Enclosure 3
Annual Radiological Environmental Operating Report (Annual REMP Report)

FirstEnergy Nuclear Operating Company
FENOC

Beaver Valley Power Station - Units 1 & 2
Unit 1 License No. DPR-66
Unit 2 License No. NPF-73

Annual
Radiological Environmental Operating Report
Calendar Year - 2004

EXECUTIVE SUMMARY

This document is a detailed report of the 2004 Beaver Valley Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels in the vicinity of Unit 1 and Unit 2 from January 1 through December 31, 2004 in air, water, shoreline sediment, milk, fish, food crops, vegetation, soil, and direct radiation measurement have been analyzed, evaluated, and summarized. The results of the REMP are intended to supplement the results of the radiological effluent monitoring by verifying that the measurable concentration of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurement and modeling of the environmental exposure pathways.

Radiation and radioactivity in the environment is monitored within a 10-mile radius of the site. Two types of samples are taken. The first type, control samples, are collected from areas that are beyond measurable influence of Beaver Valley Power Station. These samples are used as reference data. Normal background radiation levels, or radiation present due to causes other than Beaver Valley Power Station, can thus be compared to the environment surrounding the nuclear power station. Indicator samples are the second sample type obtained. These samples show how much radiation is contributed to the environment by the site. Indicator samples are taken from areas close to the station where any plant contribution will be at the highest concentration. In 2004, approximately 2500 samples were taken from nearly 100 different locations around the Beaver Valley Power Station that include the aquatic, atmospheric, and terrestrial environments. More than 2600 analyses were performed on these samples. The environmental program for 2004 is outlined in Table 2-1.

In 1974 and 1975, prior to station operation, samples were collected and analyzed to determine the amount of radioactivity present in the area. The resulting values are used as a "pre-operational baseline." Current analysis results from the indicator samples are compared to both current control sample values and the pre-operational baseline to determine if changes in radioactivity levels are attributable to station operations. The 2004 analytical results and pre-operational baseline results are summarized in Table 2-2 and Table 2-3.

A report is required to be submitted to the Nuclear Regulatory Commission when the level of radioactivity in an environmental sampling medium exceeds the limits specified in the Offsite Dose Calculation Manual (ODCM) when averaged over any calendar quarter. Also, when more than one of the radionuclides are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{Concentration (1)}}{\text{Limit Level (1)}} + \frac{\text{Concentration (2)}}{\text{Limit Level (2)}} + \ldots \geq 1.0$$

Based on the analytical results of environmental samples during 2004, the Beaver Valley Power Station reporting levels were not exceeded.

Positive results attributable to the Beaver Valley Power Station were consistent with station data of authorized radioactive discharges and were within limits permitted by the NRC license. Other radioactivity detected was attributable to naturally occurring radionuclides, previous nuclear

weapons tests, other man-made sources, and to the normal statistical fluctuation for activities near the lower limit of detection (LLD).

In 2004, the radioactivity releases from BVPS Units 1 and 2 did not exceed the effluent limits identified in the Beaver Valley Power Station Operating License Technical Specifications/Offsite Dose Calculation Manual (ODCM). Based on the estimated dose to individuals from the natural background radiation exposure, the incremental increase in total body dose to the 50 mile population (approximately 4 million), from the operation of Beaver Valley Power Station Units 1 and 2, is less than 0.00003% of the annual background dose. The National Academy of Sciences 1990 BEIR Report shows that the typical dose to an individual from background (natural radiation exposure including radon) is an estimated average of 296 mrem per year.

Analytical results are divided into four ODCM required categories based on exposure pathways: Airborne, direct radiation, ingestion, and waterborne. Each of these pathways is described below:

- The airborne exposure pathway includes airborne iodine and airborne particulates. The 2004 results were similar to previous years. There was no notable increase in natural products and no detectable fission products or other radionuclides in the airborne particulate media during the year.

- The direct exposure pathway measures environmental radiation doses by use of thermoluminescent dosimeters (TLDs). TLD results have indicated a stable trend and compare well with previous years.

- The ingestion exposure pathway includes milk, fish, and food products (leafy vegetable) samples. For milk sample, strontium-90 (Sr-90), attributable to past atmospheric weapons testing, was detected at level similar to the past five years. The gamma spectroscopy counting only indicated positive results for potassium-40 (K-40) at average environmental levels. Iodine-131 (I-131) was detected in four (4) milk samples at slightly above LLD levels. No other radionuclides were identified.

The fish samples taken indicated below LLD levels in each of the samples. Vegetation samples revealed naturally occurring K-40 at average environmental levels.

- The waterborne exposure pathway includes drinking water, surface (river) water, and river sediment. Water samples were analyzed for tritium and gamma-emitting radionuclides. Tritium was not identified in any of the twenty samples analyzed. Gamma analysis of samples indicated no gamma-emitting radionuclides above detection limits. I-131 analysis of weekly samples (156 total) indicated nine (9) positive results. There were zero (0) results that exceeded the reporting level. It was also noted that the surface water samples, which are upstream of the plant and considered outside the influence of the site had similar results to the downstream drinking water samples.

Sediment samples are taken from three locations, upstream of the site, at the discharge point of liquid releases, and downstream of the site. Analysis of samples indicated naturally occurring

radionuclides K-40 and Ra-226 in all results. Small amounts of cesium-137 (Cs-137) from previous nuclear weapons tests was also detected in six (6) of the six samples (including the Control location) at levels consistent with previous years. Co-58 and Co-60 were not detected in any of the six (6) samples.

In addition to the required samples discussed above, groundwater, precipitation, soil, and feed crops were also taken. Results were consistent with previous years and no degrading trends were identified.

The environmental monitoring program outlined in the Beaver Valley Power Station ODCM for Units 1 and 2 was followed throughout 2004. The REMP results demonstrate the adequacy of radioactive effluent control at the Beaver Valley Power Station and that the operations of Units 1 and 2 did not adversely affect the surrounding environment.

It should be noted that the radiological environmental monitoring program includes sampling sites in addition to the required sites set forth in the ODCM. These include five (5) air sampling sites, one (1) surface water site, three (3) ground water sites, three (3) precipitation sites, two (2) sediment sites, one (1) local large dairy, and one (1) milk animal feed site.

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A. Scope and Objectives of the Program

The environmental program consists of environmental monitoring for radioactivity in the vicinity of the Beaver Valley Power Station. Environmental sampling and analyses included air, water, milk, vegetation, river sediments, fish, and ambient radiation levels in areas surrounding the site. The results of these media are assessed to determine impacts of the plant operation on the environment. The Annual Radiological Environmental Report for the Beaver Valley Power Station summarizes the radiological environmental program conducted by the First Energy Nuclear Operating Company in 2004.

B. Description of the Beaver Valley Site

The Beaver Valley Power Station is located on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania, on a 501 acre tract of land. The site is approximately one mile from Midland, Pennsylvania; five miles from East Liverpool, Ohio; and twenty-five miles from Pittsburgh, Pennsylvania. Figure 1-1 shows the site location in relation to the principal population centers. Population density in the immediate vicinity of the site is relatively low. The population within a five mile radius of the plant is approximately 15,493 and the only area within the radius of concentrated population is the Borough of Midland, Pennsylvania, with a population of approximately 3,321.

The site lies in a valley along the Ohio River. It extends from the river (elevation 665 feet above sea level) to a ridge along the border south of the Beaver Valley Power Station at an elevation of 1,078 feet. Plant ground level is approximately 735 feet above sea level.

The Beaver Valley Power Station is on the Ohio River at river mile 34.8, at a location on the New Cumberland Pool that is 3.3 river miles downstream from Montgomery Lock and Dam, and 19.4 miles upstream from New Cumberland Lock and Dam. The Pennsylvania-Ohio-West Virginia border is located 5.2 river miles downstream from the site. The river flow is regulated by a series of dams and reservoirs on the Beaver, Allegheny, Monongahela and Ohio Rivers and their tributaries. For 2004, the flow ranged from a minimum monthly average of 10,447 cubic feet per second (CFS) to a maximum monthly average of 354,900 CFS. The mean flow for 2004 was 54,125 CFS.

Water temperature of the Ohio River varies from 34°F to 75°F, the minimum temperatures occur in January and/or February and maximum temperatures in July and August. Water quality in the Ohio River at the site location is affected primarily by the water quality of the Allegheny, Monongahela and Beaver rivers.

The climate of the area may be classified as humid continental. Total annual precipitation for 2004 was 53.02 inches. Yearly temperatures varied from a low of 1.9°F to a high of 87.6°F with an annual average temperature of 51.2°F. The predominant wind direction is typically from the southwest in summer and from the west southwest in winter.

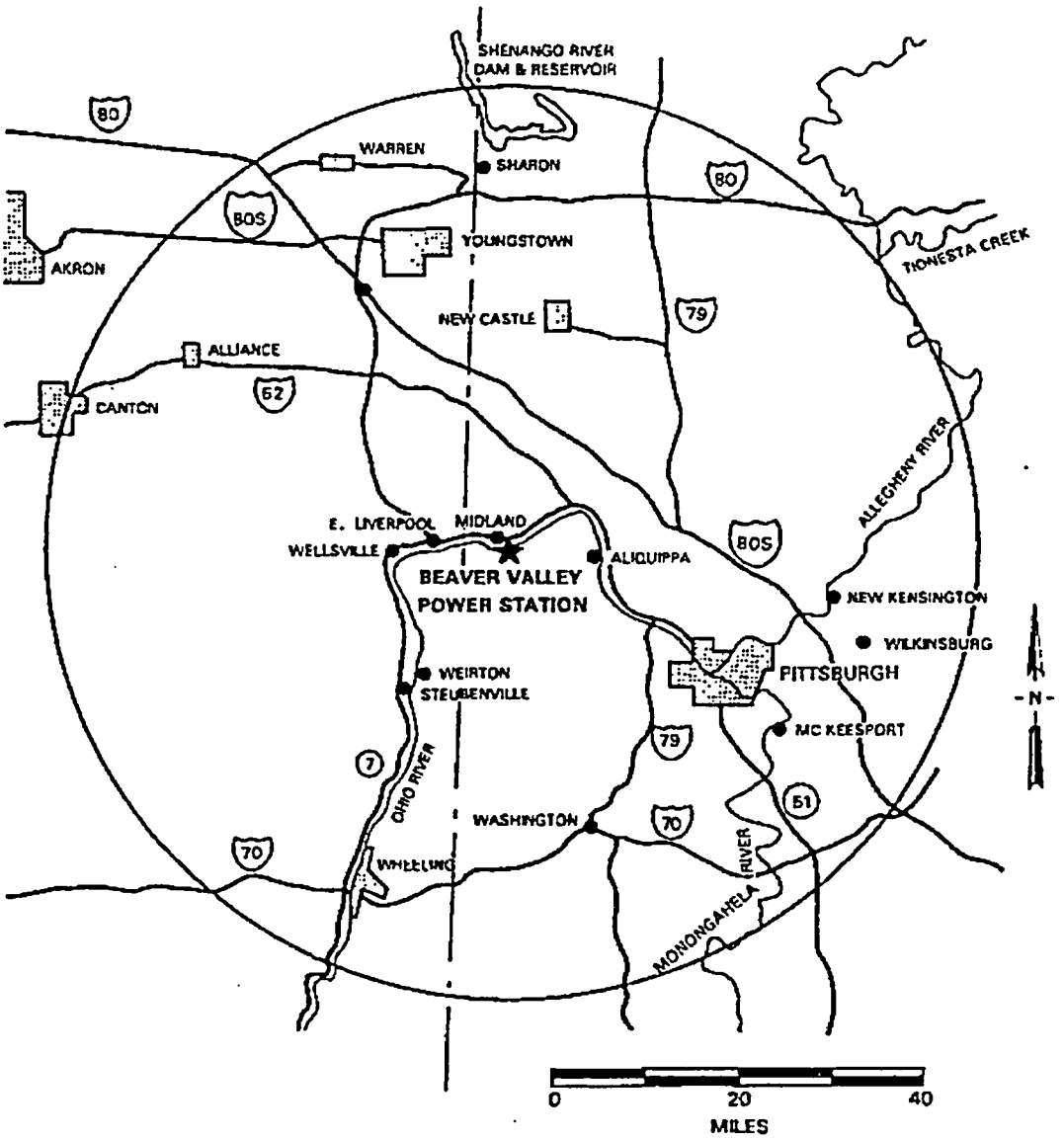
The basic features of the Beaver Valley Power Station Units 1 and 2 are tabulated below:

	Beaver Valley Unit 1	Beaver Valley Unit 2
Licensed Power Level	2685 – megawatts thermal	2685 – megawatts thermal
Type of Power	PWR	PWR
No. of Reactor Coolant Loops	3	3
No. of Steam Generators & Type	3 - Vertical	3 - Vertical
Steam Used by Main Turbine	Saturated	Saturated

The units utilize two separate systems (primary and secondary) for transferring heat from the source (the reactor) to the receiving component (turbine-generator). Because the two systems are isolated from each other, primary and secondary waters do not mix; therefore, radioactivity in the primary system water is normally isolated from the secondary system. Reactor coolant in the primary system is pumped through the reactor core and steam generators by means of reactor coolant pumps. Heat is given up from the primary system to the secondary system in the steam generators, where steam is formed and delivered to the main unit turbine, which drives the electrical generator. The steam is condensed after passing through the turbine, and returned to the steam generators to begin another steam/water cycle.

Figure 1-1

Geographical Map and Principal Communities in 50-mile Radius of the Beaver Valley Power Station



SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

A. Environmental Radioactivity Monitoring Program

1. Program Description

The program consists of monitoring water, air, soil, river bottoms, vegetation and food crops, cows milk, ambient radiation levels in areas surrounding the site, and aquatic life as summarized in Table 2-1. Further description of each portion of the program (Sampling Methods, Sample Analysis, Discussion and Results) are included in Sections 2-B through 2-I of this report.

2-B - Air Monitoring

2-C - Monitoring of Sediments and Soils

2-D - Monitoring of Feed Crops and Food Products

2-E - Monitoring of Local Cows Milk

2-F - Environmental Radiation Monitoring

2-G - Monitoring of Fish

2-H - Monitoring of Surface, Drinking, Ground Waters and Precipitation

2-I - Estimates of Radiation Dose to Man

Table 2-1

Operational Radiological Environmental Monitoring Program

	Type of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis
1	Air Particulate Radioiodine	13	11	1.49	Old Meyer Farm	Continuous sampling with sample collection at least weekly	Weekly AP	Gross Beta (b)
		30	4	0.43	Shippingport (Cook's Ferry S.S.)		Weekly Charcoal	I-131
		46.1	2/3	2.28	Industry - McKeel's Service - Rt. 68		Quarterly Composite (c)	Gamma - scan
		32	15	0.75	Midland (North S.S.)			
		48	10	16.40	Weirton Water Tower, Collier Way			
		51	5	8.00	Aliquippa (Sheffield S.S.)			
		47	14	4.88	East Liverpool Water Dept.			
		27	7	6.14	Brunton Farm			
		28	1	8.60	Sherman Farm			
		29B	3	7.97	Friendship Ridge			
2	Direct Radiation	30	4	0.43	Shippingport (Cook's Ferry S.S.)	Continuous (TLD)	Quarterly (i)	Gamma Dose
		13	11	1.49	Old Meyer Farm			
		46	3	2.49	Industry, Midway Dr.			
		32	15	0.75	Midland (North S.S.)			
		48	10	16.40	Weirton Water Tower, Collier Way			
		45.1	6	1.92	Raccoon Twp., Kennedy's Corners			
		51	5	8.00	Aliquippa (Sheffield S.S.)			
		47	14	4.88	East Liverpool Water Dept.			
		70	1	3.36	236 Engle Rd.			
		80	9	8.27	Raccoon Park Office, Rt. 18			
		81	9	3.69	Millcreek United Presby. Church			
		82	9	6.99	2697 Rt. 18			
		83	10	4.26	735 Mill Creek Rd.			
		14	11	2.53	Hookstown Boro			
		84	11	8.35	Hancock Co. Senior Center			
		85	12	5.73	2048 Rt. 30			
		86	13	6.18	1090 Ohio Ave., E. Liverpool			
		92	12	2.81	Georgetown Rd. (Georgetown S.S.)			

