentrations between farms.

6.5.3.2 Silage (TC)

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 5 of the 5 samples. Cs-137 was not detected in any of the six samples. No I-131 was detected in any sample.

6.5.3.3 Mixed Grass (TG)

Mixed grass samples were collected at each of the air sampling stations on three occasions during 2003. As expected with all biological media, naturally-occurring K-40 and Be-7 were detected in all samples. Ac-228 was detected in two of the 28 samples.

Cs-137 was detected in 6 of the 28 samples, 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 37.7 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 attached to the grass samples.

6.5.3.4 Fish (FH)

Semiannual samples of fish were collected from two locations in the Spring and Fall of 2003. 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 not detected in this year's samples although it was detected in year 2002. 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 2003 and previous years are typical of concentrations attributable to global nuclear weapons testing fallout.

No other radionuclides were detected.

6.5.4 Direct Radiation Pathway

Direct radiation was continuously measured at 53 locations surrounding the ENNVY plant with the use of thermoluminescent dosimeters (TLDs). No exceptions to this program occurred in year 2003.

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 2003. 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

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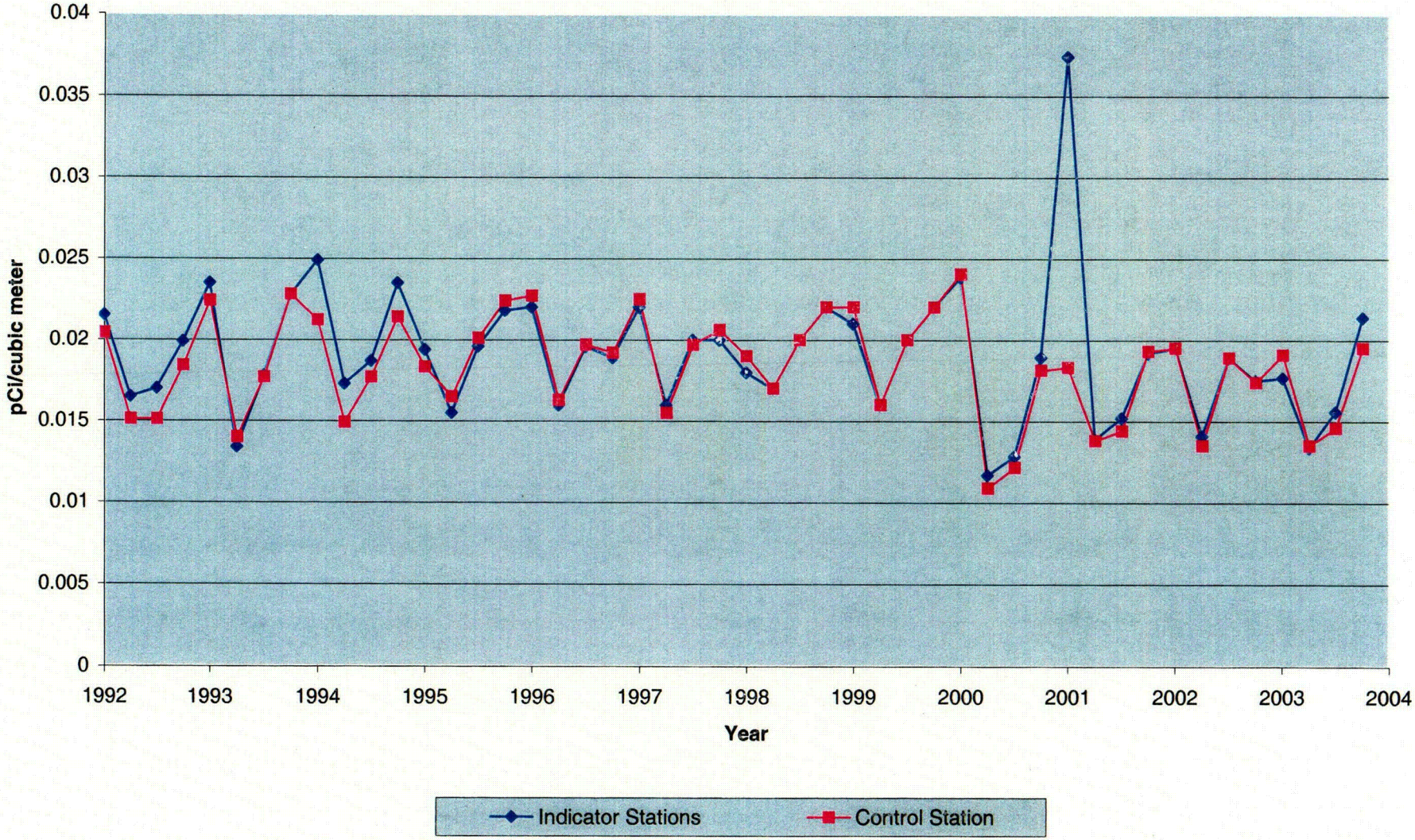
Graphs:

Figure 6.1 - Gross Beta Measurements on Air Particulate Filters - Quarterly Average Concentrations



10-C

Figure 6.2 - Gross Beta Measurements on Air Particulate Filters

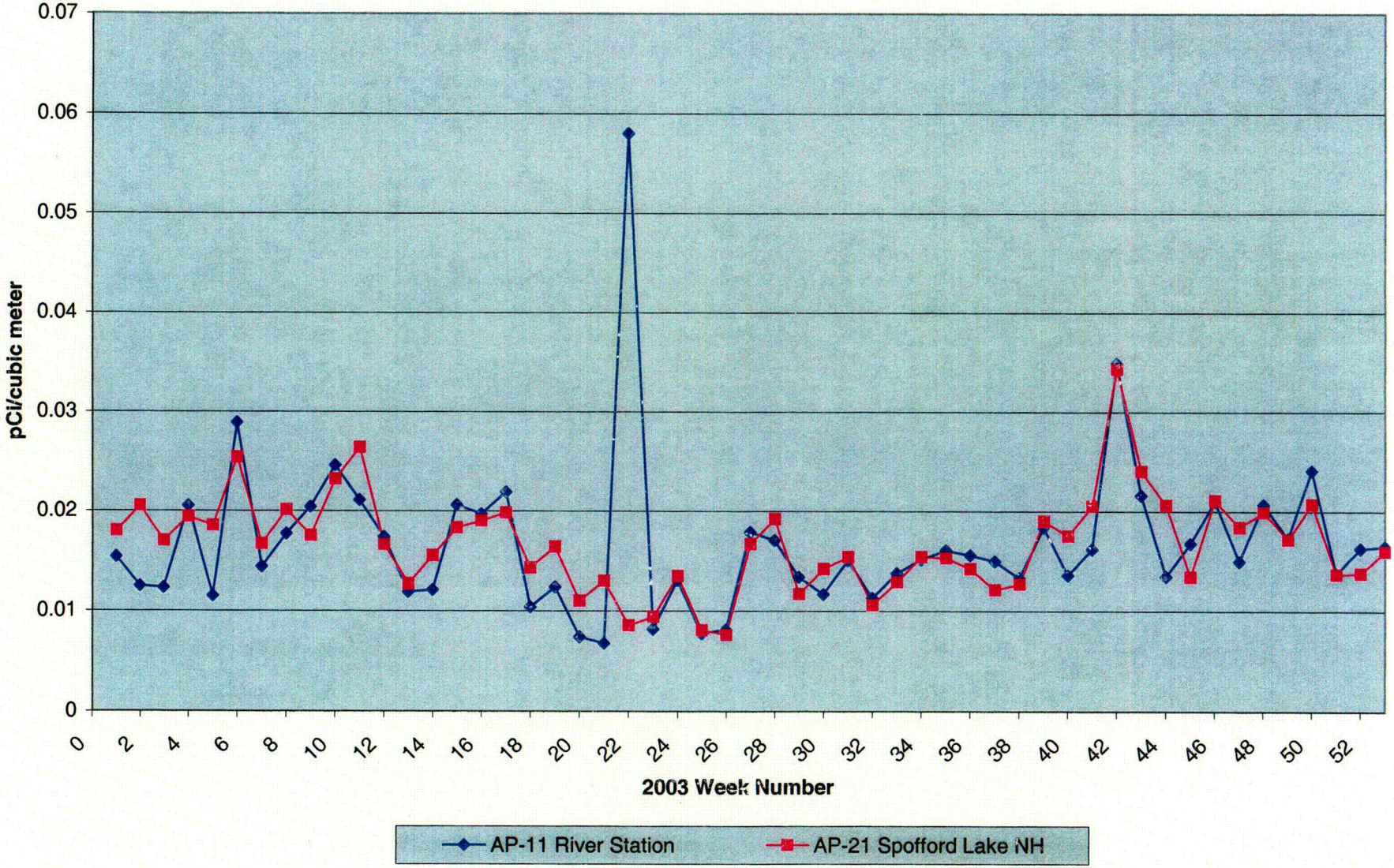
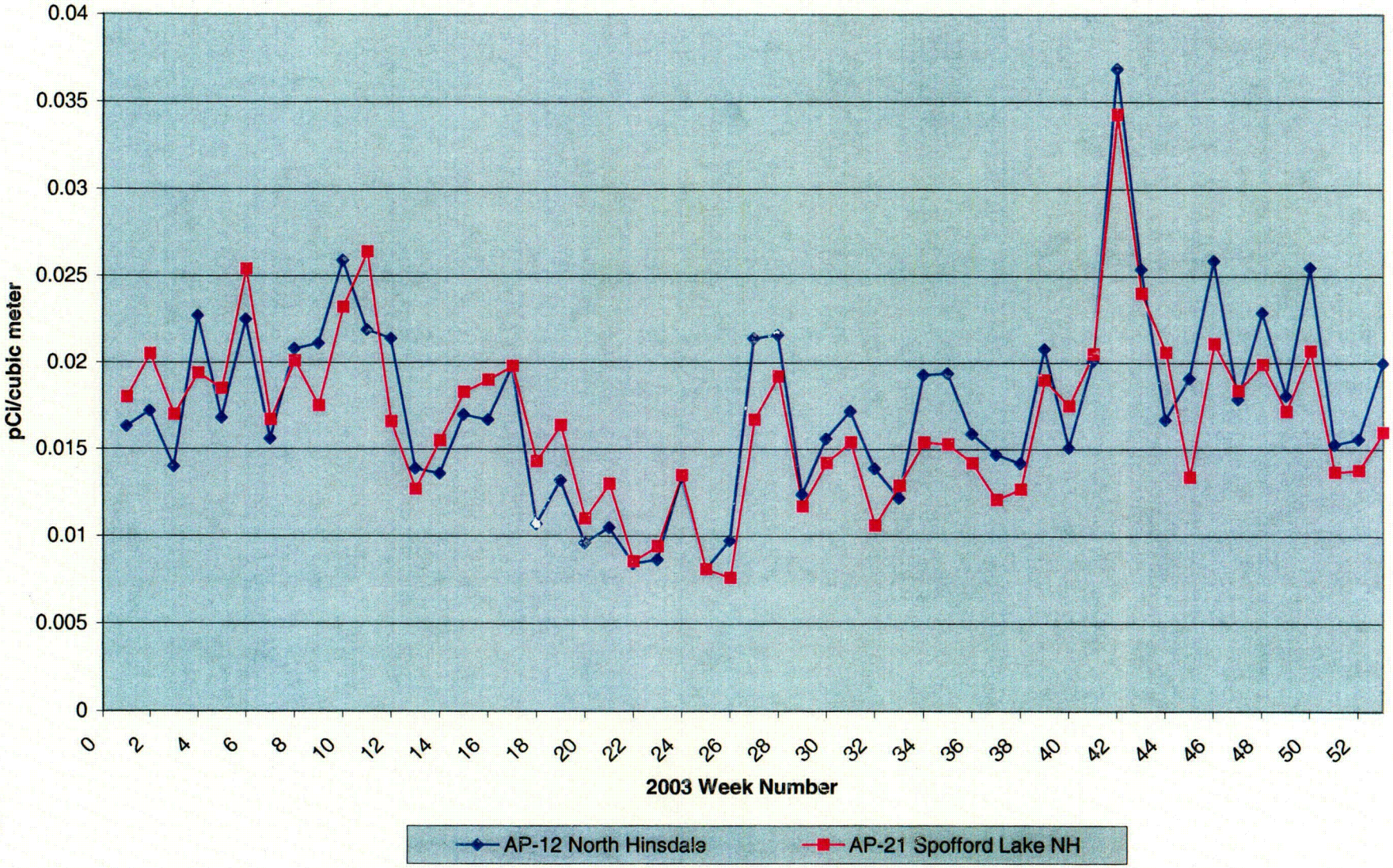
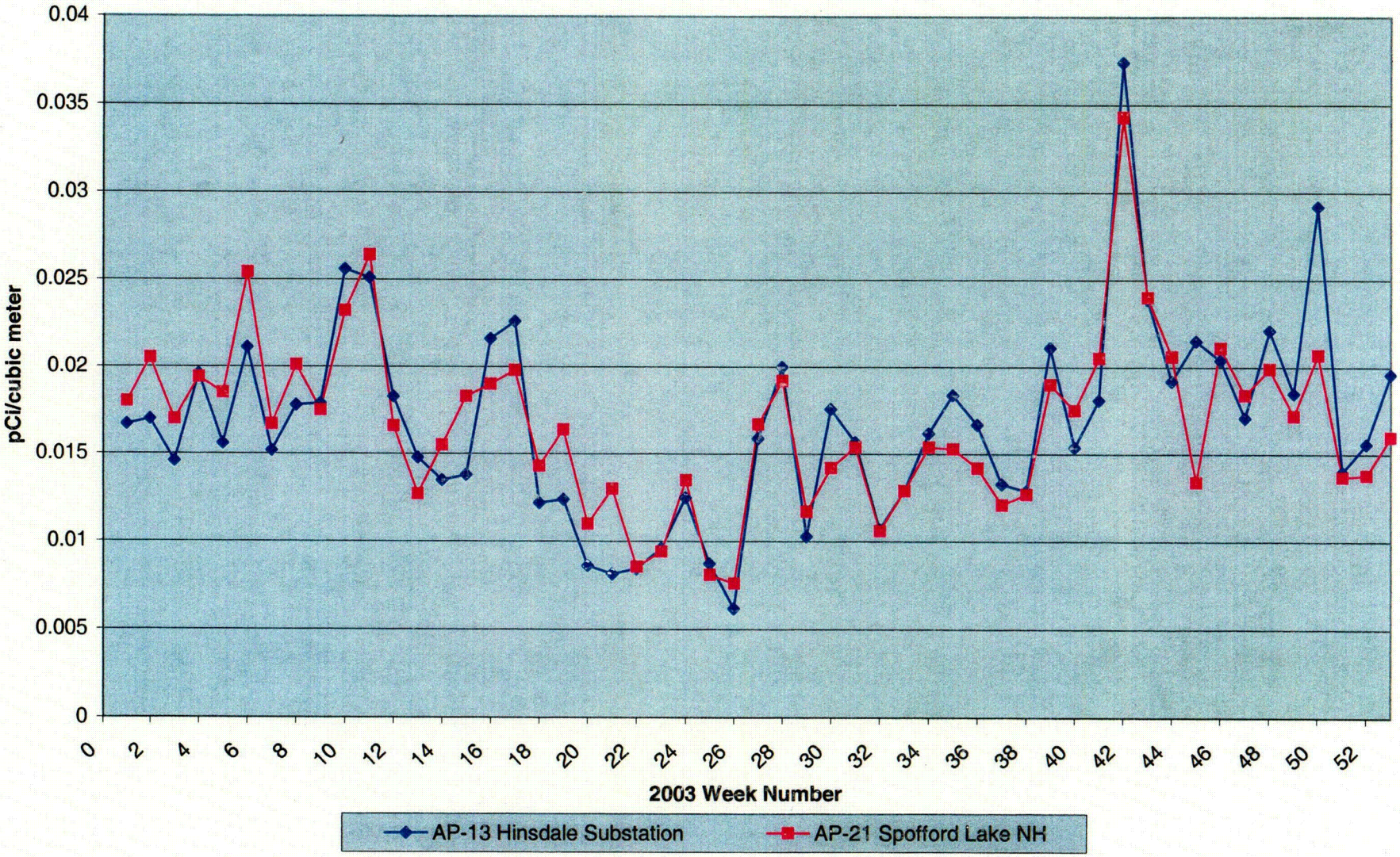