Table 2-1 (Continued)

Operational Radiological Environmental Monitoring Program

Types of Sample		Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis
2	Direct Radiation (continued)	87	14	7.04	50103 Calcutta Smith's Ferry Rd.	Continuous (TLD)	Quarterly (i)	Gamma-Dose
		88	15	2.74	110 Summit Rd., Midland Heights			
		89	15	4.72	488 Smith's Ferry Rd., Ohioville			
		90	16	5.20	6286 Tuscarawras Rd.			
		10	3/4	0.94	Shippingport Post Office			
		45	5	2.19	Christian House Baptist Chapel – Rt. 18			
		60	13	2.51	444 Hill Rd.			
		93	16	1.10	104 Linden - Sunrise Hills			
		95	10	2.37	McCleary & Polecat Hollow Rds.			
		28	1	8.60	Sherman Farm			
		71	2	6.01	Brighton Twp., First Western Bank			
		72	3	3.25	Ohioview Luthern Church - Rear			
		29B	3	7.97	Friendship Ridge			
		73	4	2.48	618 Squirrel Run Rd.			
		74	4	6.92	137 Poplar Ave - CCBC			
		75	5	4.08	117 Holt Road			
		76	6	3.80	Raccoon Elementary School			
		77	6	5.52	3614 Green Garden Rd.			
		59	6	0.99	236 Green Hill Rd.			
		78	7	2.72	Raccoon Municipal Bldg.			
		27	7	6.14	Brunton Farm			
		79	8	4.46	106 Rt. 151 – Ted McWilliams Auto Body			
		15	14	3.75	Georgetown Post Office			
		46.1	2/3	2.28	Industry – McKeel's Service - Rt. 68			
		91	2	3.89	Pine Grove Rd. and Doyle Rd.			
		94	8	2.25	832 McCleary Rd.			
3	Surface Water	49	3	4.92	Upstream of Montgomery Dam	Weekly Grab Sample (h)	Weekly Sample from Site 49	I-131
		2.1	14	1.43	Midland – ATI Allegheny Ludlam	Weekly, Intermittent Composite Sample (h)	Monthly composite of Weekly Sample (c)	Gamma-scan
		5	14	4.90	East Liverpool Water Dept.	Daily Grab Sample Only - Collected Weekly (h)		
							Quarterly Composite (c)	H-3

Table 2-1 (Continued)

Operational Radiological Environmental Monitoring Program

	Type of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis
4	Groundwater	14a	11	2.61	Hookstown Boro	Semi-Annual	Semi-Annual	Gamma-scan
		15b	14	3.75	Georgetown Boro			H-3
		11	3	0.94	Shippingport Boro			
5	Drinking	4	15	1.26	Midland Water Dept.	Intermittent (d)	Weekly Composite	I-131
						Collected Weekly	Monthly Composite (d)	Gamma-scan
							Quarterly Composite (d)	H-3
		5	14	4.90	East Liverpool Water Dept.			
6	Shoreline	2A	12	0.31	BVPS Outfall Vicinity	Semi-Annual	Semi-Annual	Gamma-scan
		49a(a)	3	4.93	Upstream of Montgomery Dam			
		50	12	11.77	Upstream of New Cumberland Dam			
7	Milk	25	10	2.10	Searight Farm	Weekly (e)	Weekly sample from Searight's only	I-131
		*				Biweekly (f) when animals are on monthly at other	Biweekly (grazing) Monthly (indoors)	Gamma-scan Sr-89, Sr-90, I-131
		*						
		*						
		96(a)	10	10.48	Windsheimer Farm			
		27a	7	6.16	Brunton Farm			

* BVPS ODCM, Appendix C, Table 3.12-1 requires three (3) dairies to be selected on basis of highest potential thyroid dose using milch census data. See Section 2-E for specific locations sampled.

Table 2-1 (Continued)

Operational Radiological Environmental Monitoring Program

Type of Sample		Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis
8	Fish	2A	12	0.31	BVPS Outfall Vicinity	Semi-Annual	Composite of edible parts by species (g)	Gamma-scan
		49a(a)	3	4.93	Upstream of Montgomery Dam			
9	Food Crops Three locations within 5 miles selected by BVPS.	10a	4	1.02	Shippingport Boro	Annual at harvest if available	Composite of each sample species	Gamma-scan I-131 on green leafy vegetables
		15a	14	3.55	Georgetown Boro			
		46a	3	3.39	Industry Boro			
		48a(a)	10	16.54	Weirton Area			
10	Feedstuff and Summer Forage	25	10	2.10	Searight Farm	Monthly	Monthly	Gamma-scan
11	Soil	13a	11	1.49	Old Meyer Farm	Every 3 years (1994, 1997, etc.)	12 Core Samples 3" Deep (2" Dia. at each Location, approx. 10' radius)	Gamma-scan
		30a	4	0.43	Shippingport (Cook's Ferry S.S.)			
		46b	3	2.66	Industry - Willows Inn – Rt. 68			
		32a	15	0.74	Midland (North S.S.)			
		48A(a)	10	15.65	Weirton Water Tower, E. Belleview Dr.			
		51a	5	7.99	Aliquippa (Sheffield S.S.)			
		47a	14	4.89	East Liverpool Water Dept.			
		27b	7	6.19	Brunton Farm			
		22	8	0.28	South of BVPS Transmission Line			
		29A	3	8.09	Nicol Farm			
12	Precipitation	30	4	0.43	Shippingport (Cook's Ferry S.S.)	Weekly grab samples when available	Quarterly Composite (c)	Gamma-scan, H-3
		47	14	4.88	East Liverpool Water Dept.			
		48	10	16.40	Weirton Water Tower, Collier Way			

Table 2-1 - Notations

Operational Radiological Environmental Monitoring Program (Continued)

Notes:

(a) Control sample station: These are locations which are presumed to be outside the influence of plant effluents.

(b) Particulate samples are not counted within 24 hours after filter change. Perform gamma isotopic analysis on each sample when gross beta is > 10 times the yearly mean of control samples.

(c) Analysis composites are well mixed actual samples prepared of equal portions from each shorter term samples from each location.

(d) Composite samples are collected at intervals not exceeding 2 hours.

(e) Weekly milk sample from Searight's Dairy is analyzed for I-131 only.

(f) Milk samples are collected bi-weekly when animals are in pasture and monthly at other times.

(g) The fish samples will contain whatever species are available. If the available sample size permits, then the sample will be separated according to species and compositing will provide one sample of each species. If the available size is too small to make separation by species practical, then edible parts of all fish in the sample will be mixed to give one sample.

(h) Composite samples are obtained by collecting an aliquot at intervals not exceeding 2 hours at location 2.1. A weekly grab sample is obtained from daily composited grab samples obtained by the water treatment plant operator at location 5. For location 49, a weekly grab sample is obtained by a field technician.

(i) Two (2) TLDs are collected quarterly from each monitoring location.

2. Summary of Results

All results of this monitoring program are summarized in Table 2-2. This table is prepared in the format specified by NRC Regulatory Guide 4.8 and in accordance with Beaver Valley Power Station Offsite Dose Calculation Manual. Summaries of results of analysis of each media are discussed in Sections 2-B through 2-H and an assessment of radiation doses are given in Section 2-I. Table 2-3 summarizes Beaver Valley Power Station pre-operational ranges for the various sampling media during the years 1974 and 1975. Comparisons of pre-operational data with operational data indicate the ranges of values are generally in good agreement for both periods of time.

Activity detected was attributed to naturally occurring radionuclides, BVPS effluents, previous nuclear weapons tests or to the normal statistical fluctuation for activities near the lower limit of detection (LLD).

The conclusion from all program data is that the operation of the Beaver Valley Power Station has resulted in no significant changes to the environment.

3. Quality Control Program

The Quality Control Program implemented by the Beaver Valley Power Station to assure reliable performance by the contractor and the supporting QC data are presented and discussed in Section 4 of this report.

4. Program Changes

The following changes were implemented in the 2004 sampling program.

During December 2004 and January 2005, the Global Positioning Satellite (GPS) system was used to obtain latitude, longitude, and elevation data at all sampling locations currently found in the Beaver Valley Power Station Radiological Environmental Monitoring Program. This information was also obtained for the locations identified in the 2004 Annual Land Use Census. The GPS data was then transferred to a computerized topographic mapping program in order to obtain compass directions, sectors, and distances. This served as a verification of currently used data. No significant differences were found, however accuracy was improved. The reference point for the "old" location data was the center of the Unit 1 Reactor Containment Building. The reference point for the GPS data used the midpoint between the Unit 1 and Unit 2 Reactor Containment Buildings. This activity was to close out corrective action twelve (12) under CR 04-00149. This CR was initiated following a presentation of the status of the Radiological Environmental Monitoring Program to the Radiation Protection Review Committee in July of 2004. The information was used to update appropriate areas in this report, the Offsite Dose Calculation Manual, and environmental procedures associated with this environmental program (CR 05-00139).

Table 2-2

Environmental Monitoring Program Results

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Water Precipitation (pCi/l)	Gamma (12)							0
	Mn-54	5	LLD	-	-	-	-	0
	Fe-59	10	LLD	-	-	-	-	0
	Co-58	5	LLD	-	-	-	-	0
	Co-60	5	LLD	-	-	-	-	0
	Zn-65	10	LLD	-	-	-	-	0
	Zr/Nb-95	5	LLD	-	-	-	-	0
	Cs-134	5	LLD	-	-	-	-	0
	Cs-137	5	LLD	-	-	-	-	0
	Ba/La-140	15	LLD	-	-	-	-	0
	H-3	200	269 (5 / 12) (167 - 473)	30 Shippingport (Cook's Ferry S.S.) 0.43 miles ENE	318 (3 / 4) (228 - 473)	48 Welton Water Tower, Collier Way 16.40 miles SSW	LLD	0

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

Table 2-2 (Continued)

Environmental Monitoring Program Results

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Groundwater (pCi/l)	H-3 (6)	200	LLD	-	-	-	-	0
	Gamma (6)							
	Mn-54	5	LLD	-	-	-	-	0
	Fe-59	10	LLD	-	-	-	-	0
	Co-58	5	LLD	-	-	-	-	0
	Co-60	5	LLD	-	-	-	-	0
	Zn-65	10	LLD	-	-	-	-	0
	Zr/Nb-95	5	LLD	-	-	-	-	0
	Cs-134	5	LLD	-	-	-	-	0
	Cs-137	5	LLD	-	-	-	-	0
	Ba/La-140	15	LLD	-	-	-	-	0

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

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(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Drinking Water (pCi/l)	I-131 (104)	0.5	0.68 (54 / 104) (0.30 - 1.40)	4 Midland Water Dept. 1.28 miles NW	0.72 (30 / 52) (0.30 - 1.40)	-	-	0
	H-3 (8)	200	LLD	-	-	-	-	0
	Gamma (24)							
	Mn-54	5	LLD	-	-	-	-	0
	Fe-59	10	LLD	-	-	-	-	0
	Co-58	5	LLD	-	-	-	-	0
	Co-60	5	LLD	-	-	-	-	0
	Zn-65	10	LLD	-	-	-	-	0
	Zr/Nb-95	5	LLD	-	-	-	-	0
	Cs-134	5	LLD	-	-	-	-	0
	Cs-137	5	LLD	-	-	-	-	0
	Ba/La-140	15	LLD	-	-	-	-	0

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
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(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Surface Water (pCi/l)	I-131 (52)	0.5	0.66 (37 / 52) (0.30 - 1.60)	49 Upstream Side of Montgomery Dam 4.92 miles NE	0.66 (37 / 52) (0.30 - 1.60)	49 Upstream Side of Montgomery Dam 4.92 miles NE	0.66 (37 / 52) (0.30 - 1.60)	0
	H-3 (12)	200	1.61 (1 / 12)	2.1 Midland - ATI Allegheny Ludlum 1.43 miles WNW	1.61 (1 / 4)	49 Upstream Side of Montgomery Dam 4.92 miles NE	LLD	0
	Gamma (36)							
	Mn-54	5	LLD	-	-	-	-	0
	Fe-59	10	LLD	-	-	-	-	0
	Co-58	5	LLD	-	-	-	-	0
	Co-60	5	LLD	-	-	-	-	0
	Zn-65	10	LLD	-	-	-	-	0
	Zr/Nb-95	5	LLD	-	-	-	-	0
	Cs-134	5	LLD	-	-	-	-	0
	Cs-137	5	LLD	-	-	-	-	0
	Ba/La-140	15	LLD	-	-	-	-	0
	Ra-226	(a)	LLD	-	-	-	-	0
	Th-228	(a)	LLD	-	-	-	-	0

(a) LLD for this nuclide for Surface Water not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

Table 2-2 (Continued)

Environmental Monitoring Program Results

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Sediment (pCi/g dry)	Gamma (9)							
	K-40	(a)	12.12 (6 / 6) (8.89 - 14.93)	2A BVPS Outfall Vicinity 0.31 miles WNW	14.67 (2 / 2) (14.40 - 14.67)	49a Upstream Side of Montgomery Dam 4.93 miles NE	11.56 (2 / 2) (11.22 - 11.90)	0
	Co-58	(a)	-	-	-	-	None Detected	0
	Co-60	(a)	-	-	-	-	None Detected	0
	Cs-134	0.06	-	-	-	-	None Detected	0
	Cs-137	0.08	0.11 (5 / 6) (0.10 - 0.12)	2A BVPS Outfall Vicinity 0.31 miles WNW	0.12 (2 / 2) (0.10 - 0.12)	49a Upstream Side of Montgomery Dam 4.93 miles NE	0.11 (2 / 2) (0.11 - 0.11)	0
	Ra-226	(a)	1.95 (6 / 6) (1.30 - 2.58)	2A BVPS Outfall Vicinity 0.31 miles WNW	2.50 (2 / 2) (2.41 - 2.58)	49a Upstream Side of Montgomery Dam 4.93 miles NE	1.92 (2 / 2) (1.80 - 2.03)	0

(a) LLD for this nuclide for Sediment not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Milk (pCi/l)	I-131 (155)	0.5	0.5 (9 / 155) (0.2 - 0.7)	113 Halstead 5.17 miles SSW	0.6 (3 / 20) (0.4 - 0.7)	96 Windshelmer Farm 10.48 miles SSW	0.3 (2 / 20) (0.3 - 0.3)	0
	Sr-89 (123)	2.0	-	-	-	-	-	
	Sr-90 (123)	0.7	1.7 (117 / 123) (0.6 - 5.2)	69 Collins 3.55 miles SE	2.5 (16 / 16) (1.3 - 5.2)	96 Windshelmer Farm 10.48 miles SSW	1.3 (20 / 20) (0.7 - 2.5)	0
	Gamma (123)							
	K-40	(a)	1448 (123 / 123) (1193 - 1905)	69 Collins 3.55 miles SE	1748 (16 / 16) (1632 - 1905)	96 Windshelmer Farm 10.48 miles SSW	1397 (20 / 20) (1269 - 1507)	0
	Cs-134	5	LLD	-	-	-	-	0
	Cs-137	5	LLD	-	-	-	-	0
	Ba/La-140	10	LLD	-	-	-	-	0

(a) LLD for this nuclide for Milk not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Food and Garden Crops (pCi/g wet)	I-131 (4)	0.06	LLD	-	-	-	-	0
	Gamma (4)							
	K-40	(a)	2.97 (4 / 4) (2.15 - 3.98)	48a Weirton Area 16.54 miles SSW (b)	3.98 (1 / 1)	48a Weirton Area 16.54 miles SSW (b)	3.98 (1 / 1)	0
	Cs-134	0.06	LLD	-	-	-	-	0
	Cs-137	0.06	LLD	-	-	-	-	0

(a) LLD for this nuclide for Food and Garden Crops not required by ODCM
(b) Exact location depends on availability of food products

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Fish (pCi/g wet)	Gamma (9)							
	Mn-54	0.05	LLD	-	-	-	-	0
	Fe-59	0.10	LLD	-	-	-	-	0
	Co-58	0.05	LLD	-	-	-	-	0
	Co-60	0.05	LLD	-	-	-	-	0
	Zn-65	0.10	LLD	-	-	-	-	0
	Cs-134	0.05	LLD	-	-	-	-	0
	Cs-137	0.05	LLD	-	-	-	-	0

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
External Radiation (mR/day)	Gamma (176)	0.05	0.19 (176 / 176) (0.11 - 0.24)	47 East Liverpool Water Dept. 4.88 miles WNW	0.22 (52 / 52) (0.20 - 0.23)	48 Weirton Water Tower, Collier Way 16.40 miles SSW	0.21 (53 / 53) (0.19 - 0.23)	0
Feed and Forage (pCi/g wet)	Gamma (12)							
	Be-7	(a)	1.2 (10 / 12) (0.3 - 2.0)	25 Searight Farm 2.10 miles SSW	1.2 (10 / 12) (0.3 - 2.0)	25 Searight Farm 2.10 miles SSW	1.2 (10 / 12) (0.3 - 2.0)	0
	K-40	(a)	6.13 (12 / 12) (1.28 - 12.14)	25 Searight Farm 2.10 miles SSW	6.13 (12 / 12) (1.28 - 12.14)	25 Searight Farm 2.10 miles SSW	6.13 (12 / 12) (1.28 - 12.14)	0
	I-131	(a)	None Detected	One sample location	-	One sample location	-	0
	Cs-134	0.5	None Detected	One sample location	-	One sample location	-	0
	Cs-137	0.5	None Detected	One sample location	-	One sample location	-	0

(a) LLD for this nuclide for Feed and Forage not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 **Docket No.** 50-334/50-412
Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Air Particulate and Radioiodine	Gross Beta (526)	2	26 (526 / 526) (12 - 46)	47 East Liverpool Water Dept. 4.88 miles WNW	27 (52 / 52) (16 - 39)	48 Weirton Water Tower, Collier Way 16.40 miles SSW	26 (53 / 53) (14 - 37)	0
($x 10^{-3}$ pCi/m^3)	I-131 (526)	< 40	LLD	-	-	-	-	0
	Gamma (40)							
	Be-7	(a)	64 (40 / 40) (47 - 87)	27 Brunton Farm 6.14 miles SE	69 (4 / 4) (57 - 87)	48 Weirton Water Tower, Collier Way 16.40 miles SSW	63 (4 / 4) (47 - 73)	0
	Cs-134	0.5	LLD	-	-		-	0
	Cs-137	0.5	LLD	-	-		-	0

(a) LLD for this nuclide for Air Particulate not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
Name of Facility Beaver Valley Power Station Unit 1 and Unit 2 Docket No. 50-334/50-412
Location of Facility Beaver, Pennsylvania Reporting Period Annual 2004
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection *(LLD)	All Indicator Locations ** Mean (f) ** Range	Locations with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Location Name Distance and Direction	** Mean (f) ** Range	Number of Nonroutine Reported Measurements***
Soil (pCi/g dry)	Gamma ( )							
NOTE: Soil sampling performed every three (3) years. Sampling was performed in 2003 and is next due in 2006.	K-40	(a)	(/) (-)		(/) (-)		(/) (-)	
	Cs-134	0.06	-	-	-	-	-	
	Cs-137	0.08	(/) (-)		(/) (-)		(/) (-)	
	Ra-226	(a)	(/) (-)		(/) (-)		(/) (-)	
	Th-228	(a)	LLD	-	-	-	-	

(a) LLD for this nuclide for Soil not required by ODCM

* Nominal Lower Limmit of Detection
** Mean and range based upon detectable measurements only. Fraction of detectabel measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975).

Table 2-3

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility Beaver Valley Power Station Docket No. 50-334

Location of Facility Beaver, Pennsylvania Reporting Level CY 1974 - 1975
(County) (State)

Pre-Operational Program Summary (Combined 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean, (f) Range		
Sediments pCi/g (dry)	Gross Alpha	(0)	--		--	
	Gross Beta	(33)	1	18	(33/33)	5 - 30
	Sr-90	(0)	--		--	
	U-234, 235, 238	(0)	--		--	
	Gamma	(33)	--	13	(33/33)	2 - 30
	K-40		1.5	13	(33/33)	2 - 30
	Cs-137		0.1	0.4	(21/33)	0.1 - 0.6
	Zr/Nb-95		0.05	0.8	(12/33)	0.2 - 3.2
	Ce-144		0.3	0.5	(3/33)	0.4 - 0.7
	Ru-106(a)		0.3	1.5	(3/33)	1.3 - 1.8
	Others		--		< LLD	
Foodstuff pCi/g (dry)	Gamma	(8)	--		--	
	K-40		1	33	(8/8)	10 - 53
	Cs-137		0.1	0.2	(1/8)	--
	Zr/Nb-95		0.05	0.2	(1/8)	--
	Ru-106(a)		0.3	0.8	(1/8)	--
	Others		--		< LLD	
Feedstuff pCi/g (dry)	Gross Beta	(80)	0.05	19	(80/80)	8 - 50
	Sr-89	(81)	0.025	0.2	(33/81)	0.04 - 0.93
	Sr-90	(81)	0.005	0.4	(78/81)	0.02 - 0.81
	Gamma	(81)	--		--	
	K-40		1	19	(75/81)	5 - 46
	Cs-137		0.1	0.5	(6/81)	0.2 - 1.6
	Ce-144		0.3	1.5	(5/81)	0.9 - 2.6
	Zr/Nb-95		0.05	0.8	(13/81)	0.2 - 1.8
	Ru-106(a)		0.3	1.4	(12/81)	0.6 - 2.3
	Others		--		< LLD	
Soil pCi/g (dry) (Template Samples)	Gross Alpha	(0)	--		--	
	Gross Beta	(64)	1	22	(64/64)	14 - 32
	Sr-89	(64)	0.25	0.4	(1/64)	--
	Sr-90	(64)	0.05	0.3	(48/64)	0.1 - 1.3
	U-234, 235, 238	(0)	--		--	
	Gamma	(64)	--		--	
	K-40		1.5	13	(63/64)	5 - 24
	Cs-137		0.1	1.5	(56/64)	0.1 - 6.8
	Ce-144		0.3	1.1	(7/64)	0.2 - 3
	Zr/Nb-95		0.05	0.3	(13/64)	0.1 - 2
	Ru-106(a)		0.3	1.1	(3/64)	0.5 - 2
	Others		--		< LLD	

(f) Fraction of detectable measurements at specified location.

Table 2-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility Beaver Valley Power Station Docket No. 50-334

Location of Facility Beaver, Pennsylvania Reporting Level CY 1974 - 1975
(County) (State)

Pre-Operational Program Summary (Combined 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean, (f) Range		
Soil	Gross Alpha	(0)	--		--	
pCi/g (dry)	Gross Beta	(8)	1	21	(8/8)	16 - 28
(Core Samples)	Sr-89	(8)	0.25		< LLD	
	Sr-90	(8)	0.05	0.2	(5/8)	0.08 - 0.5
	Gamma	(8)	--		--	
	K-40		1.5	13	(8/8)	7 - 20
	Cs-137		0.1	1.2	(7/8)	0.2 - 2.4
	Co-60		0.1	0.2	(1/8)	--
	Others		--		< LLD	
Surface Water	Gross Alpha	(40)	0.3	0.75	(5/40)	0.6 - 1.1
pCi/l	Gross Beta	(120)	0.6	4.4	(120/120)	2.5 - 11.4
	Gamma	(1)	10 - 60		< LLD	
	Tritium	(121)	100	300	(120/121)	180 - 800
	Sr-89	(0)	--		--	
	Sr-90	(0)	--		--	
	C-14	(0)	--		--	
Drinking Water	I-131	(0)	--		--	
pCi/l	Gross Alpha	(50)	0.3	0.6	(4/50)	0.4 - 0.8
	Gross Beta	(208)	0.6	3.8	(208/208)	2.3 - 6.4
	Gamma	(0)	--		--	
	Tritium	(211)	100	310	(211/211)	130 - 1000
	C-14	(0)	--		--	
	Sr-89	(0)	--		--	
	Sr-90	(0)	--		--	
Ground Water	Gross Alpha	(19)	0.3		< LLD	
pCi/l	Gross Beta	(76)	0.6	2.9	(73/75)(b)	1.3 - 8.0
	Tritium	(81)	100	440	(77/81)	80 - 800
	Gamma	(1)	10 - 60		< LLD	
Air Particulates	Gross Alpha	(188)	0.001	0.003	(35/188)	0.002 - 0.004
and Gaseous	Gross Beta	(927)	0.006	0.07	(927/927)	0.02 - 0.32
pCi/m^3	Sr-89	(0)	--		--	
	Sr-90	(0)	--		--	
	I-131	(816)	0.04	0.08	(2/816)	0.07 - 0.08
	Gamma	(197)	--		--	
	Zr/Nb-95		0.005	0.04	(122/197)	0.01 - 0.16
	Ru-106		0.010	0.04	(50/197)	0.02 - 0.09
	Ce-141		0.010	0.02	(3/197)	0.01 - 0.04
	Ce-144		0.010	0.02	(44/197)	0.01 - 0.04
	Others				< LLD	

(f) Fraction of detectable measurements at specified location.

Table 2-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility Beaver Valley Power Station **Docket No.** 50-334

Location of Facility Beaver, Pennsylvania **Reporting Level** CY 1974 - 1975
(County) (State)

Pre-Operational Program Summary (Combined 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean, (f) Range		
Milk	I-131	(91)	0.25	0.6	(4/91)	0.3 - 0.8
pCi/l	Sr-89	(134)	5	7	(4/134)	6 - 11
	Sr-90	(134)	1	5.3	(132/134)	1.5 - 12.8
	Gamma	(134)	--		--	
	Cs-137		10	13	(19/134)	11 - 16
	Others				< LLD	
External Radiation	γ - Monthly	(599)	0.5 mR*	0.20	(599/599)	0.08 - 0.51
mR/day	γ - Quarterly	(195)	0.5 mR*	0.20	(195/195)	0.11 - 0.38
	γ - Annual	(48)	0.5 mR*	0.19	(48/48)	0.11 - 0.30
Fish	Gross Beta	(17)	0.01	1.9	(15/17)	1.0 - 3.2
pCi/g (wet)	Sr-90	(17)	0.005	0.14	(17/17)	0.02 - 0.50
	Gamma	(17)	0.5			
	K-40		--	2.4	(17/17)	1.0 - 3.7
	Others		--		< LLD	

* LLD in units of mR - Lower end of useful integrated exposure detectability range for a passive radiation detector (TLD).

(a) May include Ru-106, Ru-103, Be-7.

(b) One outlier not included in mean. (Water taken from dried-up spring with high sediment and potassium content. Not considered typical groundwater sample).

(f) Fraction of detectable measurements at specified location.

B. Air Monitoring

1. Characterization of Air and Meteorology

   The air in the vicinity of the site contains pollutants typical for an industrial area. Air flow is generally from the southwest in summer and from the northwest in the winter.

2. Air Sampling Program and Analytical Techniques

   a. Program

   The air is sampled for gaseous radioiodine and radioactive particulates at each of ten (10) offsite air sampling stations. The locations of these stations are listed in Table 2-1 and shown on a map in Figure 2-1.

   Samples are collected at each of these stations by continuously drawing two cubic feet per minute of atmosphere air through a glass fiber filter and through a charcoal cartridge. The former collects airborne particulates; the latter is for radioiodine sampling. Samples are collected for analysis on a weekly basis.

   The charcoal is used in the weekly analysis of airborne I-131. The filters are analyzed each week for gross beta, then composited by station for quarterly analysis by gamma spectrometry. In order to reduce interference from natural radon and thoron radioactivities, all filters are allowed to decay for a few days after collection prior to counting for beta in a low background counting system.

   b. Procedures

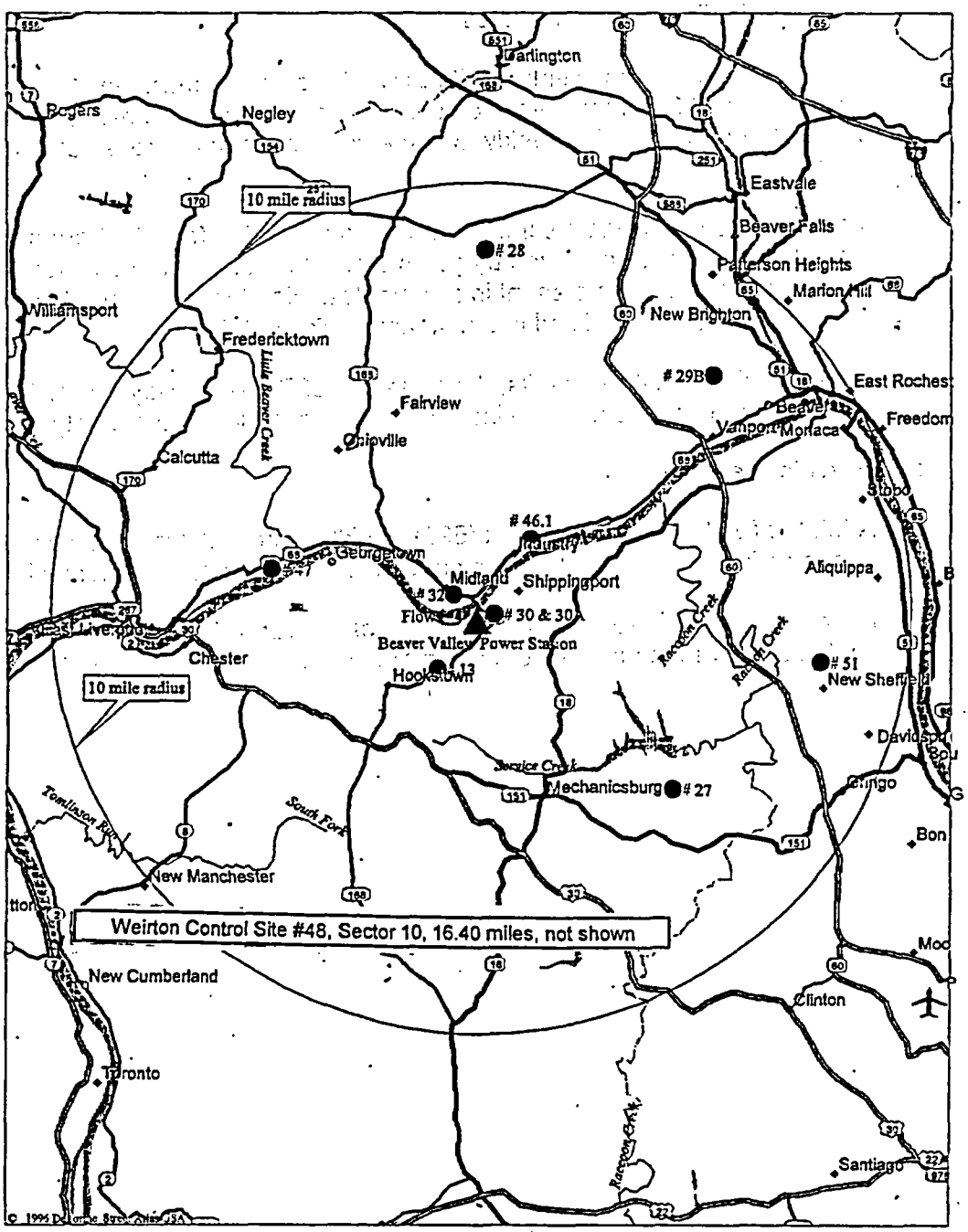
   Gross beta analysis is performed by placing the filter paper from the weekly air sample in a 2" planchet and counting it in a low background, gas flow proportional counter.

   Gamma emitters are determined by stacking all the filter papers from each monitoring station collected during the quarter and scanning this composite on a high resolution germanium gamma spectrometer.

   Radioiodine (I-131) analysis is performed by a gamma scan of the charcoal in a weekly charcoal cartridge.

Figure 2-1

Air Sampling Stations



Sample Type*	Site #	Sector	Distance (miles)	Location	Sample Type*	Site #	Sector	Distance (miles)	Location
AI/AP	13	11	1.49	Old Meyer Farm	AI/AP	32	15	0.75	Midland (North S.S.)
AI/AP	27	7	6.14	Brunton Farm	AI/AP	46.1	2/3	2.28	Industry - McKeel's Service - Rt. 68
AI/AP	28	1	8.60	Sherman Farm	AI/AP	47	14	4.88	East Liverpool Water Dept.
AI/AP	29B	3	7.97	Friendship Ridge	AI/AP	48	10	16.40	Weirton Water Tower, Collier Way
AI/AP	30	4	0.43	Shippingport (Cook's Ferry S.S.)	AI/AP	51	5	8.00	Aliquippa (Sheffield S.S.)

* AI/AP - Air Iodine/Air Particulate

3. Results and Conclusions

A summary of data is presented in Table 2-2.

a. Airborne Radioactive Particulates

A total of five hundred twenty-six (526) weekly samples from ten (10) locations were analyzed for gross beta. Results were comparable to previous years. Figure 2-2 illustrates the weekly average concentration of gross beta in air particulates.

The weekly air particulate samples were composited to forty (40) quarterly samples which were analyzed by gamma spectrometry. Naturally occurring beryllium-7 (Be-7) was present in all samples. No other radionuclides were detected. Results are listed in the summary Table 2-2.

Based on the analytical results, the operation of Beaver Valley Power Station did not contribute any measurable increase in air particulate radioactivity during 2004.

b. Radioiodine

A total of five hundred twenty-six (526) weekly charcoal filter samples were analyzed for I-131. No detectable concentrations were present at any locations.

Based on analytical results, the operation of Beaver Valley Power Station did not contribute any measurable increase in airborne radioiodine during 2004.