Figure 6.3 - Gross Beta Measurements on Air Particulate Filters



C-03

Figure 6.4 - Gross Beta Measurements on Air Particulate Filters



C-04

Figure 6.5 - Gross Beta Measurements on Air Particulate Filters

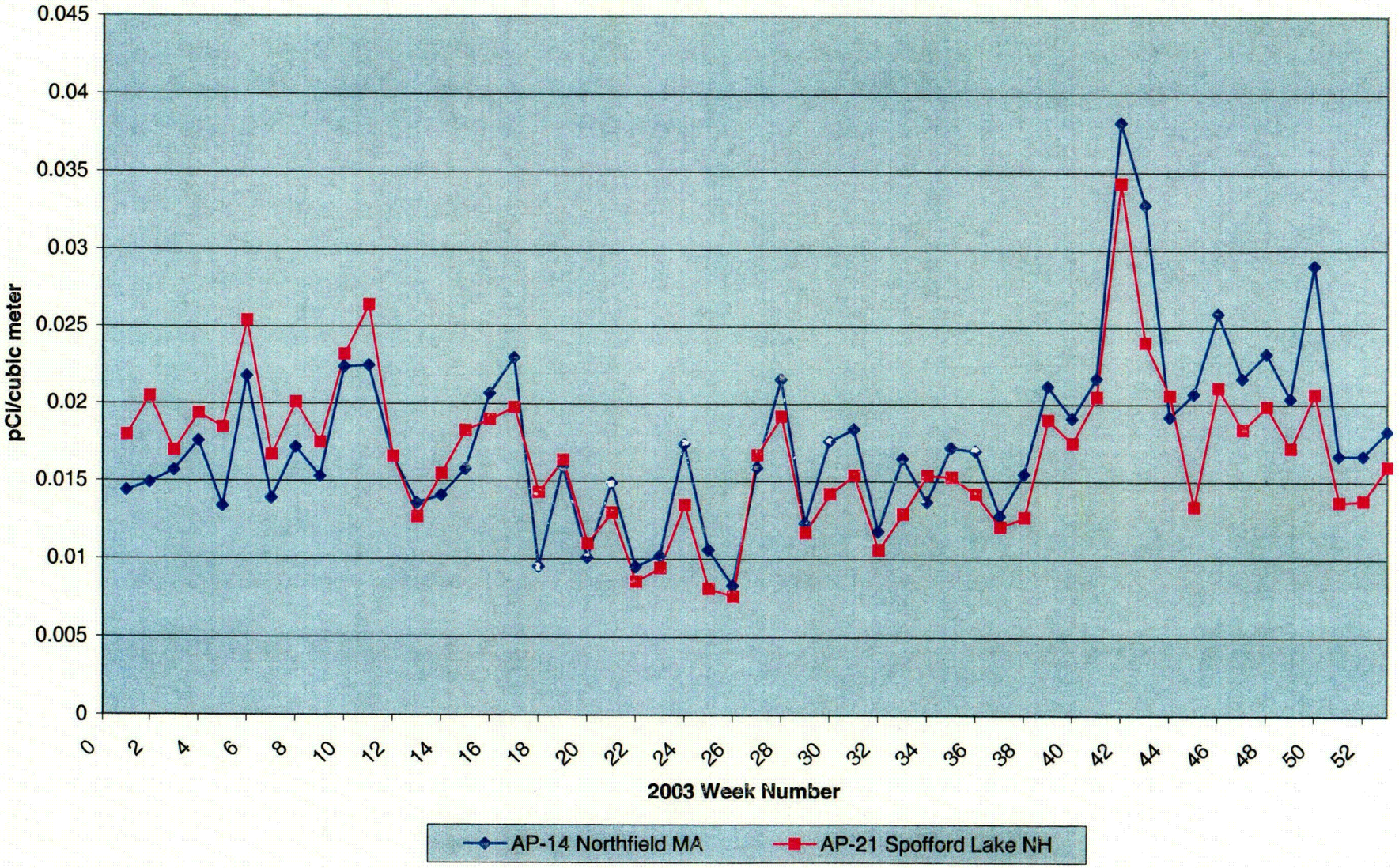
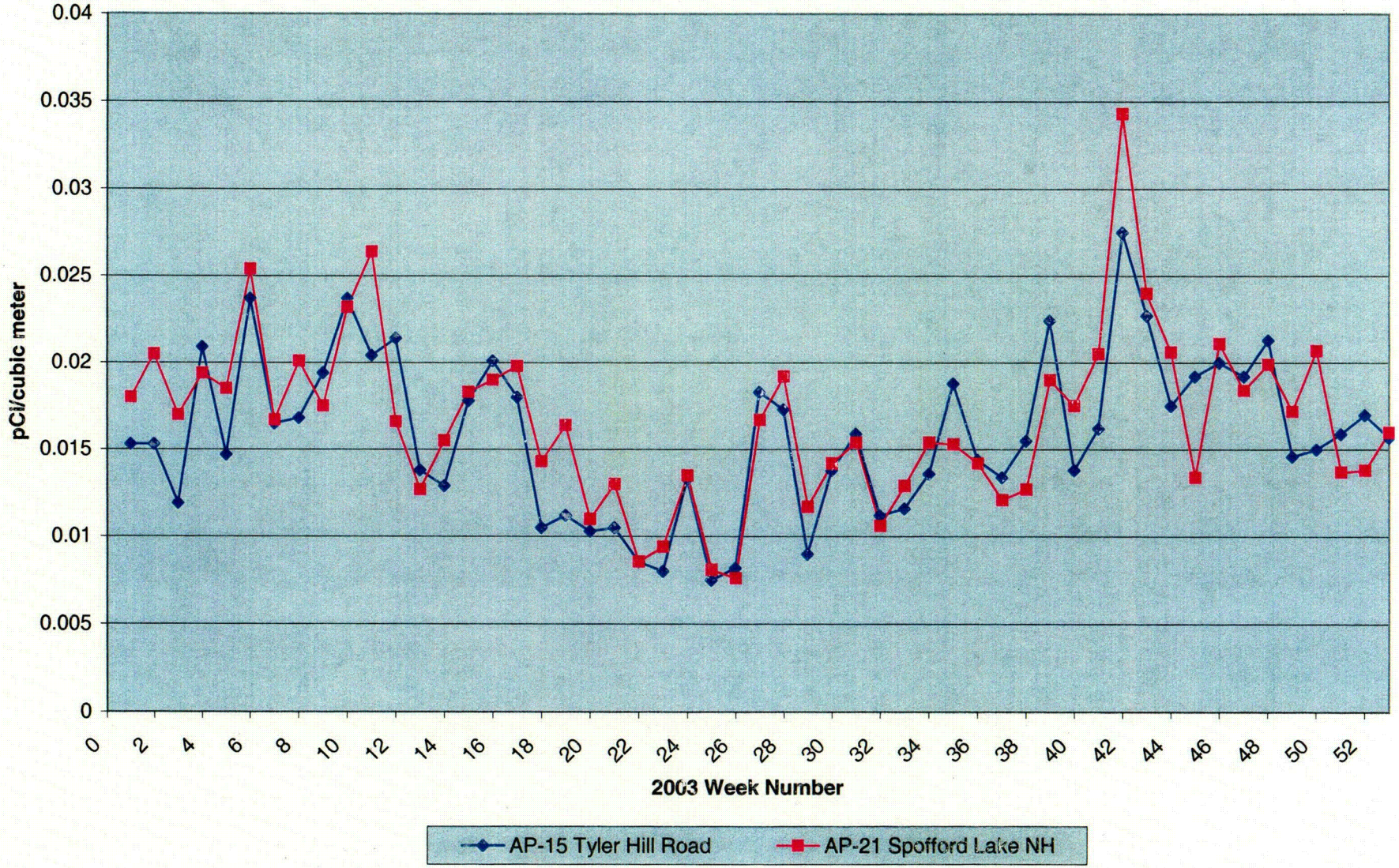


Figure 6.6 - Gross Beta Measurements on Air Particulate Filters



20-C

Figure 6.7 - Gross Beta Measurements of Air Particulate Filters

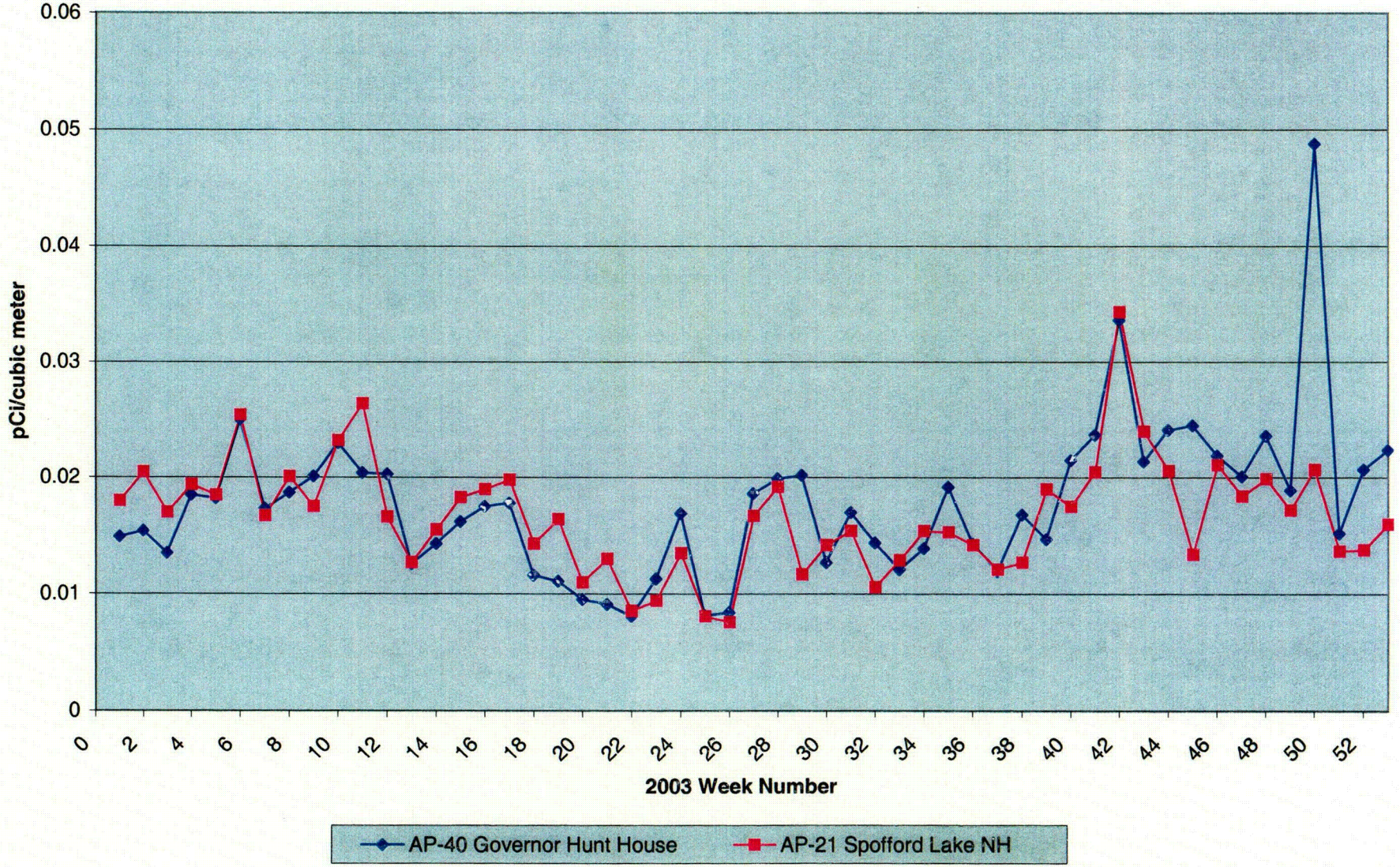


Figure 6.8 - Gross Beta Measurements on River Water Semi-Annual Average Concentration

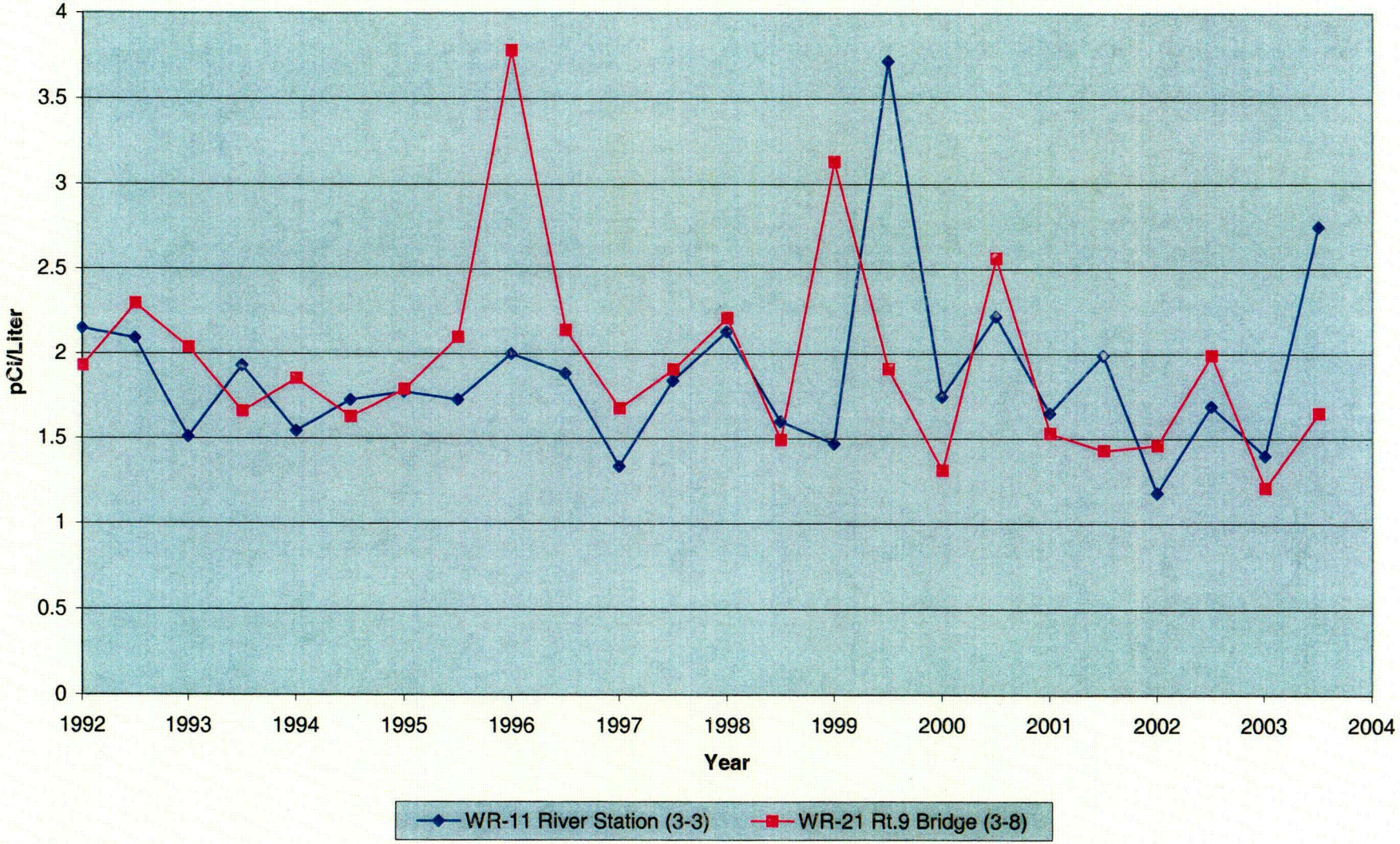


Figure 6.9 - Gross Beta Measurements on Ground Water Semi-Annual Average Concentrations