Figure 2-2

Average Concentration of Gross Beta in Air Particulates

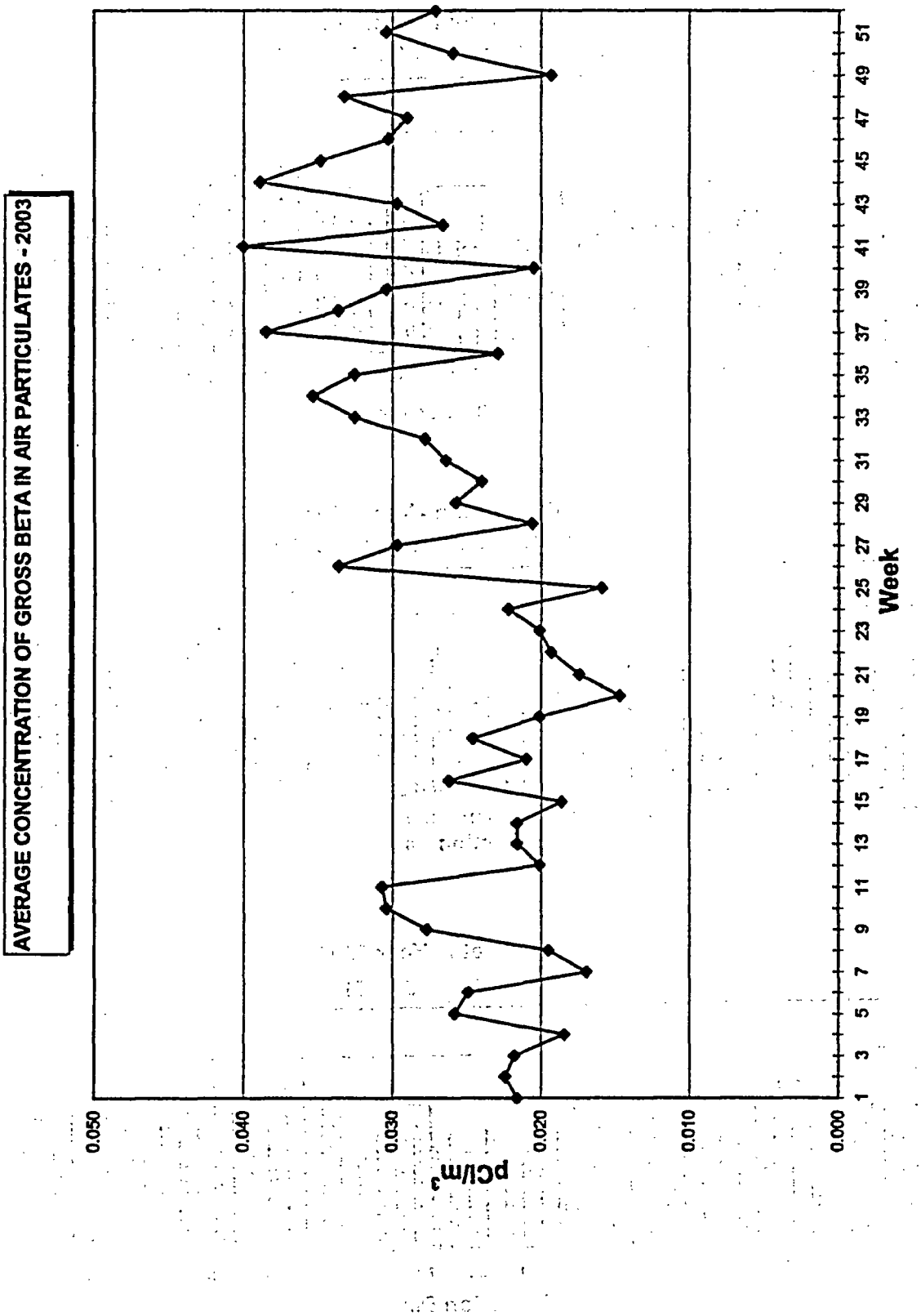
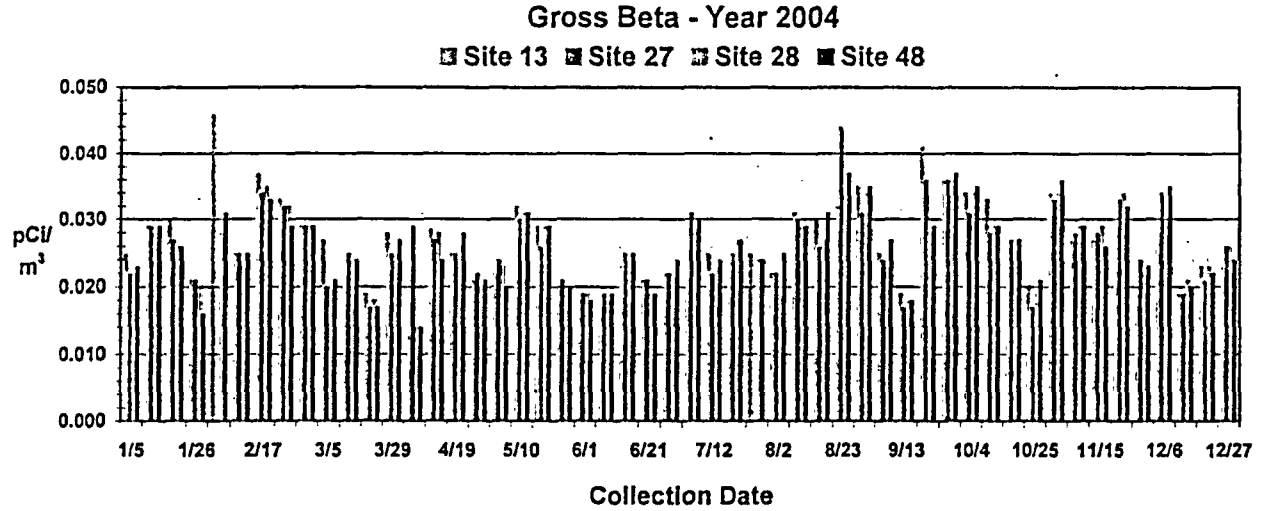
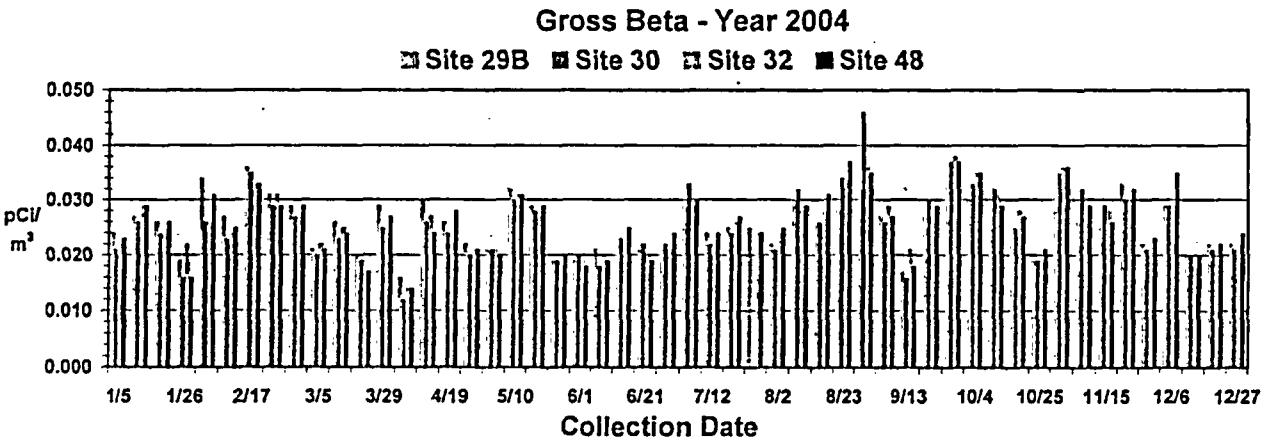


Table 2-4

Gross Beta - Annual





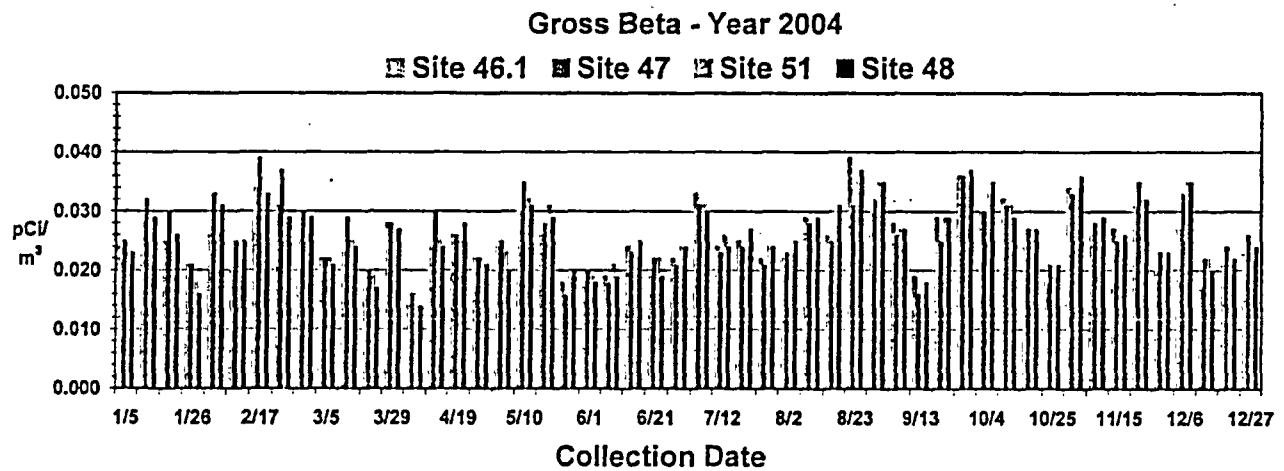


Table 2-5

Gross Beta – 1st Quarter

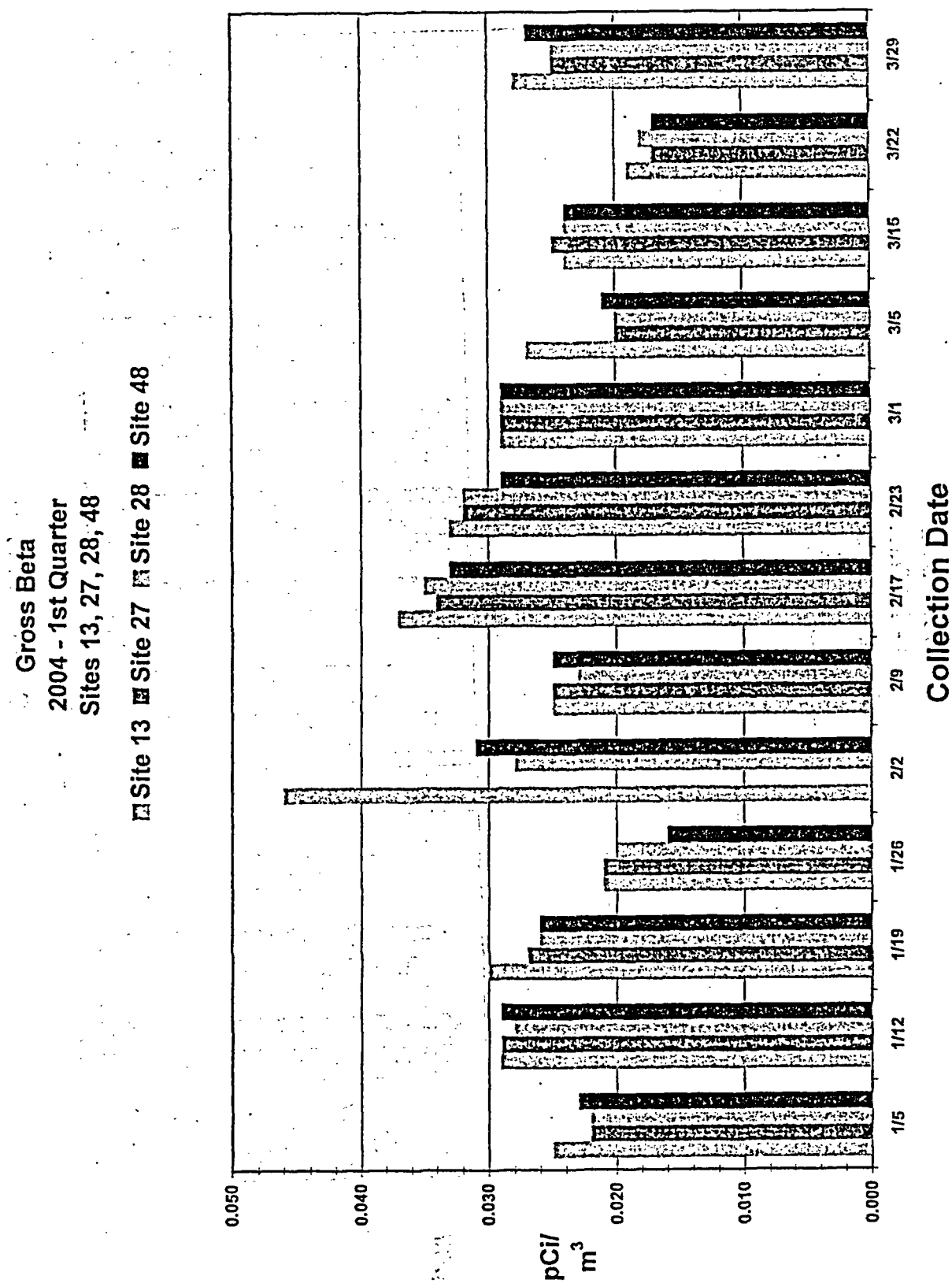
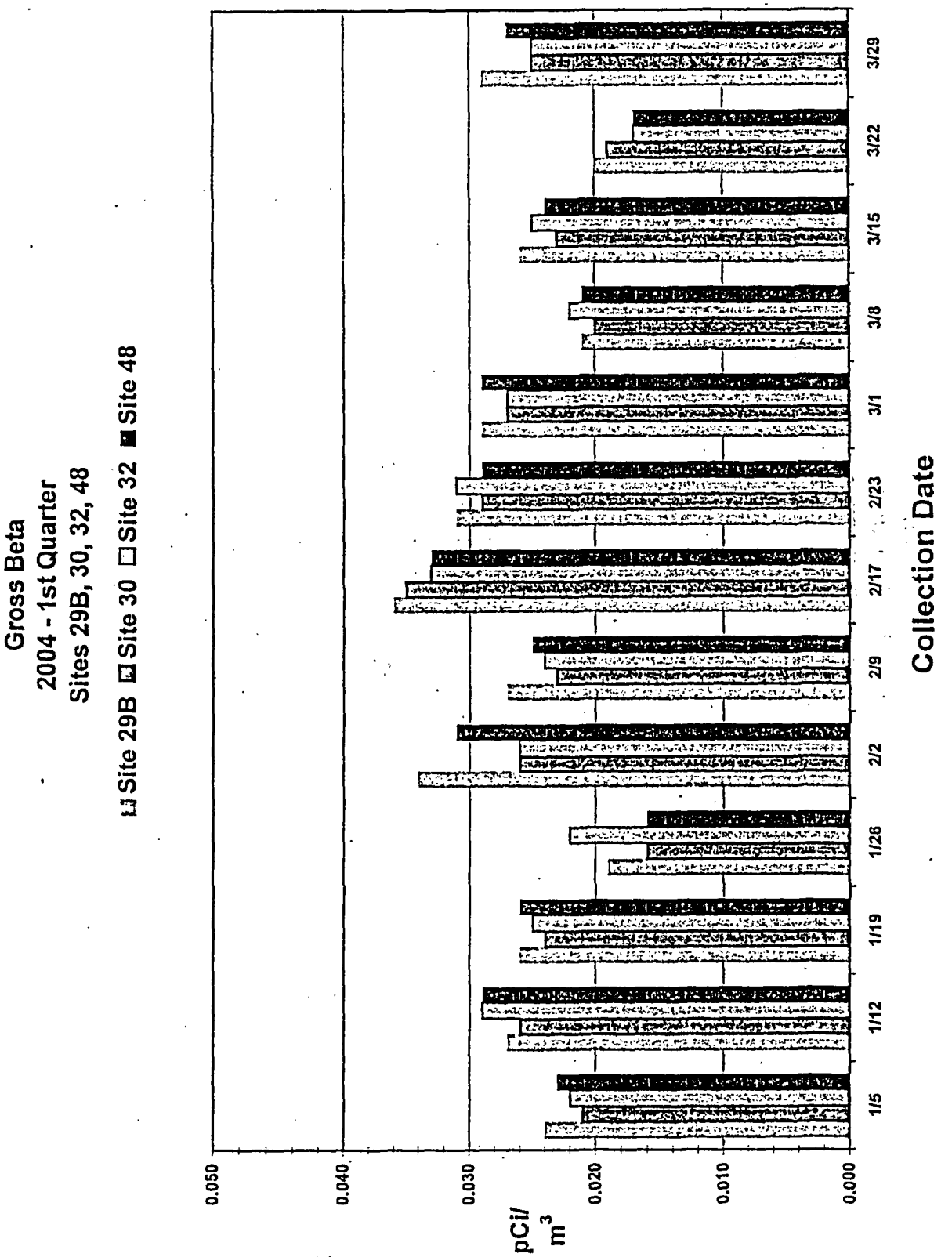


Table 2-5 (continued)

Gross Beta – 1st Quarter (continued)



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Gross Beta – 1st Quarter (continued)

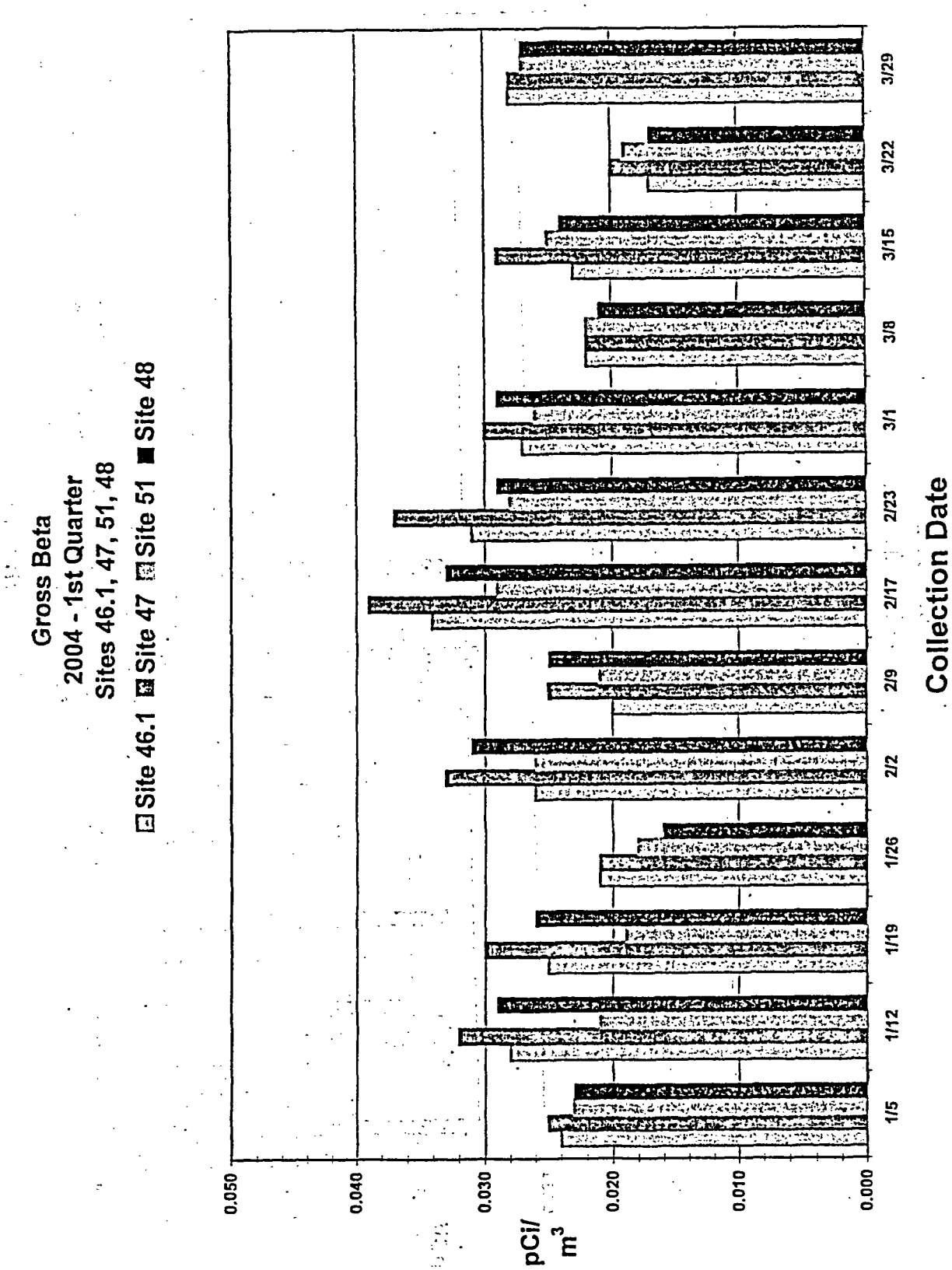
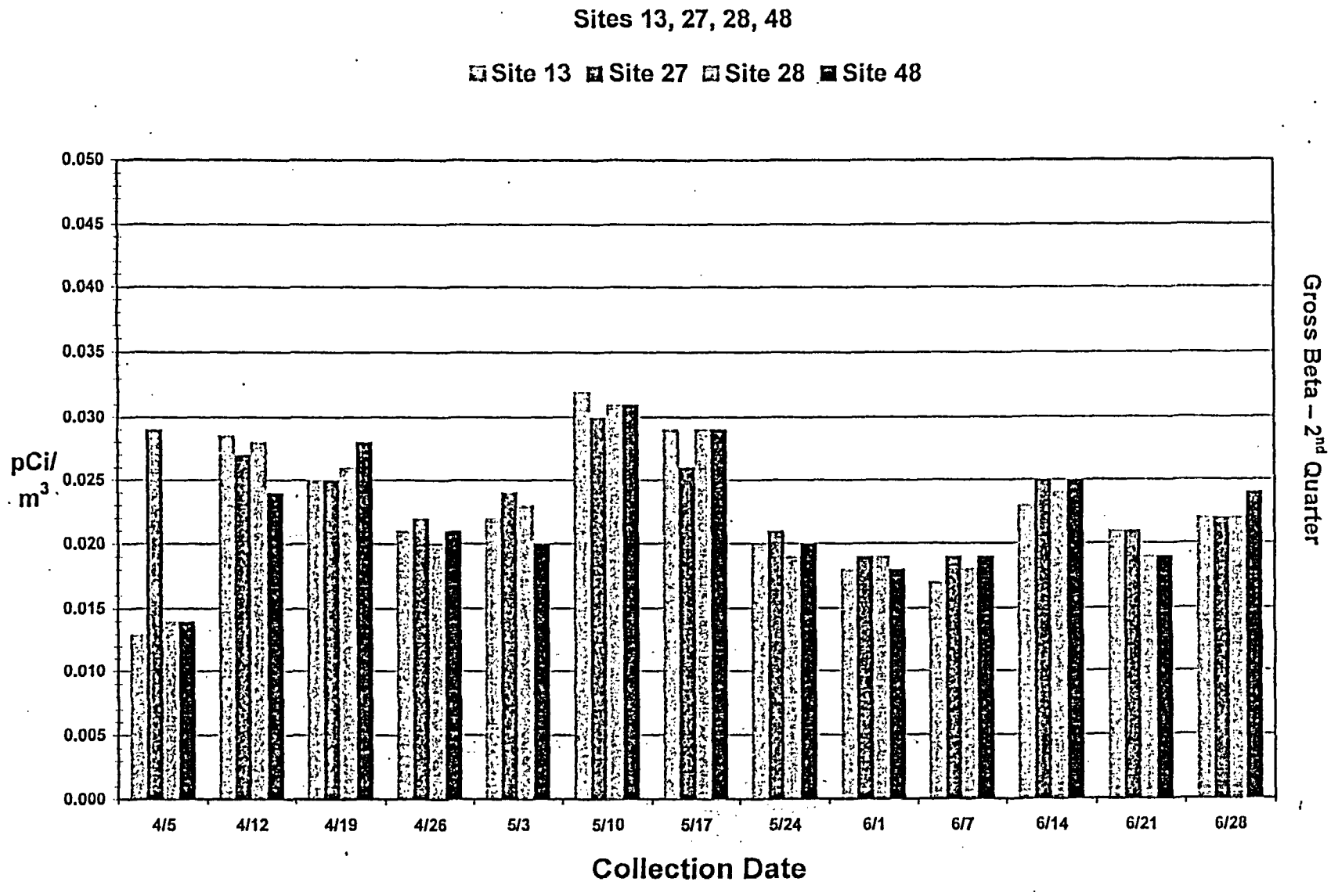


Table 2-6

Gross Beta – 2nd Quarter



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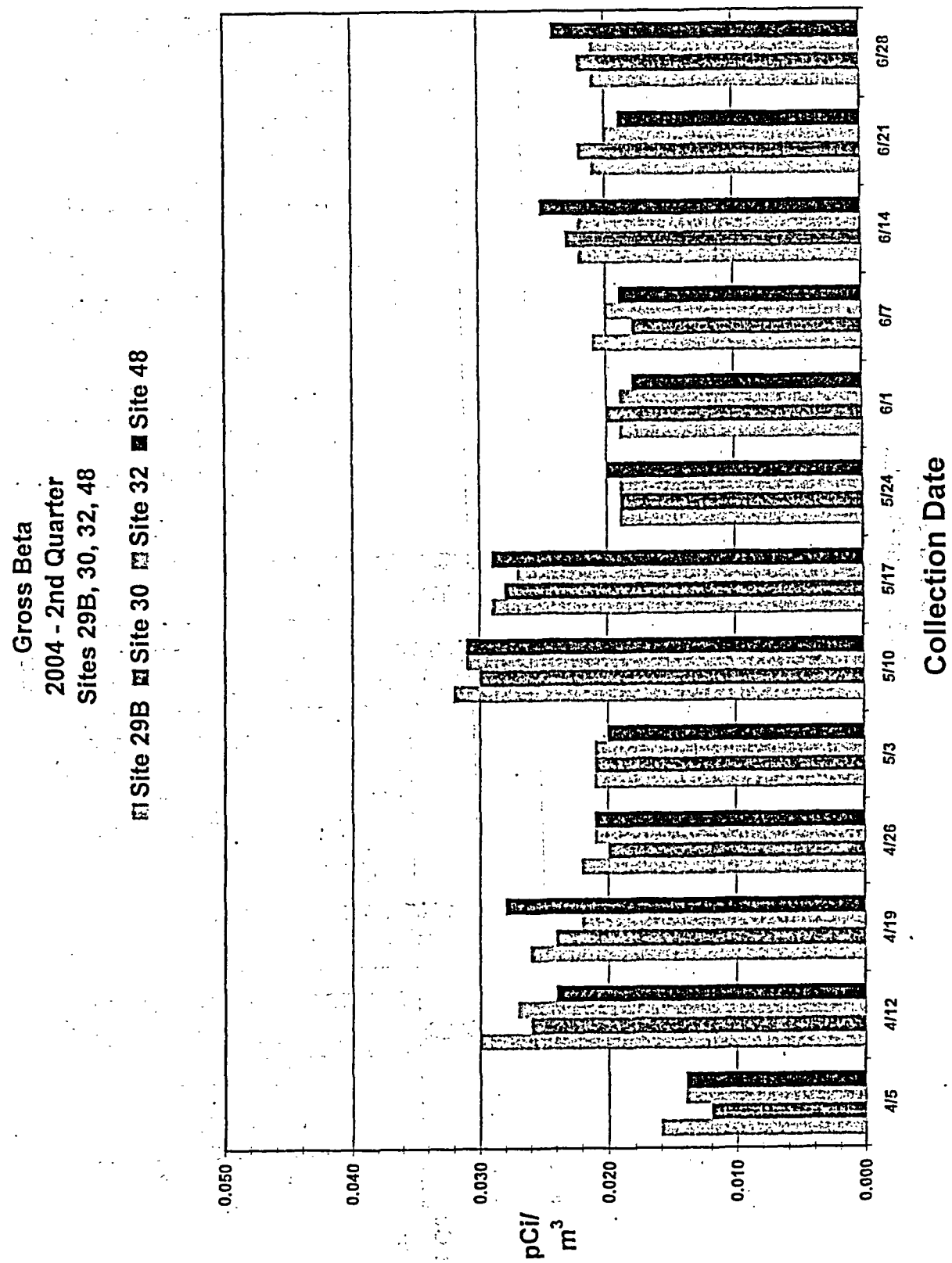

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Gross Beta – 2nd Quarter (continued)