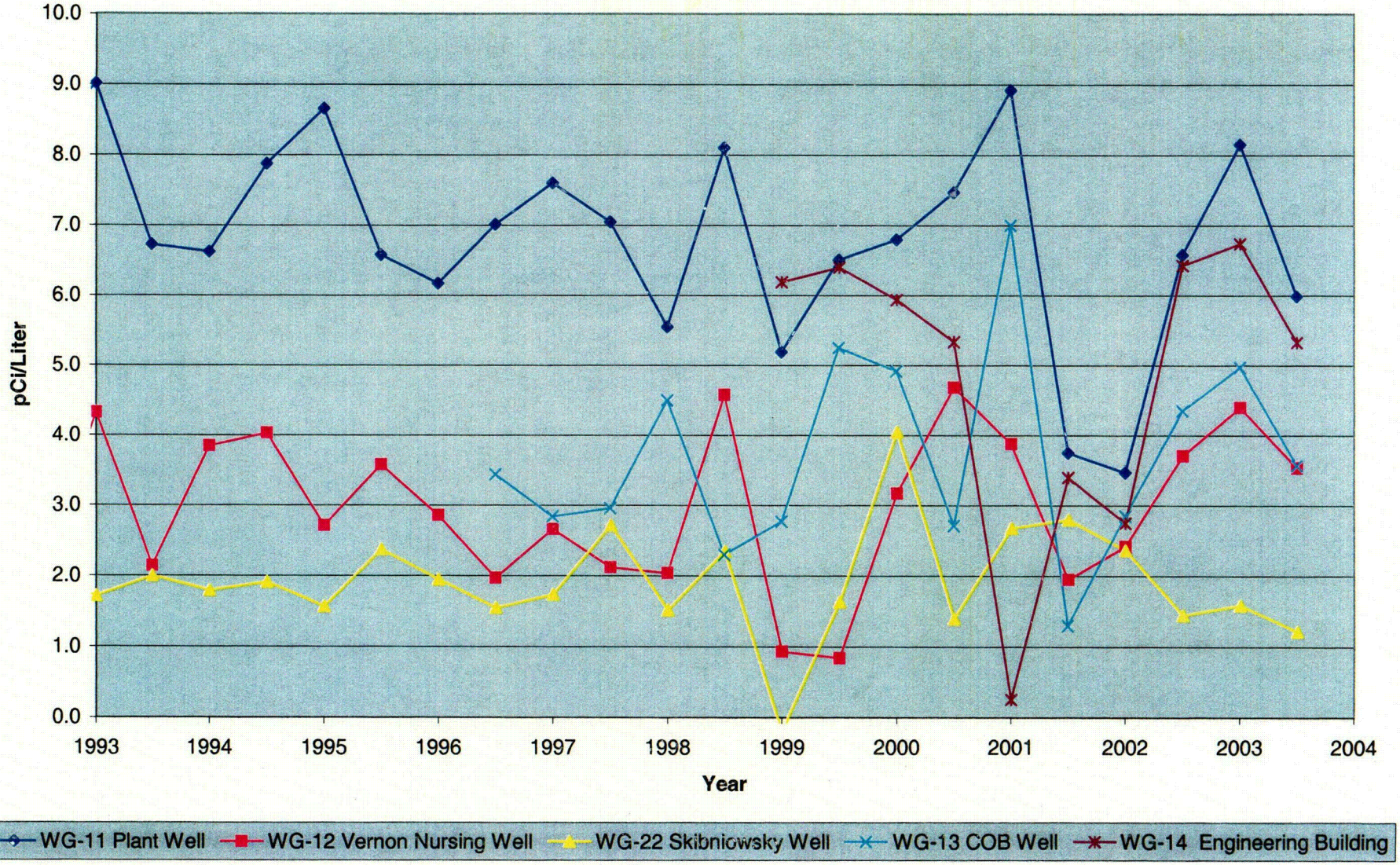
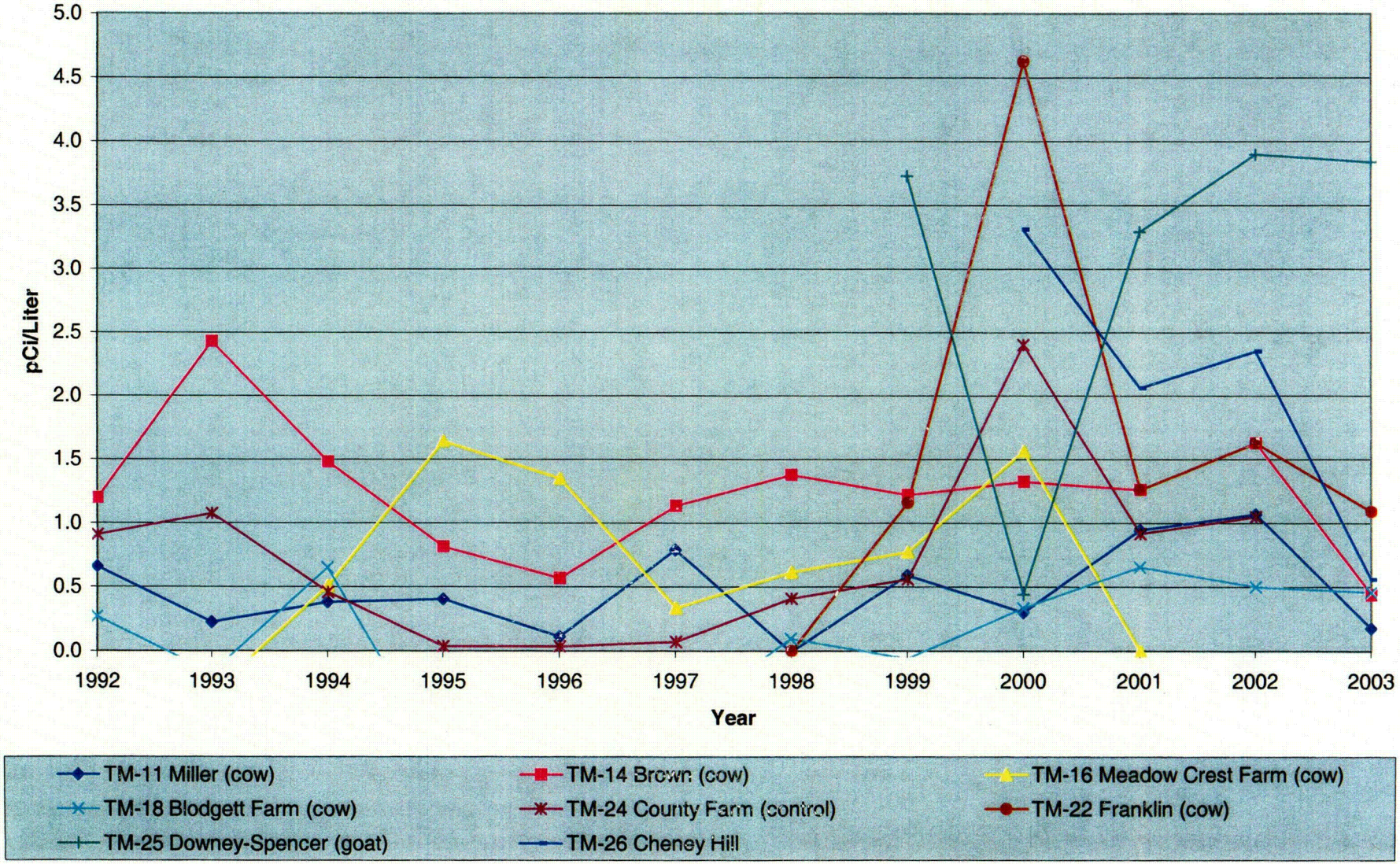
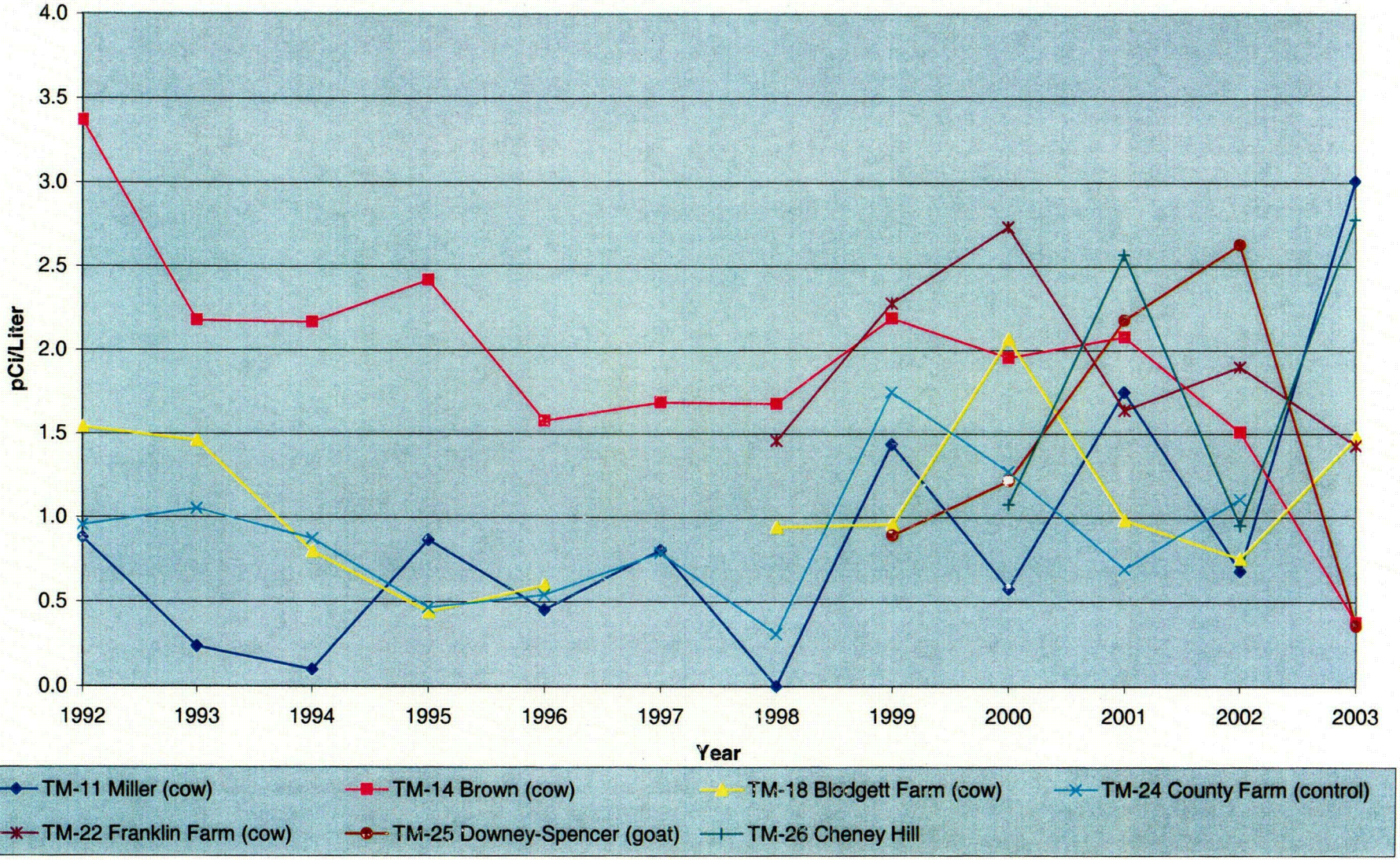