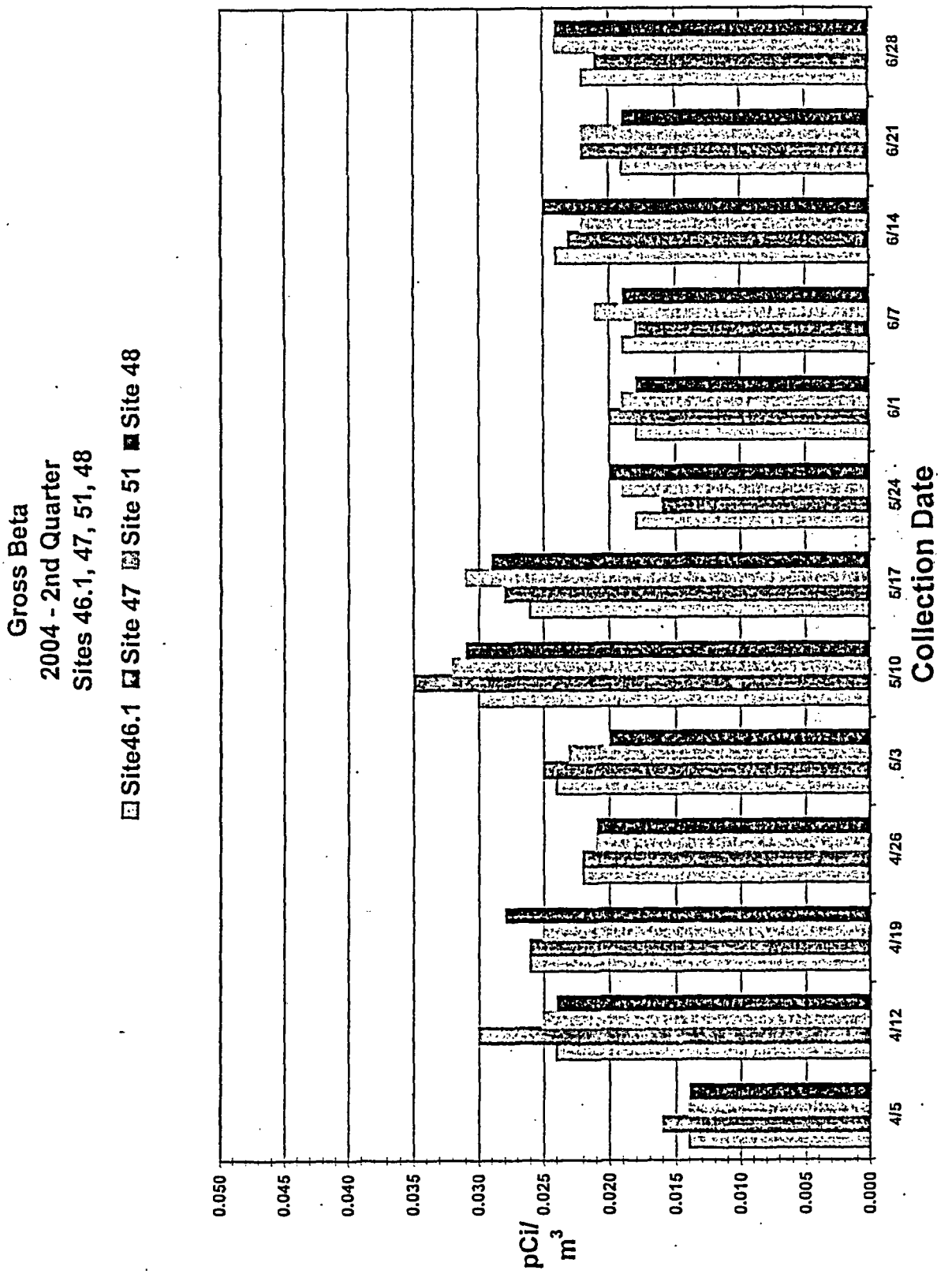


Table 2-7

Gross Beta – 3rd Quarter

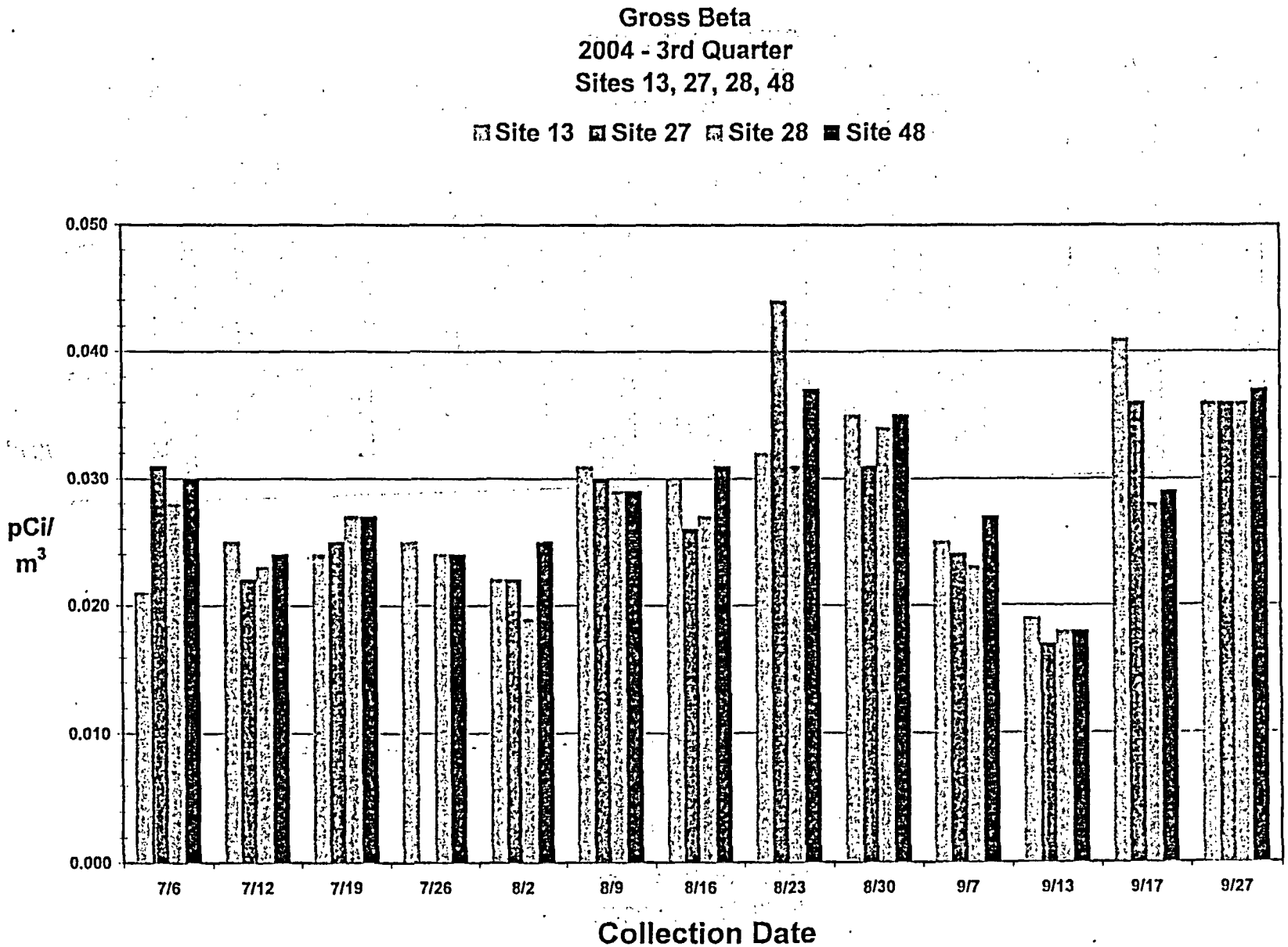
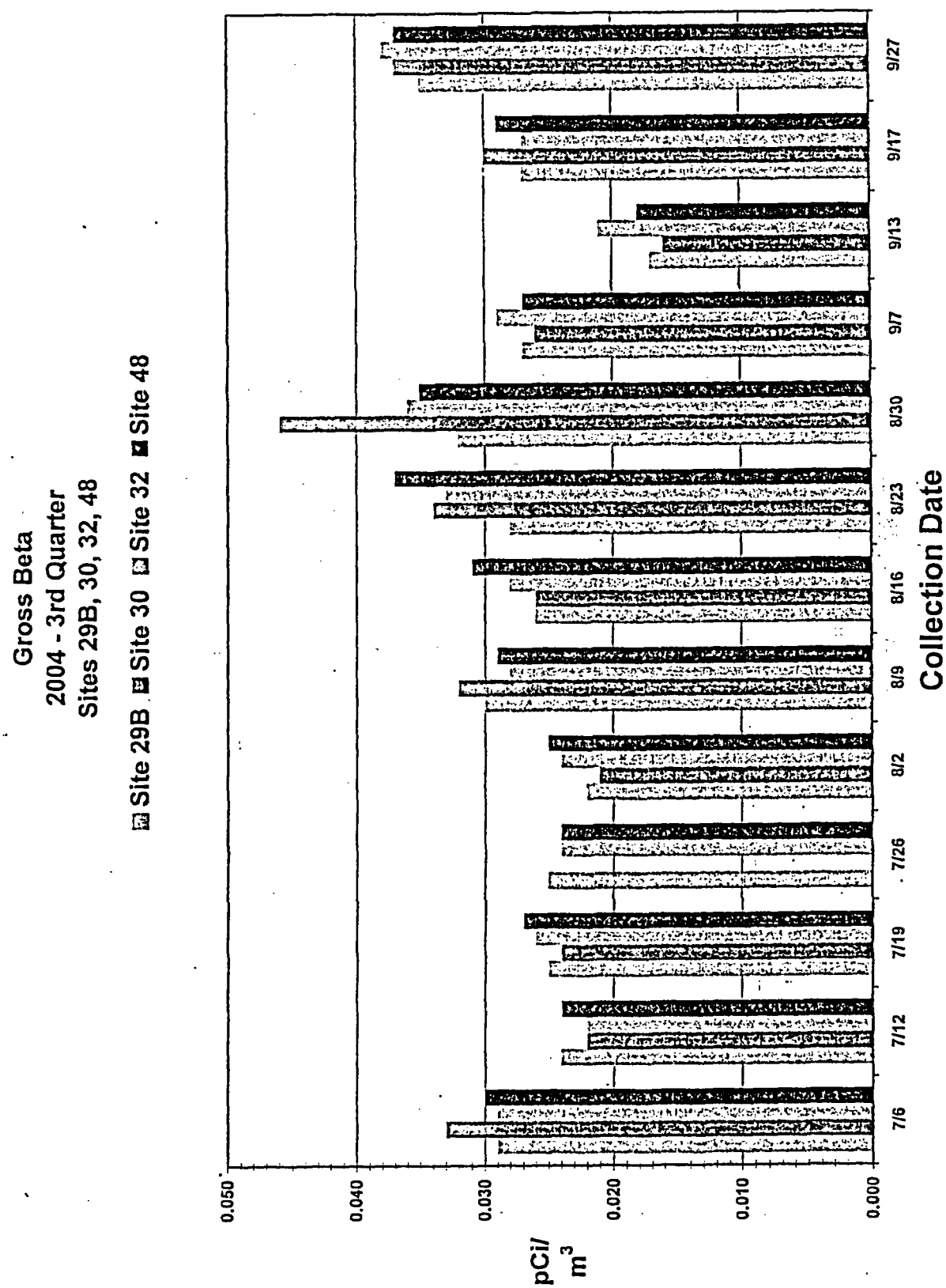


Table 2-7 (continued)

Gross Beta – 3rd Quarter (continued)



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Gross Beta – 3rd Quarter (continued)

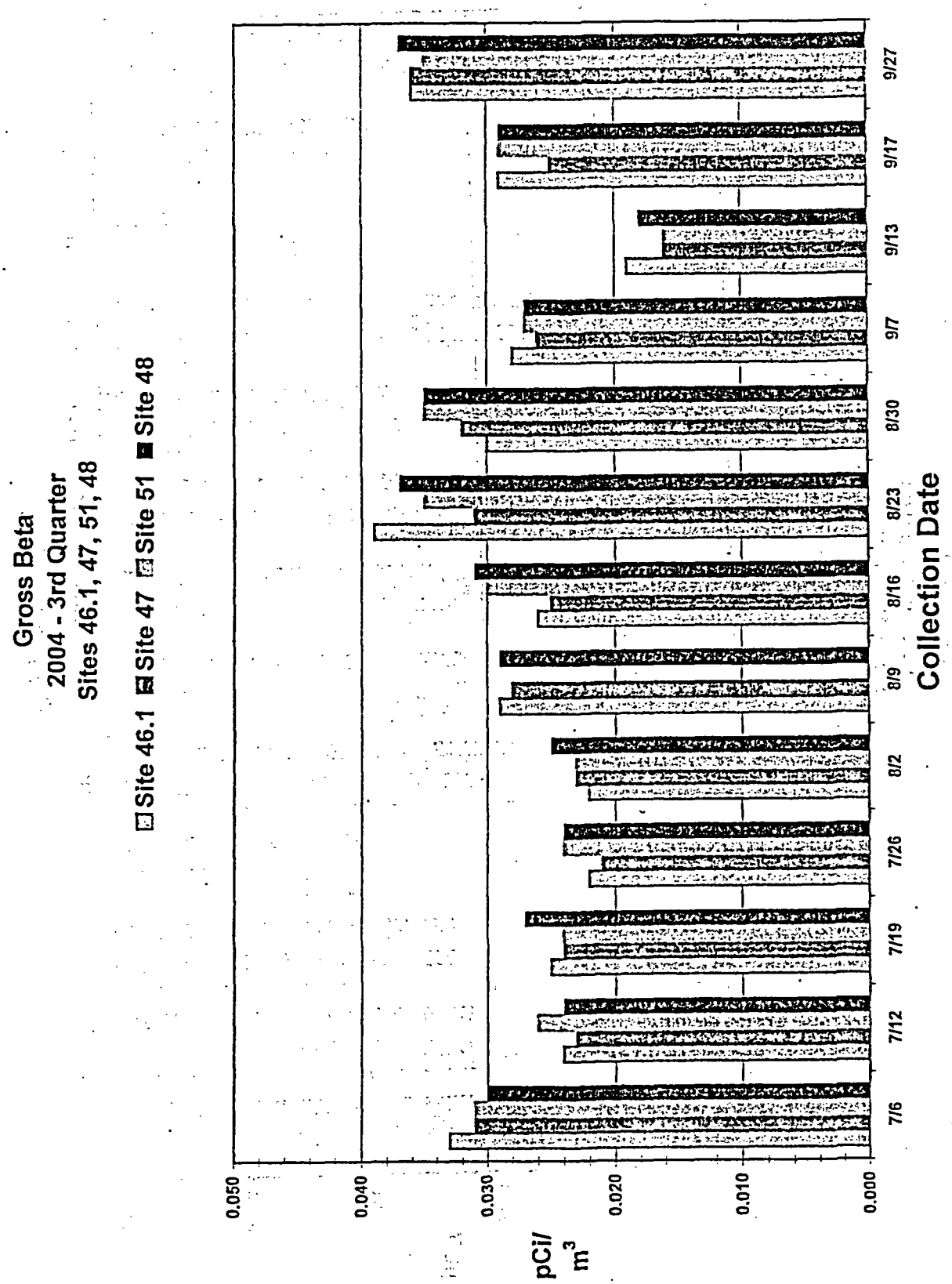


Table 2-8

Gross Beta – 4th Quarter

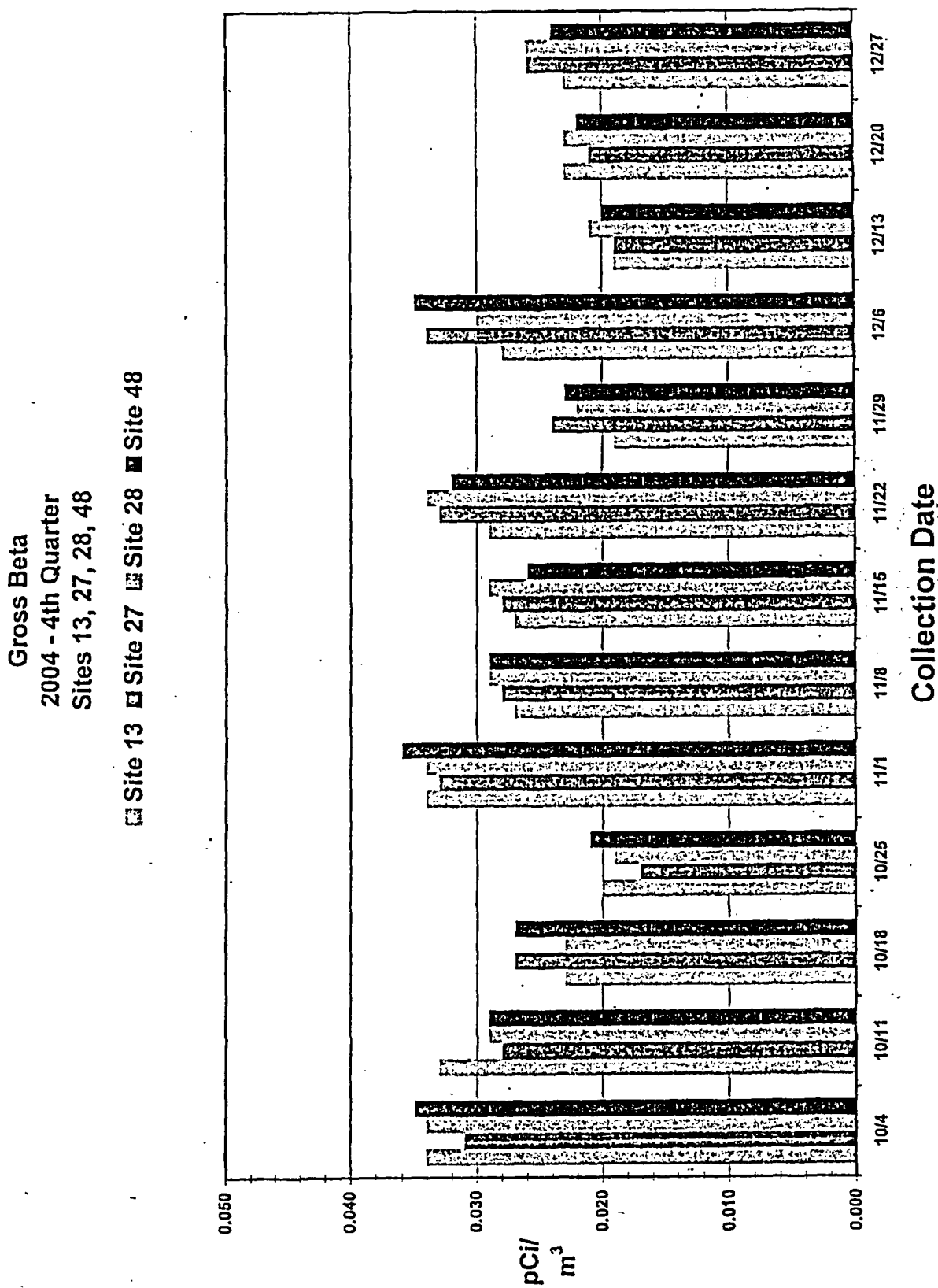


Table 2-8 (continued)

Gross Beta – 4th Quarter (continued)

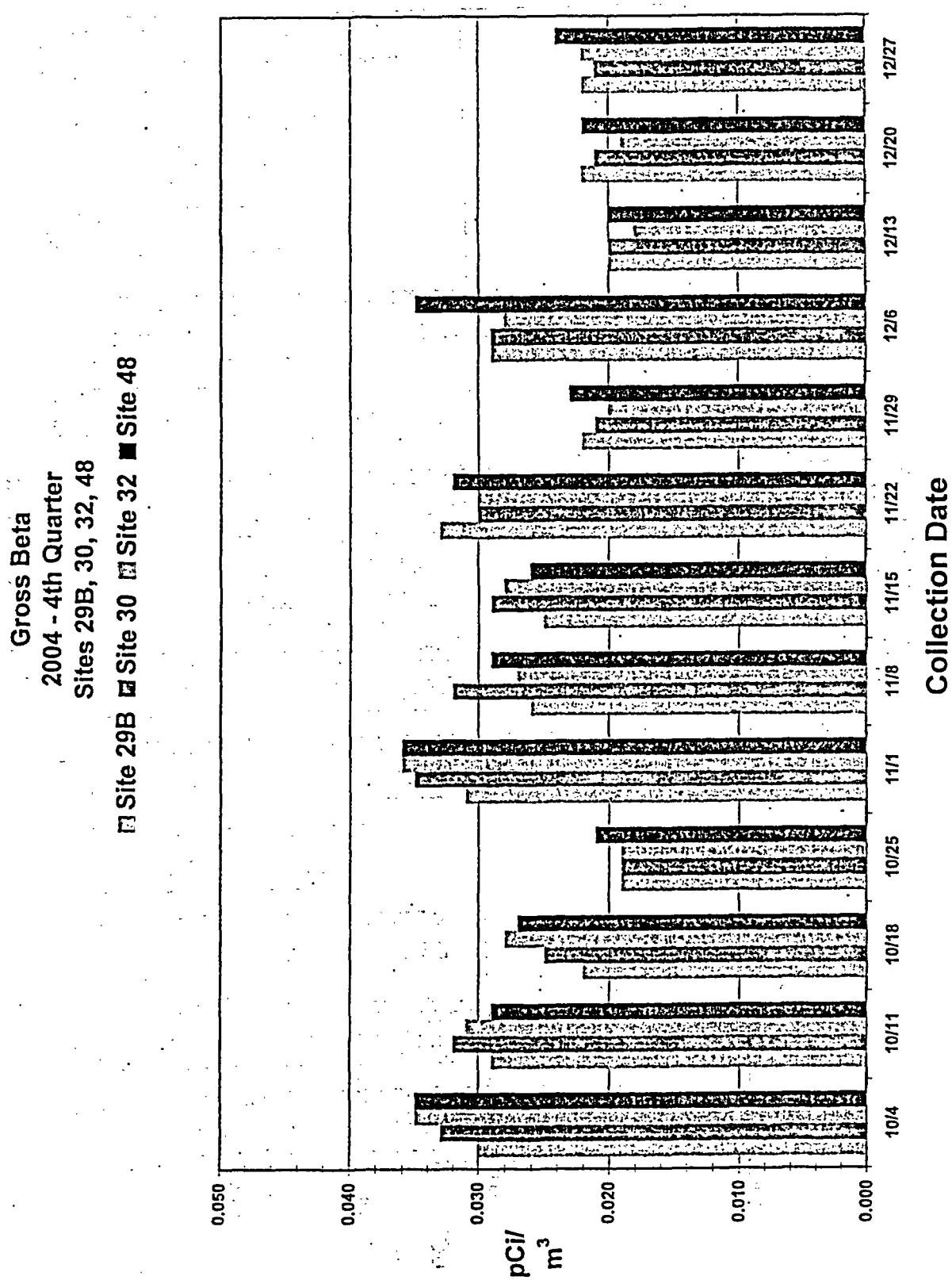
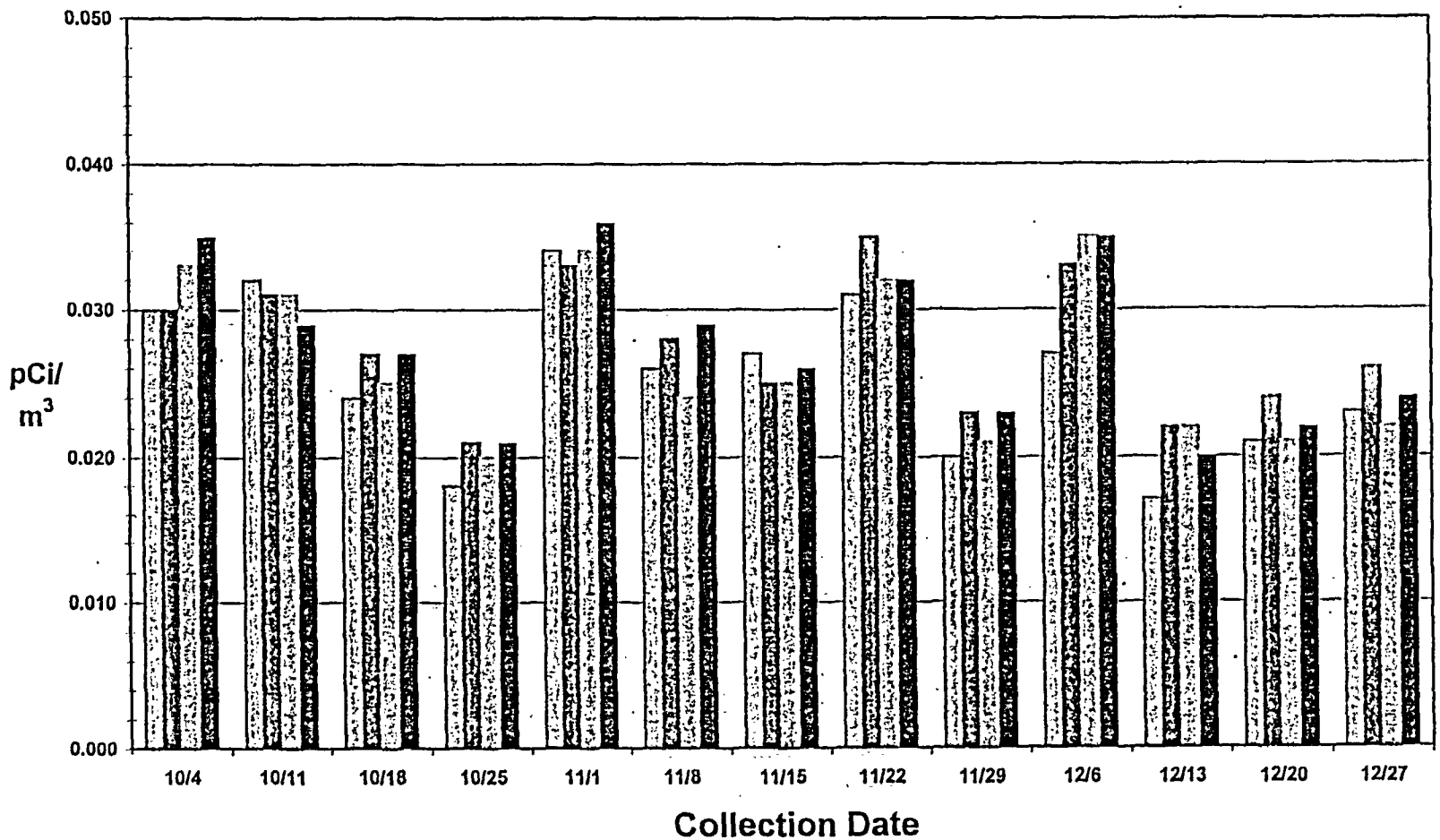


Table 2-8 (continued)

Gross Beta – 4th Quarter (continued)



C. Monitoring of Sediments and Soils

1. Characterization of Stream Sediments and Soils

The stream sediments consist largely of sand and silt. Soil samples may vary from sand and silt to a heavy clay with variable amounts of organic material.

2. Sampling Program and Analytical Techniques

a. Program

River bottom sediments were collected semi-annually above the Montgomery Dam, in the vicinities of the Beaver Valley discharge and above the New Cumberland Dam. A Ponar or Eckman dredge is used to collect the sample. The sampling locations are also listed in Table 2-1 and are shown in Figure 2-3.

Soil samples are collected every three years. They were collected at each of ten (10) locations during 2003 and are not due to be collected until 2006. At each location, 12 core samples (3" diameter by 2" deep) are gathered at prescribed points on a 10 foot radius circle. Each location is permanently marked with reference pins. Each set of samples is systematically selected by moving along the radius in such a manner as to assure representative undisturbed samples. Sampling locations are listed in Table 2-1 and are shown in Figure 2-3.

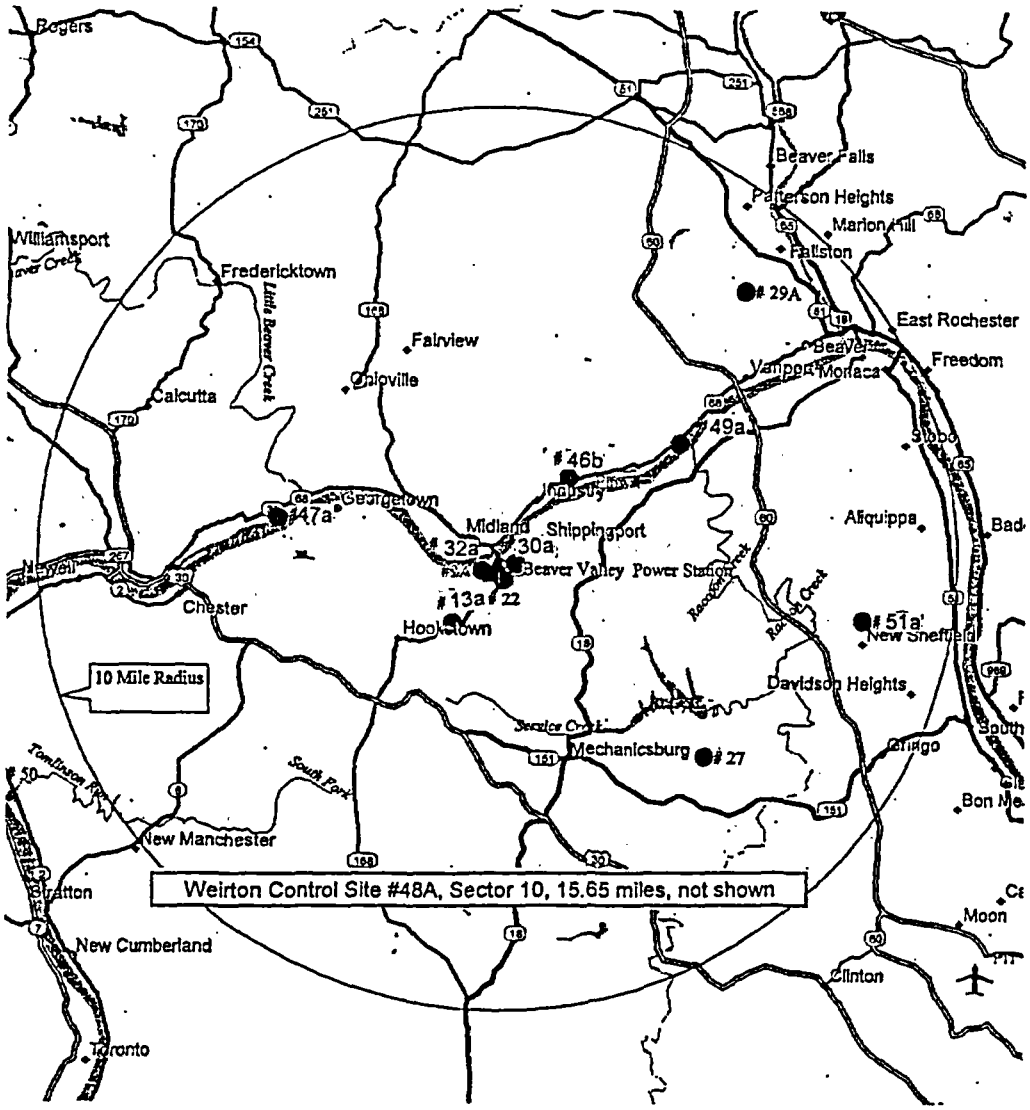
Bottom sediments and soils are analyzed for gamma-emitting radionuclides.

b. Analytical Procedures

Gamma analysis of sediment or soil is performed in a 300 ml plastic bottle which is counted by a gamma spectrometer.

Figure 2-3

Environmental Monitoring Locations - Shoreline Sediments and Soil



Sample Type	Site #	Sector	Distance (miles)	Location	Sample Type	Site #	Sector	Distance (miles)	Location
Soil	13a	11	1.49	Old Meyer Farm	Soil	32a	15	0.74	Midland (North S.S.)
Soil	22	8	0.28	South of BVPS, Transmission Line	Soil	46b	3	2.66	Industry - Willows Inn - Rt 68
Soil	27b	7	6.19	Brunton Farm	Soil	47a	14	4.89	East Liverpool Water Dept.
Soil	29A	3	8.09	Nicol Farm	Soil	48A	10	15.65	Weirton Water Tower, E. Belleview Dr.
Soil	30a	4	0.74	Shippingport (Cook's Ferry S.S.)	Soil	51a	5	7.99	Aliquippa (Sheffield S.S.)

Sample Type	Site #	Sector	Distance (miles)	Location	Sample Type	Site #	Sector	Distance (miles)	Location
Sediment	2A	12	0.31	BVPS Outfall Vicinity	Sediment	50	12	11.77	Upstream of New Cumberland Dam
Sediment	49a	3	4.93	Upstream of Montgomery Dam					

3. Results and Conclusions

A summary of sediment analysis is presented in Table 2-2.

a. Sediment

A total of six (6) samples were analyzed by gamma spectrometry. Naturally occurring K-40 was detected in all six samples. Ra-226 was detected in all six samples. Small amounts of Cs-137 from previous nuclear weapons tests were detected in five (5) of the six river sediment samples, including two upstream above Montgomery Dam, which is unaffected by plant effluents. Co-58 and Co-60 were not detected at any location.

b. Soil

Soil is sampled every three years and was sampled in 2003. 2006 will be the next year for soil sampling to take place.

D. Monitoring of Feed crops and Food Products

1. Characterization of Farm Products

According to the latest data from the Agricultural Statistics 2003-2004*, there were approximately 645 farms in Beaver County. Total cash receipts from the sale of agricultural crops and livestock was $21,089,943.00. Some of the principal sources of revenue are estimated as follows:

Dairy Products	$5,334,000.00
Field Crops	$2,427,143.00
Fruits	$45,000.00
Horticulture and Mushrooms	No Data Available
Vegetables and Potatoes	No Data Available
Poultry and Meat Products	No Data Available

2. Sampling Program and Analytical Techniques

a. Program

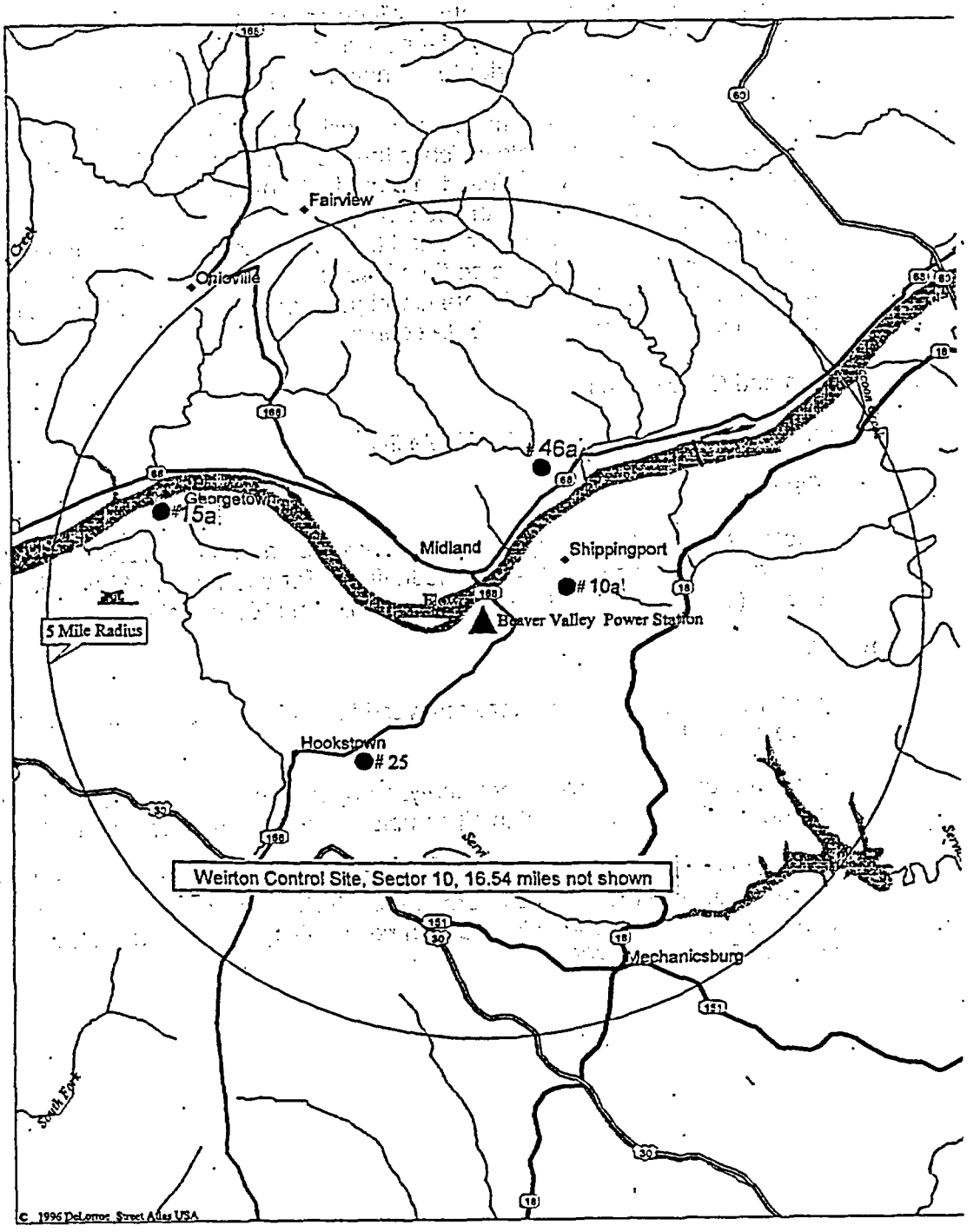
Representative samples of cattle feed are collected monthly from the nearest dairy (Searight). See Figure 2-4. Each sample is analyzed by gamma spectrometry.

Food products (vegetables) were collected at garden locations during the summer of 2004. Leafy vegetables, i.e., cabbage, were obtained from Shippingport, Georgetown, Industry, PA, and Weirton, WV. All samples were analyzed for gamma emitters by gamma spectroscopy. Samples were also analyzed by radiochemical analysis for I-131.

* www.nass.usda.gov/pa - 2. Annual Summary – 2003-2004 – Appropriate Listings

Figure 2-4

Environmental Monitoring Program – Feed Crop and Food Product Locations



Sample Type	Site #	Description
Feed	25	Searight Dairy
Food	10a	Shippingport Boro
Food	15a	Georgetown Boro
Food	46a	Industry Boro
Food	48a	Weirton Area

b. Procedures

Gamma emitters in feed are determined by scanning a dried, homogenized sample with the gamma spectroscopy system. A high resolution germanium detector is utilized with this system. Food samples are loaded into tared 300 or 150 ml plastic bottles or 1-liter Marinelli containers, weighed and the net weight of the sample is determined prior to scanning for gamma emitters.