Figure 6.10 - Cesium 137 in Milk - Annual Average Concentration



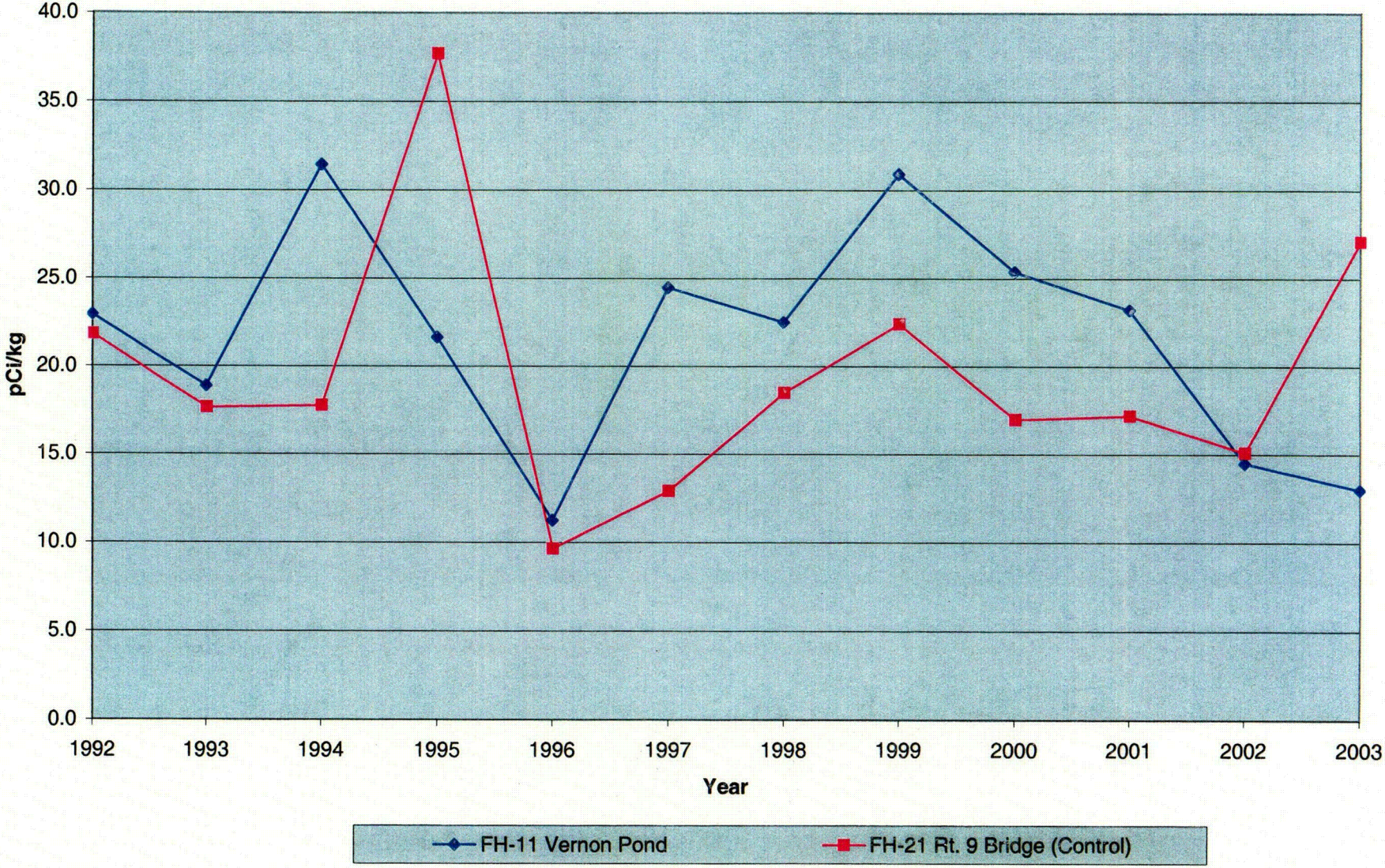
C.10

Figure 6.11 - Strontium 90 in Milk - Annual Averge Concentrations



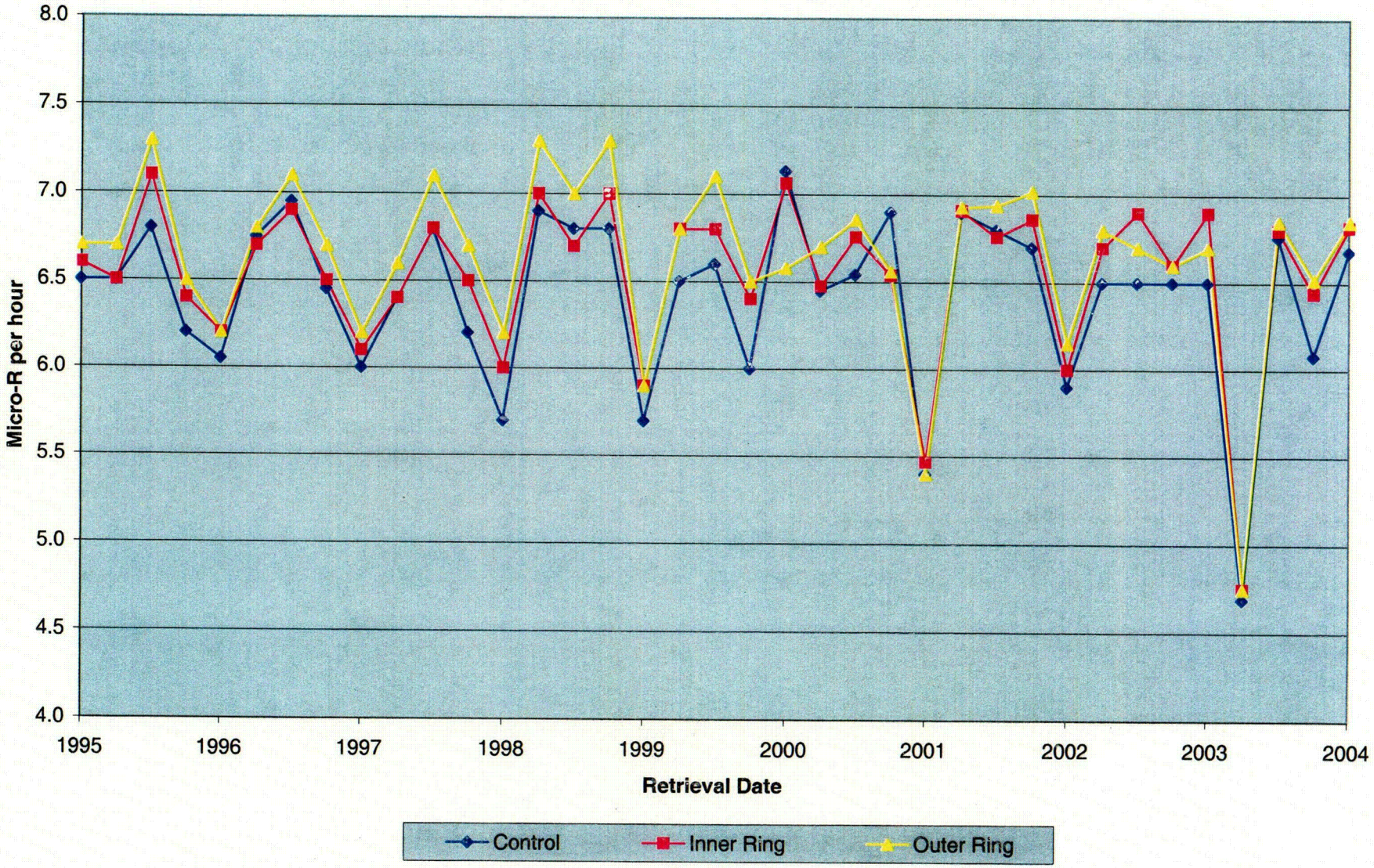
C-11

Figure 6.12 - Cesium 137 in Fish - Annual Average Concentrations



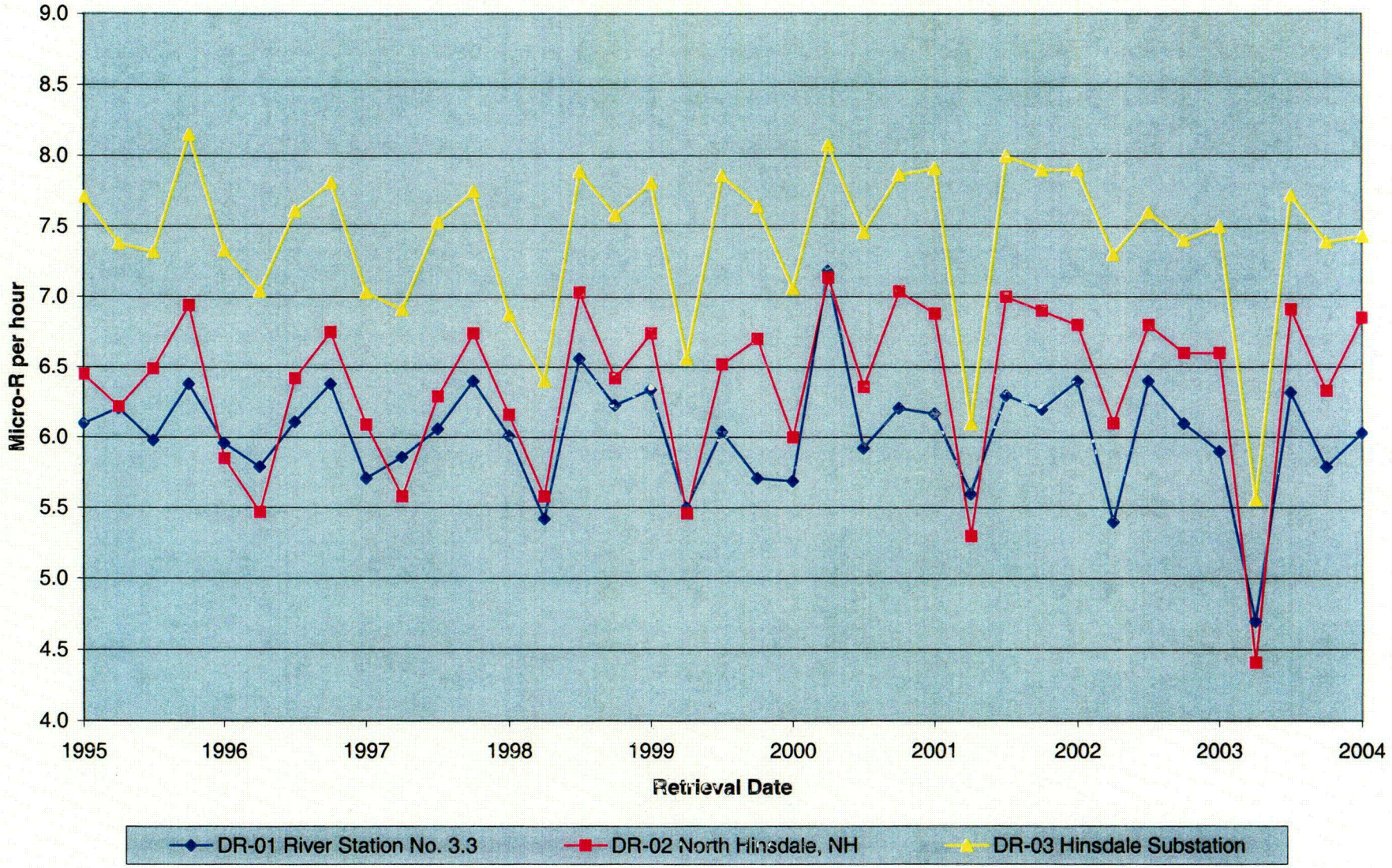
C-12

Figure 6.13 - Average Exposure Rate at Inner Ring, Outer Ring and Control TLDs



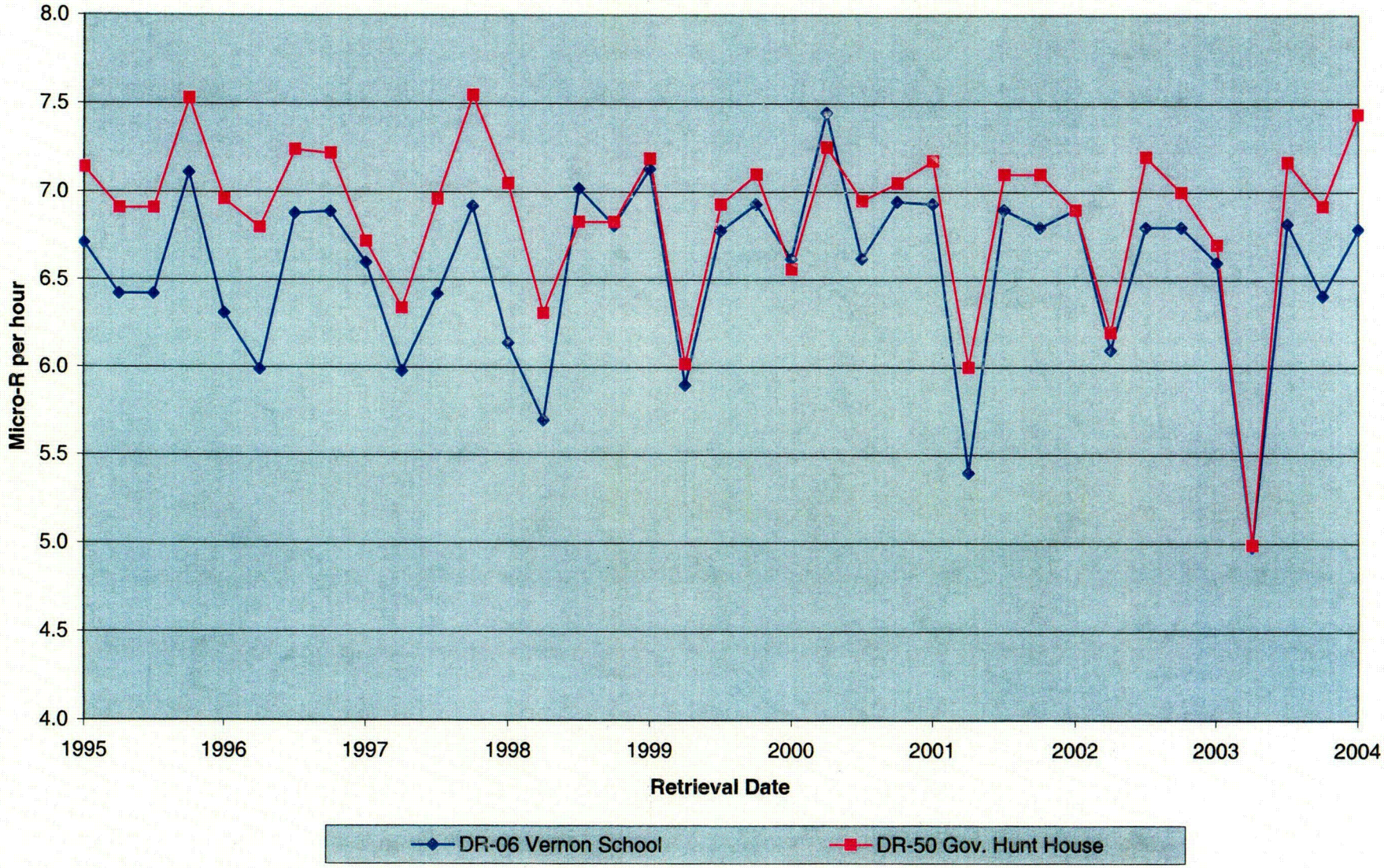
C-13

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



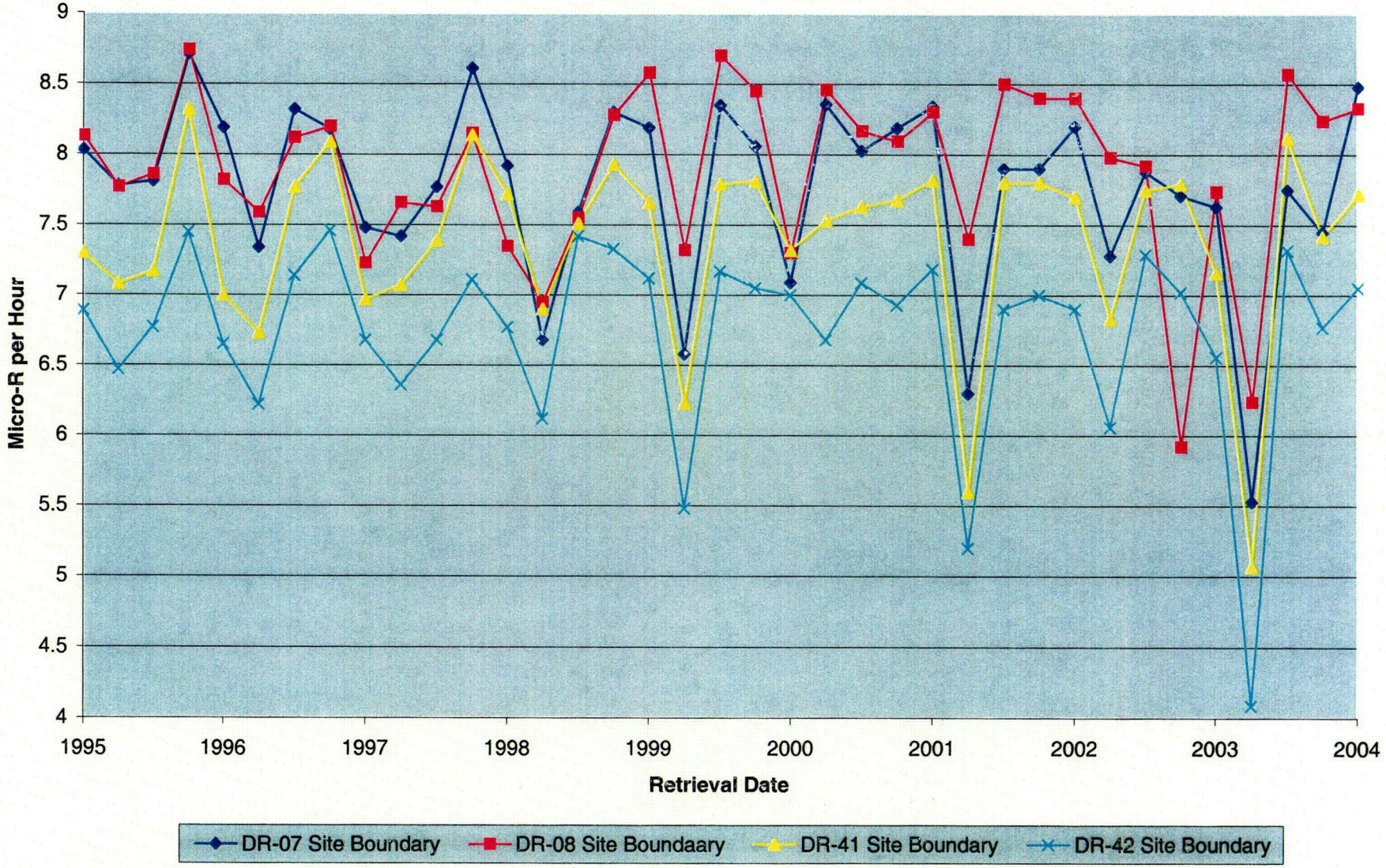
C-14

Figure 6.15 - Exposure Rate at Indicator TLDs, DR06 & DR-50



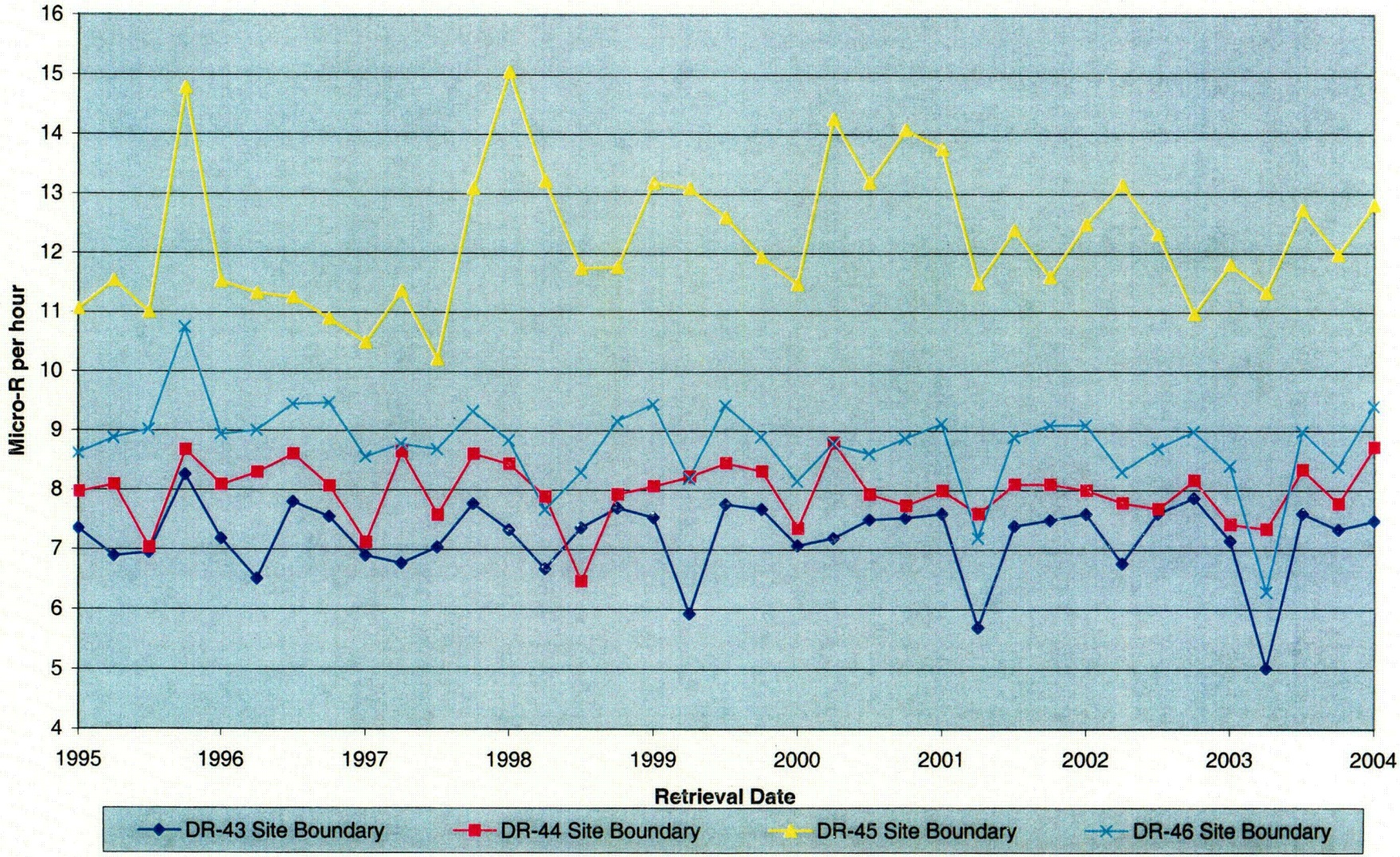
C-15

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



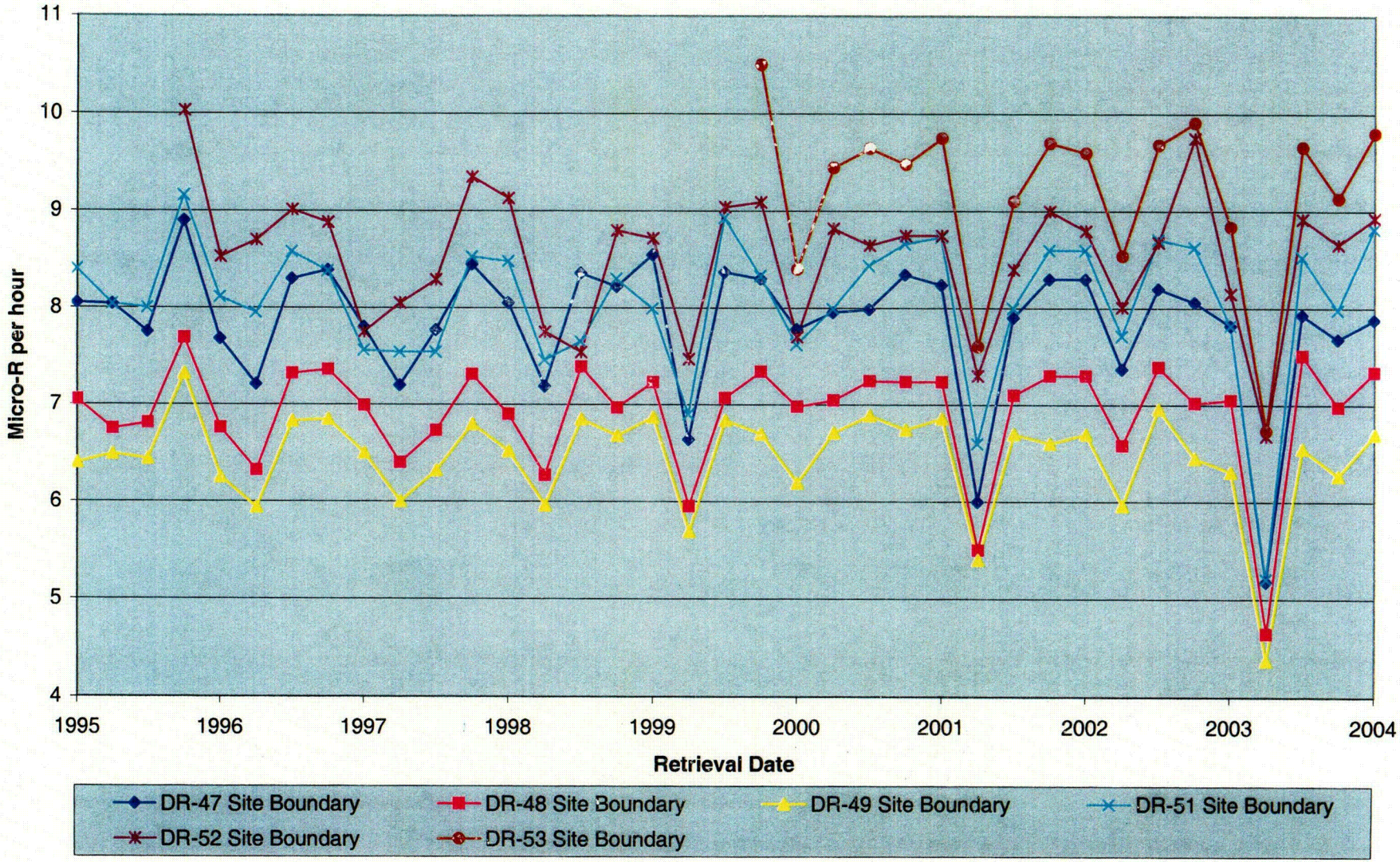
C-16

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



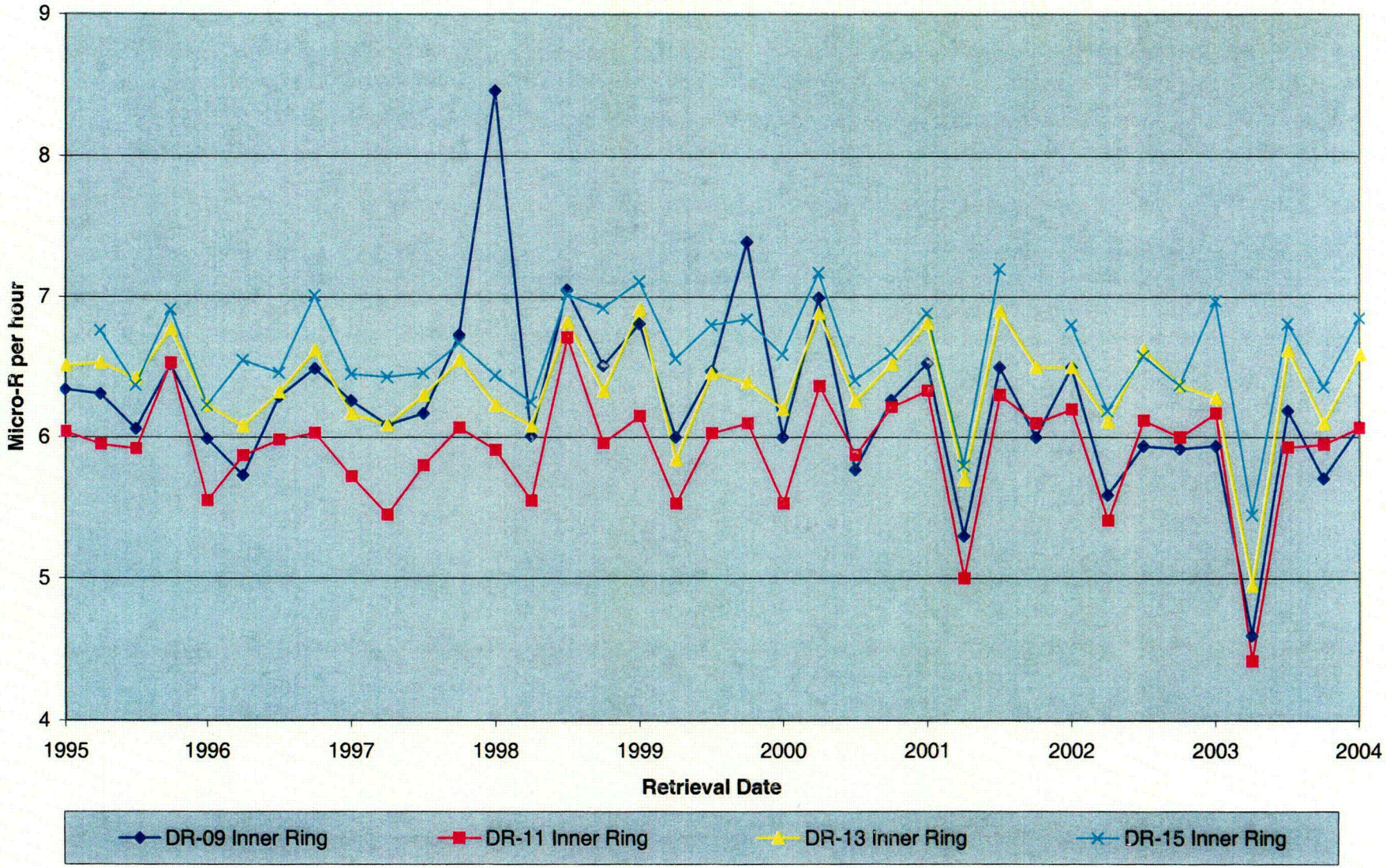
C-17

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



C-18

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



6.1-2

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

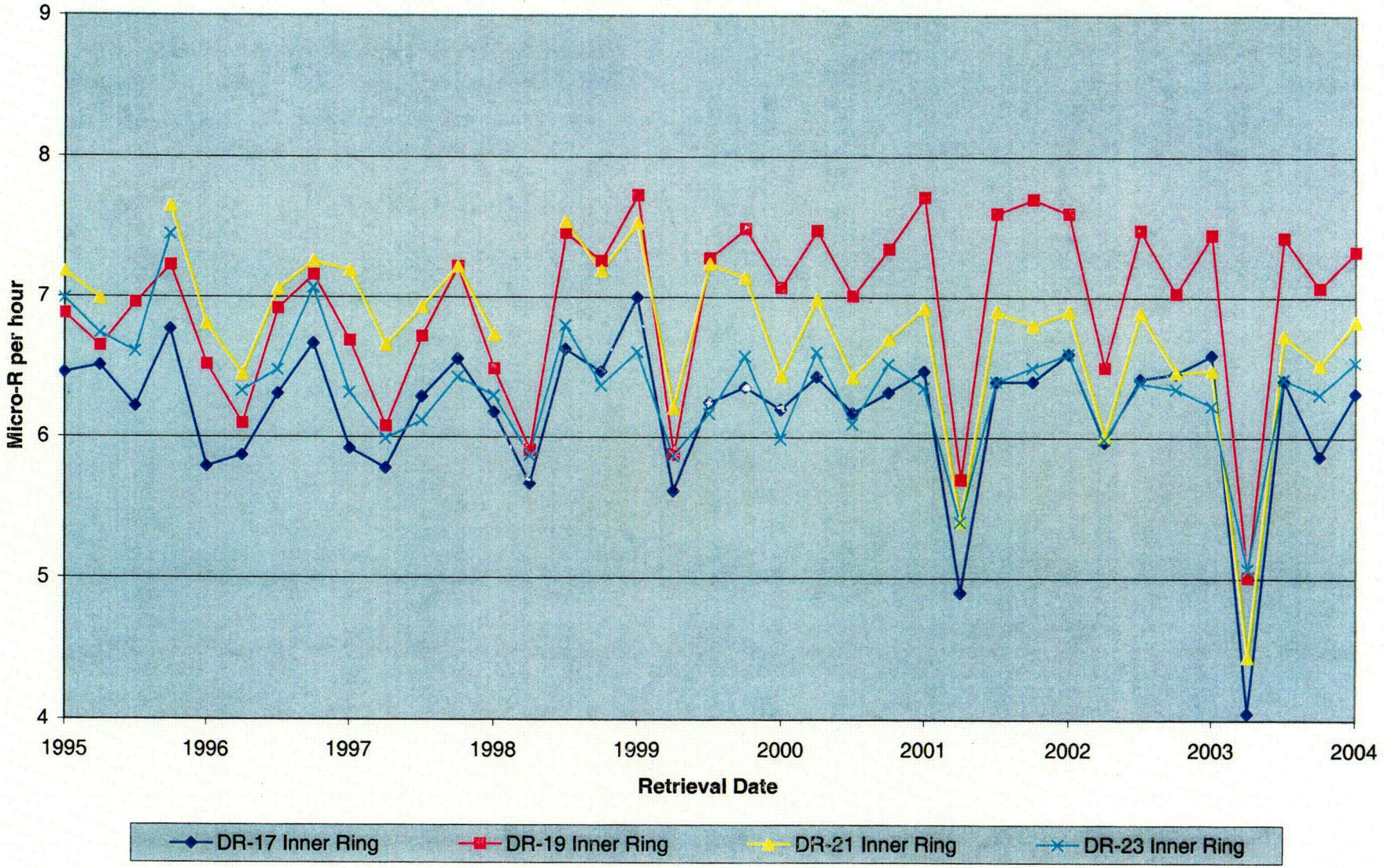
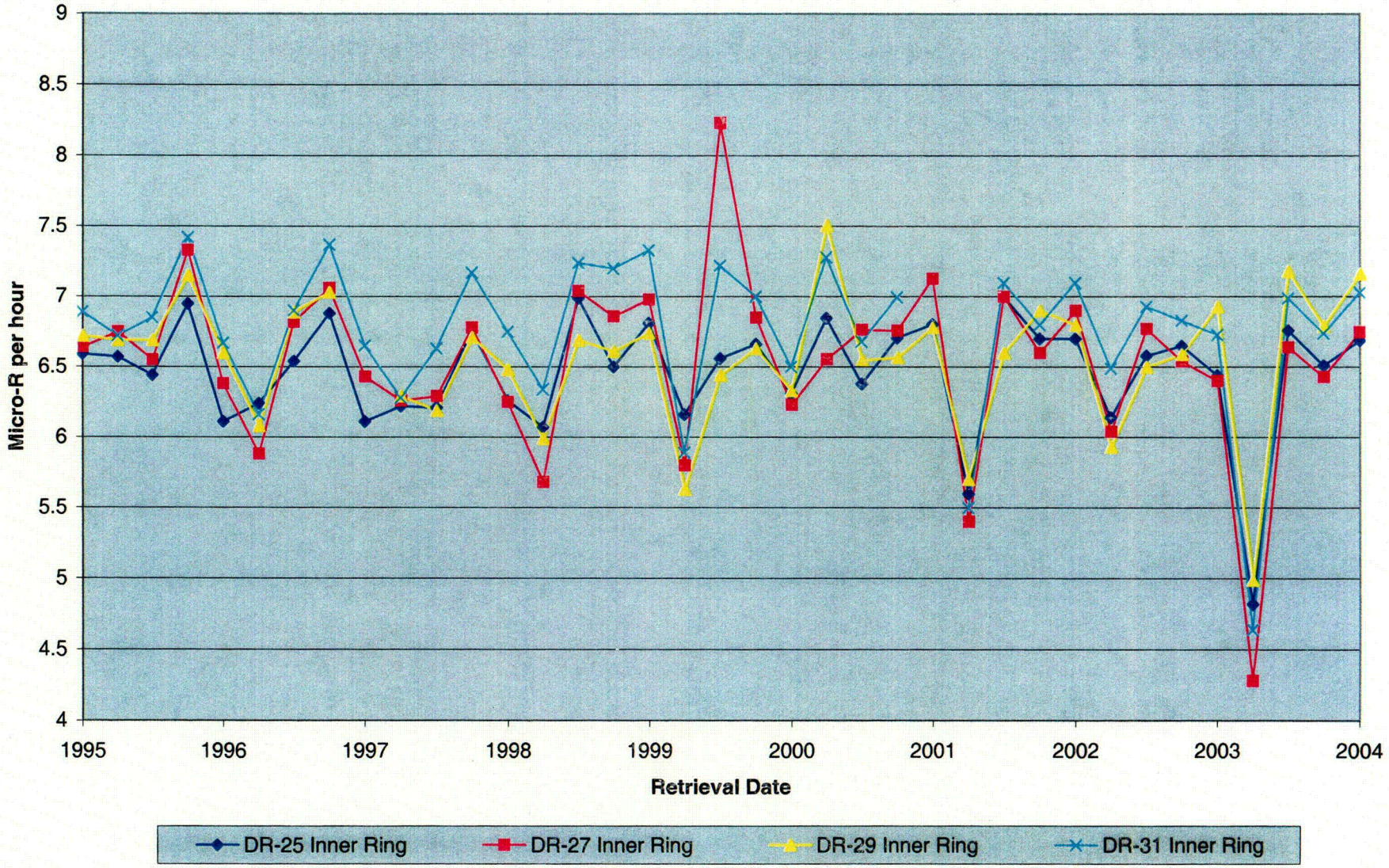
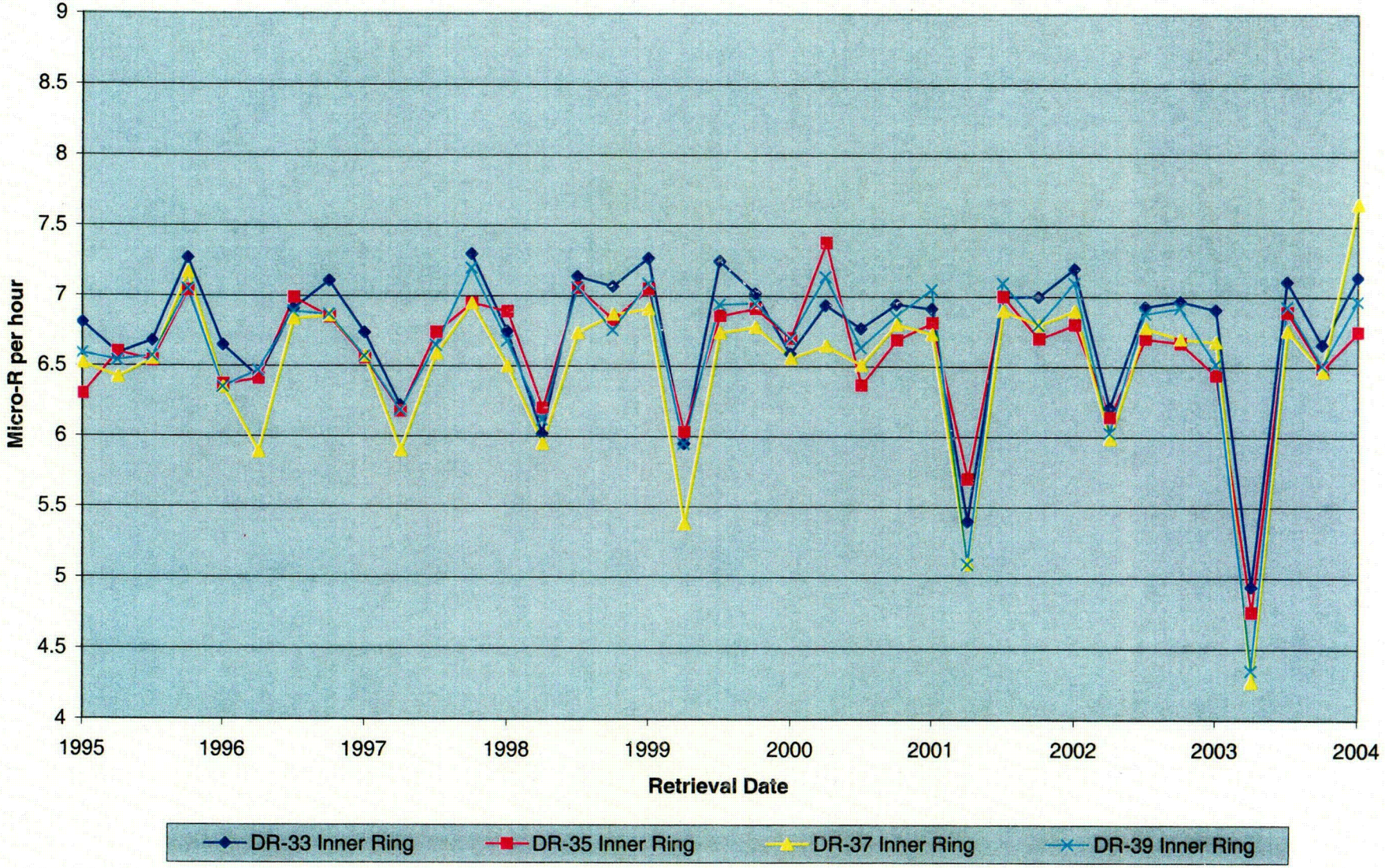


Figure 6.21 - Exposure Rate at Inner Ring TLDs DR25, 27, 29 & 31



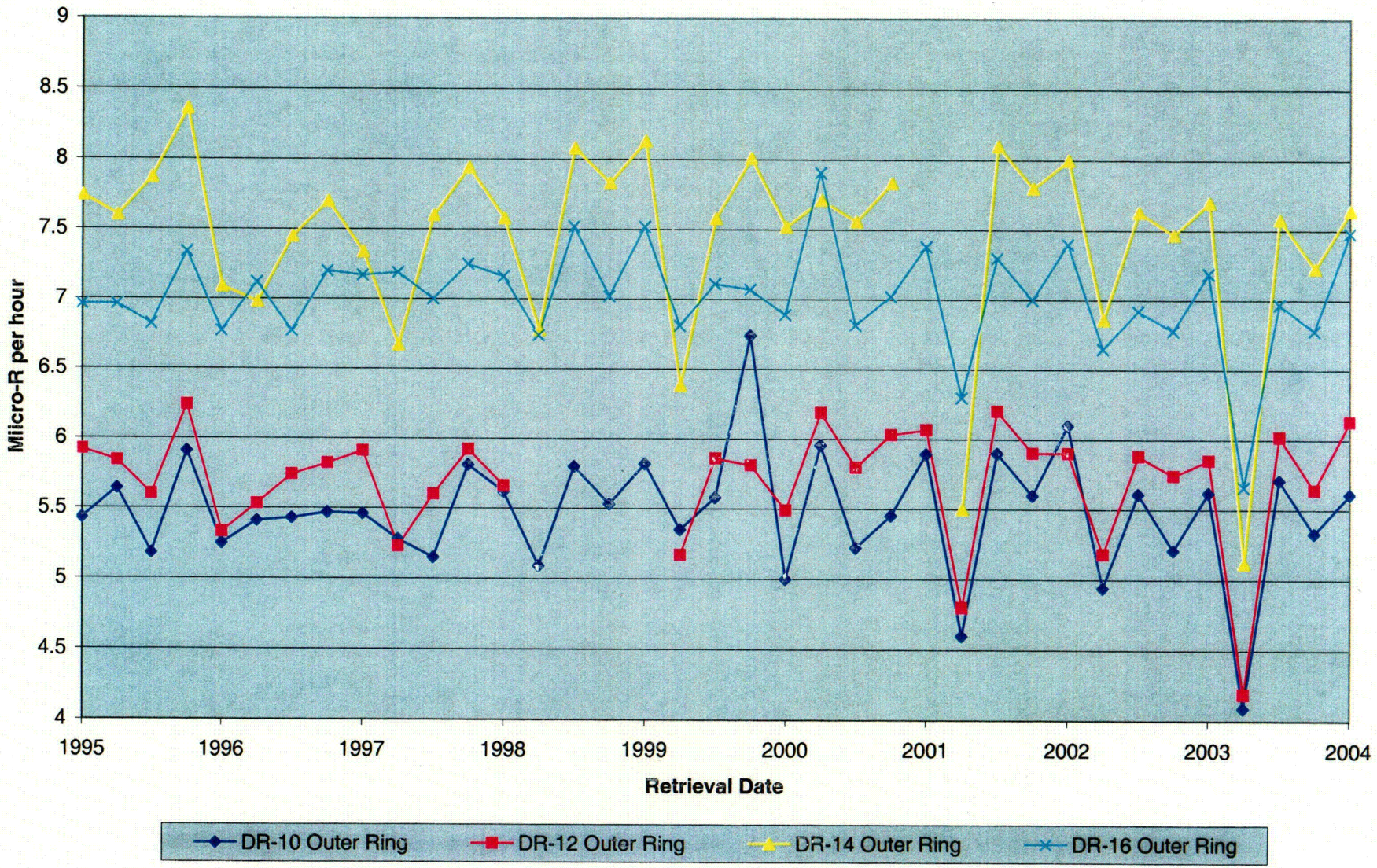
12-7

Figure 6.22 - Exposure Rate at Inner Ring TLDs DR33, 35, 37 & 39



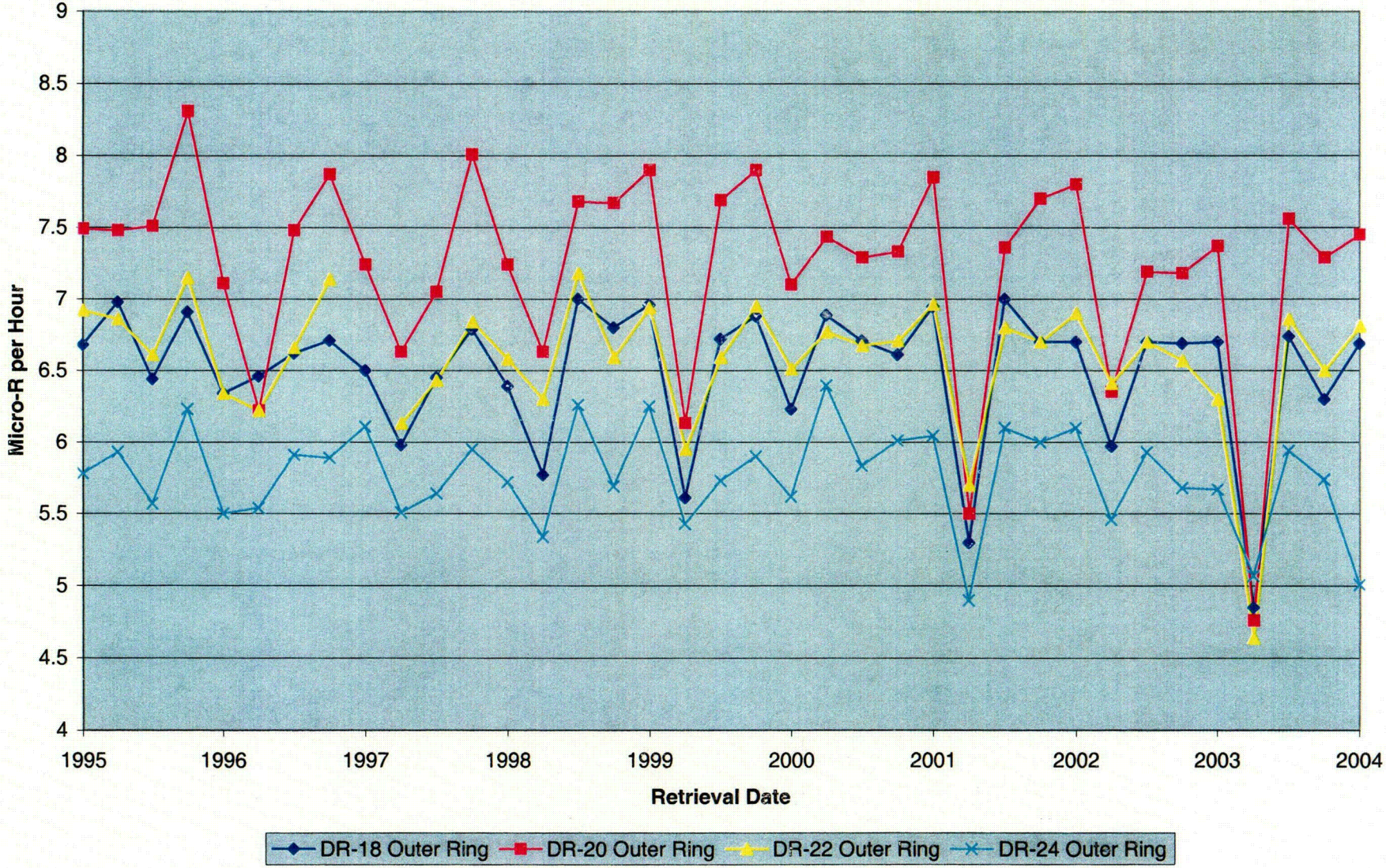
C-11

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



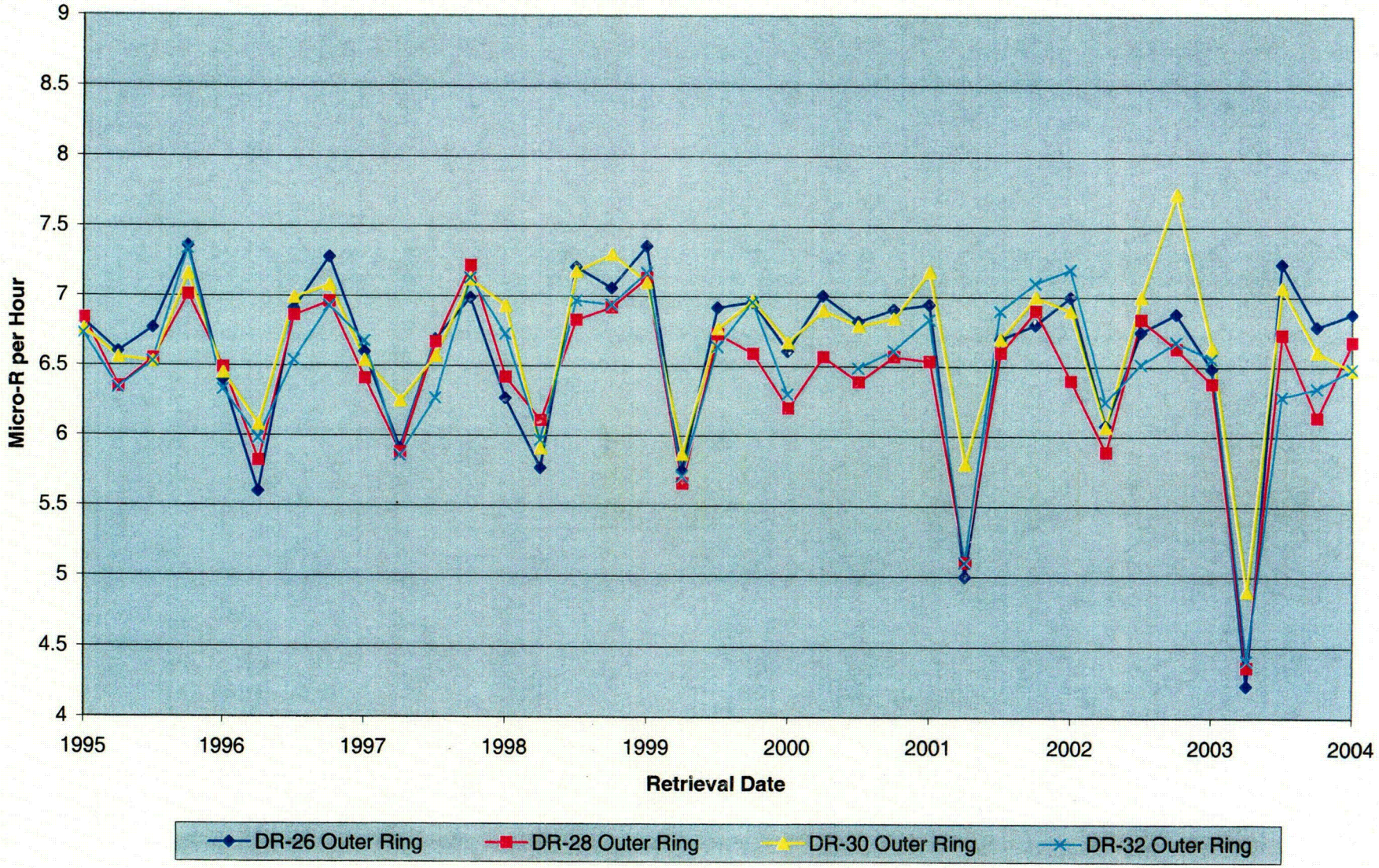
C-23

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



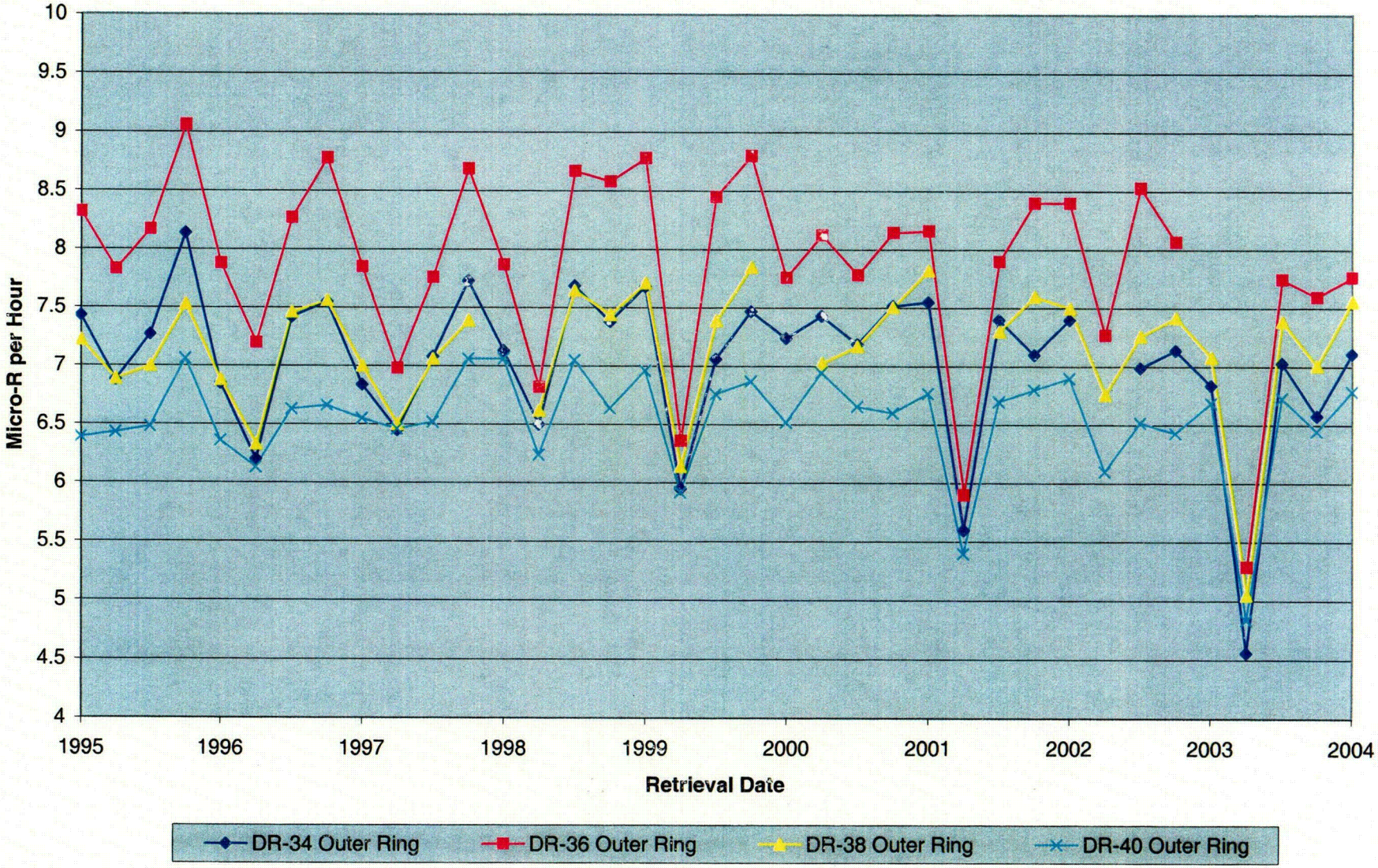
hc-3

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



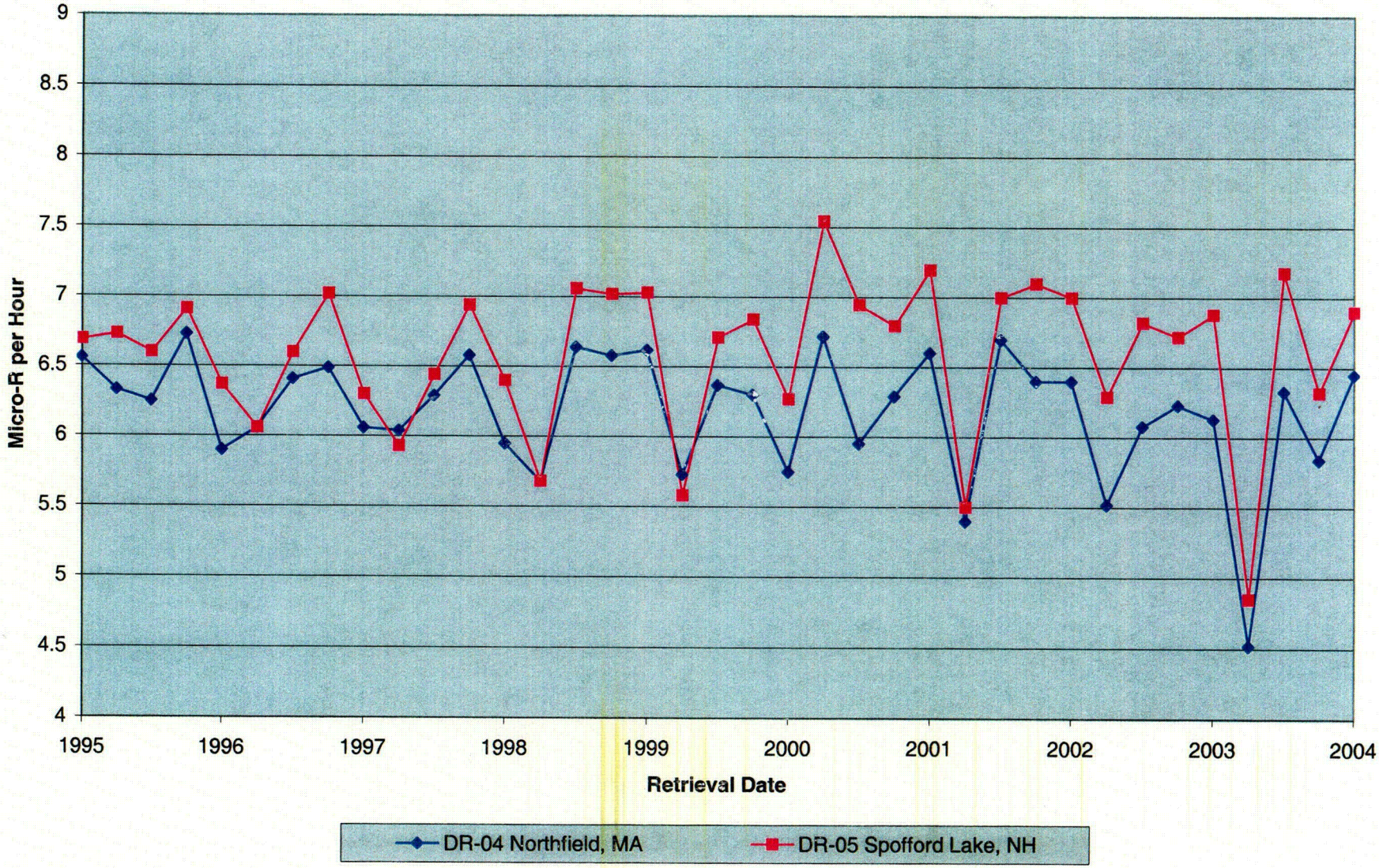
C-25

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



C-26

Figure 6.27 - Exposure Rate at Control TLDs DR04 & 05



12-7

7 QUALITY ASSURANCE PROGRAM

7.1 Framatome ANL Environmental Laboratory (E-LAB) - Environmental TLD Quality Assurance Program

Routine quality control (QC) testing was performed for each type of dosimeter issued by the Framatome ANP E-LAB Dosimetry Services Section. The dosimeter types included Panasonic 808 and 814 whole body dosimeters, combination 808/814 neutron dosimeters, extremity dosimeters and Panasonic environmental dosimeters. QC dosimeters were irradiated in-house as well as by a third party. All testing methods used by the accredited third-party tester conform to ANSI N13.11-1993 or ANSI N13.32-1995.

Performance documentation of the routine processing of the Panasonic environmental TLDs (thermoluminescent dosimeter) program at the Framatome ANP E-LAB Dosimetry Services Section 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 Section 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.

Ninety performance tests were conducted in 2003 by Framatome ANP E-LAB Dosimetry Services Section 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	90	100	100

Summary of Third Party Testing

Dosimeter Type	Exposure Period	ANSI Category	% (Bias ± SD)
Panasonic Environmental	Q4/2002	II, high energy	4.2 ± 1.2
Panasonic Environmental	Q1/2003	II, high energy	6.1 ± 8.6
Panasonic Environmental	Q2/2003	II, high energy	1.8 ± 1.4
Panasonic Environmental	Q3/2003	II, high energy	3.2 ± 0.9

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

Note: Results are expressed as the delivered exposure for environmental TLD. ANSI HPS N13.29-1995 (Draft) Category II, High energy photons (Cs-137 or Co-60).

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, 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).

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).

TBE-ES Laboratory-Knoxville has successfully completed the NUPIC, BWX Technologies, and the Research Institute's audits. These audits were each a comprehensive review of TBE-ES's Quality and Technical programs used to assess the laboratory's ability to produce accurate and defensible data. 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-one nuclides associated with six media types were analyzed by means of the laboratory's internal process control, Analytics, ERA and DOE 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 Tables 7.2. Below is a synopsis of the media types evaluated:

- Air Filter
- Charcoal (Air Iodine)
- Milk
- Soil
- Vegetation
- Water

7.2.2.1.2 Analytics Environmental Cross-Check Program

Twelve nuclides were evaluated during this reporting period. All but three of the 88 environmental analyses performed were within the acceptable criteria. In two samples, incorrect calculation resulted in low Strontium-89 activity. Calculated correctly, the results of 138 and 95.8 Pico Curies per Liter (pCi/L) compared well to the known activities of 133 and 100 pCi/L, respectively. In one sample, coincidental summing resulted in high Iron-59 activity. Elimination of the coincidental summing resulted in an activity of 71 Pico Curies (pCi), which compared well to the known activity of 61 pCi. No further action was required.

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

TBE-ES participated in the EML program. During this reporting period, 14 nuclides were evaluated. All but one of the 44 environmental analyses were within acceptable criteria. In one sample, an incorrect bottle size resulted in high Cesium-137 activity. When placed into a smaller bottle and counted, the results of 1529 Pico Curies (pCi) compared well to the known activity of 1450 (pCi). No further action was required.

TBE-ES participated in the semi annual Mixed Analyte Performance Evaluation Program (MAPEP) for liquid analyses (MAPEP-00-W8). All eight nuclides were evaluated and were acceptable. All fifteen of the environmental analyses performed were within the acceptable criteria.

7.2.2.1.5 Summary of participation in the ERA Program

During this reporting period, eight nuclides were analyzed under ERA criteria. All but four of the 15 environmental analytical results were acceptable. In one sample, the stable iodine carrier was unaccounted for in the calculation which resulted in low Iodine-131 activity. When recalculated, the correct result of 20 Pico Curies per Liter (pCi/L) compared well to the known activity of 20.8 pCi/L. One sample was evaluated as not acceptable for high Cesium-137 activity. The "found" versus "known" ratio of 1.10 falls within limits of 0.80 – 1.20 and is considered, by TBE, as acceptable. In one sample, the decay correction for an extended count time was not taken into consideration in the calculation which resulted in low Iodine-131 activity. When recalculated, the result of 23.2 pCi/L was in agreement with the known activity of 28.2. One sample incorrectly calculated resulted in low Tritium activity. When recalculated, the correct result of 16300 pCi/L was in agreement with the known activity of 14300 pCi/L. No further action was required.

7.2.2.2 Intra-Laboratory Process Control Program

The TBE-ES Laboratory's internal process control program evaluated 923 individual samples.

7.2.2.2.1 Spikes

All 544 environmental spikes were analyzed with statistically appropriate activity reported for each spike.

7.2.2.2.2 Analytical Blanks

During this reporting period, all but 7 of the 544 environmental analytical blanks analyzed reported less than MDC. The activity detected for the 7 blanks is indistinguishable from natural background.

7.2.2.2.3 Duplicates

All 218 duplicate sets analyzed were within acceptable limits.

7.2.2.2.4 Non-Conformance Reports

There were five non-conformance reports issued for this reporting period. No ENNVY data was impacted by the non-conformance in each of these cases.

Table 7.2.1
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March, 2003	E3585-396	Milk	Sr-89	pCi/L	80	133	0.60	N (1)
			Sr-90	pCi/L	11.2	11.8	0.95	A
	E3586-396	Milk	I-131	pCi/L	75	74	1.01	A
			Ce-141	pCi/L	168	173	0.97	A
			Cr-51	pCi/L	243	246	0.99	A
			Cs-134	pCi/L	83	90	0.92	A
			Cs-137	pCi/L	207	200	1.04	A
			Co-58	pCi/L	49	47	1.04	A
			Mn-54	pCi/L	65	64	1.02	A
			Fe-59	pCi/L	53	47	1.13	A
			Zn-65	pCi/L	114	93	1.23	W
			Co-60	pCi/L	169	162	1.04	A
	E3588-396	AP	Ce-141	pCi	239	224	1.07	A
			Cr-51	pCi	348	318	1.09	A
			Cs-134	pCi	101	117	0.86	A
			Cs-137	pCi	277	259	1.07	A
			Co-58	pCi	66	60	1.10	A
			Mn-54	pCi	97	83	1.17	A
			Fe-59	pCi	80	61	1.31	N (2)
			Zn-65	pCi	152	120	1.27	W
			Co-60	pCi	223	209	1.07	A
	E3587-396	Charcoal	I-131	pCi	68	74	0.92	A
June, 2003	E3747-396	Milk	Sr-89	pCi/L	89	85	1.05	A
			Sr-90	pCi/L	20	23	0.87	A
	E3748-396	Milk	I-131	pCi/L	115	103	1.12	A
			Ce-141	pCi/L	285	283	1.01	A
			Cr-51	pCi/L	266	239	1.11	A
			Cs-134	pCi/L	99	103	0.96	A
			Cs-137	pCi/L	236	230	1.03	A
			Co-58	pCi/L	106	93	1.14	A
			Mn-54	pCi/L	190	186	1.02	A
			Fe-59	pCi/L	108	99	1.09	A
			Zn-65	pCi/L	208	181	1.15	A
			Co-60	pCi/L	142	132	1.08	A
	E3750-396	AP	Ce-141	pCi	238	248	0.96	A
			Cr-51	pCi	239	209	1.14	A
			Cs-134	pCi	79	91	0.87	A
			Cs-137	pCi	189	202	0.94	A
			Co-58	pCi	71	81	0.88	A
			Mn-54	pCi	164	163	1.01	A
			Fe-59	pCi	91	87	1.05	A
			Zn-65	pCi	155	159	0.97	A
			Co-60	pCi	109	116	0.94	A

Table 7.2.1(cont)
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE QC SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June, 2003	E3749-396	Charcoal	I-131	pCi	78	62	1.26	W
September, 2003	E3898-396	Milk	Sr-89	pCi/L	45	100	0.45	N (1)
			Sr-90	pCi/L	13	14	0.93	A
	E3899-396	Milk	I-131	pCi/L	73	74	0.99	A
			Ce-141	pCi/L	85	86	0.99	A
			Cr-51	pCi/L	220	233	0.94	A
			Cs-134	pCi/L	106	119	0.89	A
			Cs-137	pCi/L	90	88	1.02	A
			Co-58	pCi/L	96	99	0.97	A
			Mn-54	pCi/L	95	93	1.02	A
			Fe-59	pCi/L	84	79	1.06	A
			Zn-65	pCi/L	187	176	1.06	A
			Co-60	pCi/L	132	123	1.07	A
	E3901-396	AP	Ce-141	pCi	79	77	1.03	A
			Cr-51	pCi	227	210	1.08	A
			Cs-134	pCi	93	108	0.86	A
			Cs-137	pCi	70	79	0.89	A
			Co-58	pCi	80	89	0.90	A
			Mn-54	pCi	73	84	0.87	A
			Fe-59	pCi	74	71	1.04	A
			Zn-65	pCi	143	158	0.91	A
			Co-60	pCi	93	111	0.84	A
	E3900-396	Charcoal	I-131	pCi	74	86	0.86	A
November, 2003	E3790-396	Milk	Sr-89	pCi/L	185	168	1.10	A
			Sr-90	pCi/L	19	17	1.12	A
	E3971-396	Milk	I-131	pCi/L	87	90	0.97	A
			Ce-141	pCi/L	186	202	0.92	A
			Cr-51	pCi/L	287	280	1.03	A
			Cs-134	pCi/L	119	135	0.88	A
			Cs-137	pCi/L	116	129	0.90	A
			Co-58	pCi/L	111	111	1.00	A
			Mn-54	pCi/L	176	173	1.02	A
			Fe-59	pCi/L	94	102	0.92	A
			Zn-65	pCi/L	190	197	0.96	A
			Co-60	pCi/L	140	155	0.90	A

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

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
November, 2003	E3973-396	AP	Ce-141	pCi	144	142	1.01	A
			Cr-51	pCi	203	198	1.03	A
			Cs-134	pCi	90	96	0.94	A
			Cs-137	pCi	85	91	0.93	A
			Co-58	pCi	80	78	1.03	A
			Mn-54	pCi	115	122	0.94	A
			Fe-59	pCi	72	72	1.00	A
			Zn-65	pCi	121	139	0.87	A
			Co-60	pCi	102	109	0.94	A
	E3972-396	Charcoal	I-131	pCi	67	77	0.87	A

(1) Incorrectly calculated. The recalculated March & September Sr-89 results of 138 & 95.8 pCi/L, respectively, are acceptable. The efficiency required for these samples is different than the efficiency for regular samples. NCR 04-02

(2) Using only the results from the 1099.2 keV photon, the Fe-59 would be 71 pCi, which is acceptable. Coincidental summing occurs only with significant Fe-59 activity levels. Therefore, there is no impact on environmental samples. NCR 04-02

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable. Reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning. Reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable. Reported result falls outside the ratio limits of < 0.70 and > 1.30.

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 (a)	Known Value (b)	Ratio (c) TBE/EML	Evaluation (d)
March, 2003	QAP 58 (QAP 0303)	AP	Co-60	Bq/filter	35.9	33.5	1.07	A
			Cs-137	Bq/filter	113.7	99.7	1.14	A
			Gr-Beta	Bq/filter	1.6	1.5	1.07	A
			Mn-54	Bq/filter	49.4	43.8	1.13	A
			Sr-90	Bq/filter	2.4	2.8	0.86	A
		Soil	Ac-228	Bq/kg	70.2	57.06	1.23	W
			Bi-212	Bq/kg	72.5	60.6	1.20	W
			Bi-214	Bq/kg	76.2	67.0	1.14	A
			Cs-137	Bq/kg	1883	1450	1.30	N (1)
			K-40	Bq/kg	805.7	636	1.27	W
			Pb-212	Bq/kg	74.8	57.9	1.29	W
			Pb-214	Bq/kg	79.2	71.1	1.11	A
			Sr-90	Bq/kg	53.5	64.4	0.83	A
			Th-234	Bq/kg	169.1	127	1.33	A
		Vegetation	Co-60	Bq/kg	14.4	12.1	1.19	A
			Cs-137	Bq/kg	522	444	1.18	A
			K-40	Bq/kg	1360	1120	1.21	A
			Sr-90	Bq/kg	498.3	650	0.77	A
		Water	Co-60	Bq/L	252.3	234	1.08	A
			Cs-134	Bq/L	31.1	30.5	1.02	A
			Cs-137	Bq/L	71.5	63.8	1.12	W
			Gr-Beta	Bq/L	821.3	627.5	1.31	W
			H-3	Bq/L	418.3	390	1.07	A
			Sr-90	Bq/L	3.63	4.34	0.84	W
September, 2003	QAP 59 (QAP 0309)	AP	Mn-54	Bq/filter	54.0	58.0	0.93	A
			Co-60	Bq/filter	53.3	55.1	0.97	A
			Sr-90	Bq/filter	1.7	2.058	0.83	A
			Cs-137	Bq/filter	51.2	54.8	0.93	A
			Gr-Beta	Bq/filter	3.4	3.89	0.87	W
		Soil	K-40	Bq/kg	517.0	488.0	1.06	A
			Sr-90	Bq/kg	70.0	80.3	0.87	A
			Cs-137	Bq/kg	2127.0	1973.0	1.08	A
			Bi-212	Bq/kg	56.1	53.9	1.04	A
			Pb-212	Bq/kg	52.7	50.7	1.04	A
			Bi-214	Bq/kg	36.4	34.4	1.06	A
			Pb-214	Bq/kg	41.5	35.2	1.18	A
			Ac-228	Bq/kg	56.2	50.8	1.11	A
			Th-234	Bq/kg	145.4	116.0	1.25	A

Table 7.2.2 (cont.)
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 (a)	Known Value (b)	Ratio (c) TBE/EML	Evaluation (d)
September, 2003	QAP 59 (QAP 0309)	Water	H-3	Bq/L	511.0	446.3	1.14	A
			Co-60	Bq/L	491.0	513.0	0.96	A
			Sr-90	Bq/L	5.9	7.04	0.84	W
			Cs-134	Bq/L	62.4	63.0	0.99	A
			Cs-137	Bq/L	74.9	80.3	0.93	A
			Gr-Beta	Bq/L	1663.0	1948.0	0.85	A

(1) Incorrect bottle size used. Sample was placed into a smaller container and recounted. All recount results were acceptable except Bi-212 which was acceptable with warning. Previously analyzed samples were examined and no other incorrect container sizes were noted. NCR 03-07

(a) Teledyne Brown Engineering reported result.

(b) The DOE/EML known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to DOE/EML results.

(d) DOE/EML evaluation: A=acceptable, W=acceptable with warning, N=not acceptable. Control Limits are established based upon percentiles of historic data distributions. Analytical performance is evaluated based on the historical analytical capabilities for individual analyte/matrix pairs. The criteria for acceptable performance, "A" has been chosen to be between the 15th and the 85th percentile. The acceptable with warning criteria, "W" is between the 5th and 15th percentile and the 85th and 95th percentile. In other words, the middle 70% of all reported values are acceptable, while the outer 5th through 15th (10%) and 85th through 95th (10%) are in the warning area. The not acceptable criteria, "N" is established at less than the 5th percentile and greater tha the 95th percentile, that is the outer 10% of historical data.

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 (a)	Known Value (b)	Control Limits	Evaluation (c)
May, 2003	Rad 53	Water	I-131	pCi/L	13.6	20.8	15.6 - 26.0	N (1)
			H-3	pCi/L	1200	1250	678 - 1820	A
			Co-60	pCi/L	69.9	63.8	55.1 - 72.5	A
			Cs-134	pCi/L	73.5	75.7	67.0 - 84.4	A
			Cs-137	pCi/L	165	150	141 - 159	N (2)
			Sr-89	pCi/L	37.0	31.3	22.6 - 40.0	A
			Sr-90	pCi/L	23.5	27.4	18.7 - 36.1	A
November, 2003	Rad 55	Water	I-131	pCi/L	22.2	28.2	23.0 - 33.4	N (3)
			H-3	pCi/L	1630	14300	11800 - 16800	N (3)
			Co-60	pCi/L	28.4	27.7	19.0 - 36.4	A
			Cs-134	pCi/L	21.7	23.4	14.7 - 32.1	A
			Cs-137	pCi/L	63.6	64.2	55.5 - 72.9	A
			Sr-89	pCi/L	47.9	50.4	41.7 - 59.1	A
			Sr-90	pCi/L	9.23	10.2	1.54 - 18.9	A
			Gr-Beta	pCi/L	161	168	124 - 212	A

(1) The stable iodine carrier in the sample was unaccounted for in the calculation. When recalculated, the correct result of 20.0 pCi/L was within acceptance criteria. NCR 03-11

(2) Although Cs-137 is evaluated as N, the TBE/ERA ratio of 1.10 falls within limits of 0.80 - 1.20 and is considered by TBE as acceptable.

(3) The decay correction did not take into account the extended count time. When recalculated, the correct result of 23.2 was within acceptance criteria. NCR 04-06

Due to recalculating H-3 to required reporting units, a decimal place was dropped. The correct result of 16300 is within acceptance criteria. NCR 04-06

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls

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

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
February, 2003	02-W10	Water	Cs-134	Bq/L	382.7	421	294.70 - 547.30	A
			Cs-137	Bq/L	329.3	329	230.30 - 427.70	A
			Co-57	Bq/L	58.17	57	39.90 - 74.10	A
			Co-60	Bq/L	41.2	38.2	26.74 - 49.66	A
			Mn-54	Bq/L	35.07	32.9	23.03 - 42.77	A
			Sr-90	Bq/L	11.70	12.31	8.62 - 16.00	A
			Zn-65	Bq/L	566	516	361.20 - 670.80	A
July, 2003	03-S10	Soil	Cs-134	Bq/Kg	204	238	166.60 - 309.40	A
			Cs-137	Bq/Kg	803	832	582.40 - 1081.60	A
			Co-57	Bq/Kg	499	530	371.00 -689.00	A
			Co-60	Bq/Kg	427	420	294.00 - 546.00	A
			Mn-54	Bq/Kg	136	137	95.90 - 178.10	A
			K-40	Bq/Kg	686	652	456.40 - 847.60	A
			Sr-90	Bq/Kg	651	714	499.80 - 928.20	A
			Zn-65	Bq/Kg	528	490	343.00 - 637.00	A

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

8. Land Use Census

The ENNVY 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. The census 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 2003 Land Use Census was conducted in the summer of 2003 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. No changes in the census from year 2001 occurred for the 2003 census, therefore no such revision of the 2001 calculations were required.

Pursuant to ODCM 3.5.2.a, a dosimetric analysis would be performed, using site specific meteorological data, to determine which milk animal locations would provide the optimal sampling locations. If any location had experienced a 20% greater potential dose commitment than at a currently sampled location, the new location would be added to the routine environmental sampling program in replacement of the location with the lowest calculated dose (which is eliminated from the program). The 2003 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 results of the 2003 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

2003 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 2003 as in all previous years of plant operation, a program was conducted to assess the levels of radiation or radioactivity in the ENNVY 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 naturally-occurring 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 such as Cs-137 and Sr-90 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 ENNVY 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. In fact, measured values were several orders of magnitude below reportable levels listed in Table 4.5.

10. REFERENCES

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

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

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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.