I-131 in food crops is determined by radiochemistry. Stable iodide carrier is first added to a chopped sample which is then leached with sodium hydroxide solution, evaporated to dryness and fused in a muffle furnace. The melt is dissolved in water, filtered and treated with sodium hypochlorite. The iodate is then reduced to iodine with hydroxylamine hydrochloride and is extracted into toluene. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchet for low level beta counting.

3. Results and Conclusions

A summary of data is presented in Table 2-2.

a. Feed

A total of twelve (12) samples were analyzed by gamma spectroscopy. Only naturally occurring nuclides were identified. For example: K-40 was found in all twelve (12) samples and Be-7 was found in ten (10) samples.

b. Food

A total of four (4) samples were analyzed for I-131. No detectable concentrations were present.

A total of four (4) samples were analyzed by gamma spectrometry. Naturally occurring K-40 was present in all samples. No other nuclides were identified.

c. The data from food and feed analyses were consistent with previous data. Based on the analytical results, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the foods and feeds in the vicinity of the site in 2004.

E. Monitoring of Local Cows Milk

1. Description - Milch Animal Locations

Samples of fresh milk are obtained from milch animals at locations and frequencies noted in Table 2-1. This milk is analyzed for its radioiodine content, gamma emitters, and strontium-89 and strontium-90.

Detailed field surveys are performed during the grazing season to locate and enumerate milch animals within a five (5) mile radius of the site. Survey data for the most recent survey conducted is shown in Section 3, Land Use Census.

2. Sampling Program and Analytical Techniques

a. Program

Milk was collected from two (2) reference dairy farms Searight Farm and Brunton Farm within a 10-mile radius of the site and from one (1) control location Windsheimer Farm outside of the 10-mile radius. Additional dairies, which represent the highest potential milk pathway for radioiodine based on milch animal surveys and meteorological data, were selected and sampled. These dairies are subject to change based upon availability of milk or when more recent data (milch animal census) indicate other locations are more appropriate. The location of each is shown in Figure 2-5 and described below.

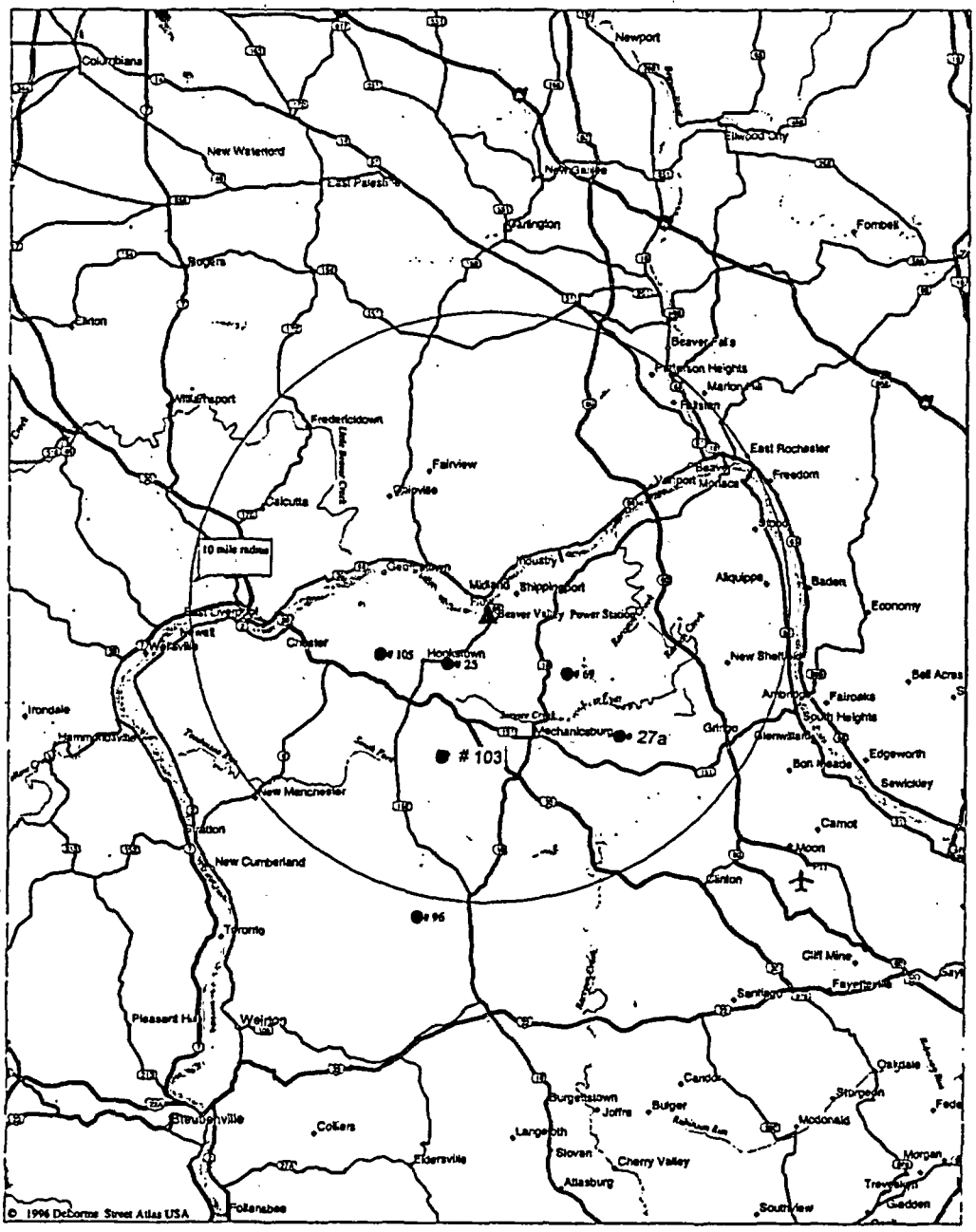
Site	Dairy	Approximate Number of Animals being Milked	Direction and Distance from Midpoint of Unit 1 Reactor	Collection Period
25	Searight	36 Cows	2.10 miles SSW	Jan. - Dec.
27	Brunton	94 Cows	6.16 miles SE	Jan. - Dec.
69*	Collins	4 Goats	3.55 miles SE	Mar. - Oct.
96	Windsheimer	63 Cows	10.48 miles SSW	Jan. - Dec.
103*	Halstead	55 Cows	5.10 miles SSW	Aug. - Dec.
105*	Ambrose**	0 Cows	3.85 miles WSW	Jan. - Jun.
114	Moore	8 Goats	3.85 miles WSW	Mar. - Dec.

* Highest potential pathway dairies
** Sold cows on 6/19/04

The sample from the Searight Farm is collected and analyzed weekly for radioiodine using a procedure with a high sensitivity. Samples from each of the other selected dairies are collected monthly when cows are indoors, and bi-weekly when cows are grazing. This monthly or bi-weekly sample is analyzed for Sr-89, Sr-90, gamma emitters including Cs-137 by high resolution germanium gamma spectroscopy and I-131 high sensitivity analysis.

Figure 2-5

Environmental Monitoring Locations - Milk



Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
25	10	2.10	Searight Farm	103*	10	5.08	Halstead Farm
27a	7	6.16	Brunton Farm	105*	12	3.85	Ambrose Farm
69*	7	3.55	Collins				
96	10	10.48	Windsheimer Farm				

* Dairies selected based on highest deposition factors.

b. Procedure

Radioiodine (I-131) analysis in milk was performed using chemically prepared samples and analyzed with a low-level beta counting system.

Gamma emitters are determined by gamma spectroscopy of a 1 liter Marinelli container of milk.

Strontium milk samples are prepared by adding stable strontium carrier and evaporating to dryness, then ashing in a muffle furnace, followed by precipitating phosphates. Strontium is purified in all samples by the Argonne method using 3 grams of extraction material in a chromatographic column. Stable yttrium carrier is added and the sample is allowed to stand for a minimum of 5 days for the ingrowth of yttrium-90 (Y-90). Yttrium is then precipitated as hydroxide, is dissolved and re-precipitated as oxalate. The yttrium oxalate is mounted on a nylon planchet and is counted in a low-level beta counter to infer Sr-90 activity. Sr-89 activity is determined by precipitating strontium carbonate ($SrCO_3$) from the sample after yttrium separation. This precipitate is mounted on a nylon planchet and is covered with an 80 mg/cm^2 aluminum absorber for low level beta counting. Chemical yields of strontium and yttrium are determined gravimetrically.

3. Results and Conclusions

A summary of data is presented in Table 2-2.

a. A total of one hundred twenty-three (123) samples were analyzed for Sr-89 and Sr-90. Sr-90 was detected in one hundred seventeen (117) samples at levels attributable to previous nuclear weapons tests and are within the normally expected range.

b. A total of one hundred twenty-three (123) samples were analyzed by gamma spectroscopy. Naturally occurring K-40 was present in all samples. No other radionuclides were identified.

c. A total of one hundred fifty-five (155) samples were analyzed for I-131 during 2004. Of the nine (9) positive I-131 results, six (6) were less than the 0.5 pCi/l LLD value. The three (3) remaining values were less than 0.2 above the LLD value.

d. Based on all the analytical results and the above investigation, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the milk in the vicinity of the site during 2004.

F. Environmental Radiation Monitoring

1. Description of Regional Background Radiation and Sources

The terrain in the vicinity of the Beaver Valley Power Station generally consists of rough hills with altitude variations of 300-400 feet. Most of the land is wooded.

The principal geologic features of the region are nearly flat-laying sedimentary beds of the Pennsylvania Age. Beds of limestone alternate with sandstone and shale with abundant interbedded coal layers. Pleistocene glacial deposits partially cover the older sedimentary deposits in the northwest. Most of the region is underlain by shale, sandstone, and some coal beds of the Conemaugh Formation. Outcrops of sandstone, shale, and limestone of the Allegheny Formation exist within the Ohio River Valley and along major tributary streams.

Based on surveys reported in previous annual reports, exposure rates ranged from 6-12 μR/hr.

2. Locations and Analytical Procedures

Ambient external radiation levels around the site were measured using thermoluminescent dosimeters (TLDs).

In 2004 there were a total of forty-four (44) offsite environmental TLD locations. The locations of the TLDs are shown in Figure 2-6.

The TLDs were annealed at the Contractor Central Laboratory shortly before placing the TLDs in their field locations. The radiation dose accumulated in-transit between the Central Laboratory, the field location, and the Central Laboratory was corrected by transit controls maintained in lead shields at both the Central Laboratory and the field office. All dosimeters were exposed in the field in a special environmental holder.

3. Results and Conclusions

Data obtained with the contractor TLD during 2004 are summarized in Table 2-2.

The annual exposure rate of all offsite TLDs averaged 0.190 mR/day in 2004. As in previous years, there was some variation among locations and seasons as would be expected. In 2004, ionizing radiation dose determinations from TLDs averaged 69.2 mR for the year. This is comparable to previous years. There was no evidence of anomalies that could be attributed to the operation of the Beaver Valley Power Station. The TLDs confirm that changes from natural radiation levels, if any, are negligible.

Figure 2-6

TLD Locations

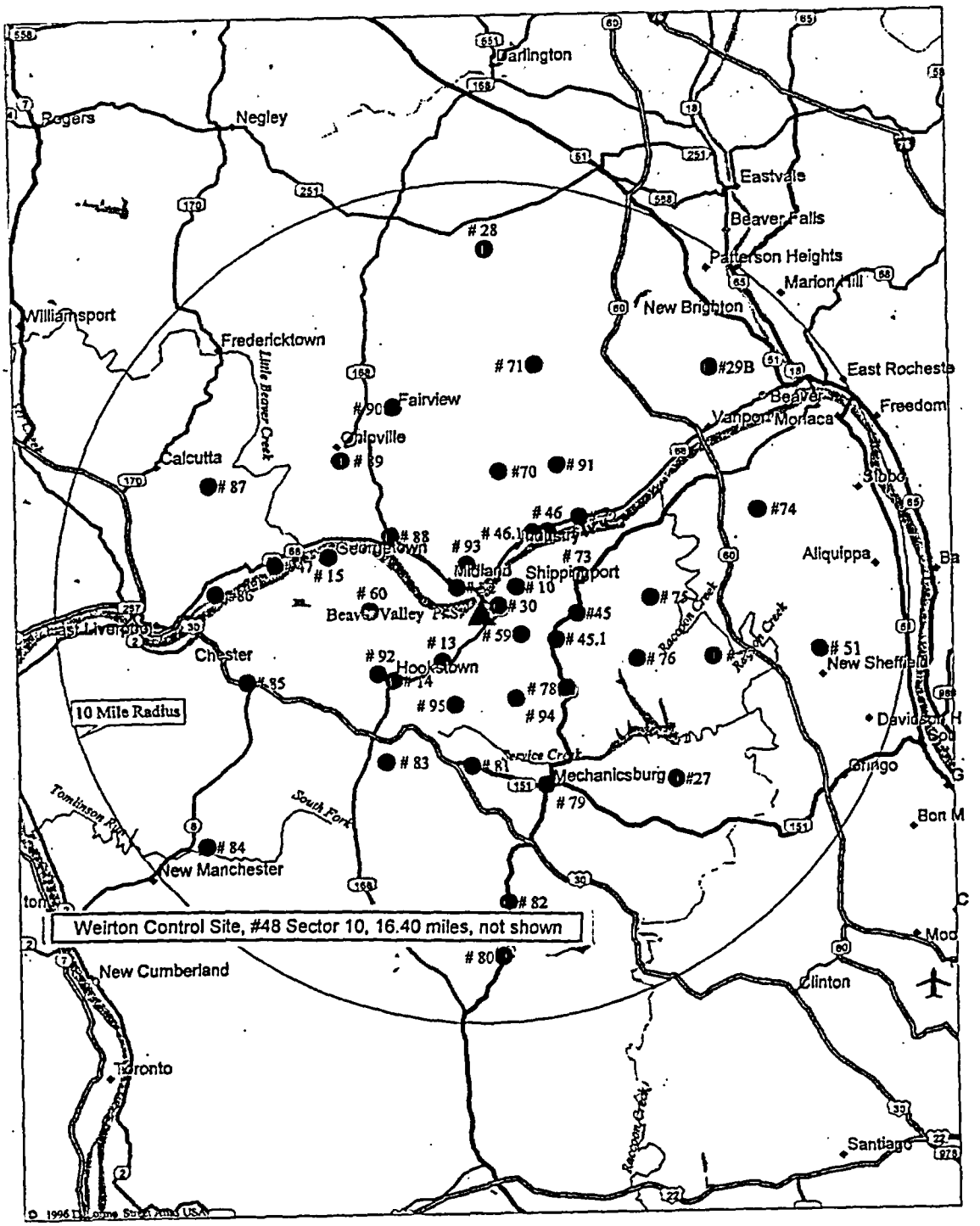


Figure 2-6 (Continued)

TLD Locations

SOUTHEAST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
27	7	6.14	Brunton Farm	78	7	2.72	Raccoon Municipal Bldg
45.1	6	1.92	Raccoon Twp., Kennedy's Corners	79	8	4.46	106 Rt. 151 – Ted McWilliams Auto Body
51	5	8.00	Aliquippa (Sheffield S.S.)	80	9	8.27	Raccoon Park Office, Rt. 18
59	6	0.99	236 Green Hill Rd.	82	9	6.99	2697 Rt. 18
76	6	3.80	Raccoon Elementary School	94	8	2.25	832 McCleary Rd.
77	6	5.52	3614 Green Garden Rd.				

NORTHWEST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
15	14	3.75	Georgetown Post Office	87	14	7.04	50103 Calcutta Smith's Ferry Rd.
32	15	0.75	Midland (North S.S.)	88	15	2.74	110 Summit Rd., Midland Heights
47	14	4.88	East Liverpool Water Dept.	89	15	4.72	488 Smith Ferry Rd., Ohioville
60	13	2.51	444 Hill Rd.	90	16	5.20	6286 Tuscarawras Rd.
86	13	6.18	1090 Ohio Ave., E. Liverpool	93	16	1.10	104 Linden - Sunrise Hills

NORTHEAST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
10	3/4	0.94	Shippingport Post Office	70	1	3.36	236 Engle Rd.
28	1	8.60	Sherman Farm	71	2	6.01	Brighton Twp., First Western Bank
29B	3	7.97	Friendship Ridge	72	3	3.25	Ohioview Luthern Church - Rear
30	4	0.43	Shippingport (Cook's Ferry S.S.)	73	4	2.48	618 Squirrel Run Rd.
45	5	2.19	Christian House Baptist Chapel – Rt. 18	74	4	6.92	137 Poplar Ave. - CCBC
46	3	2.49	Industry Midway Dr.	75	5	4.08	117 Holt Road
46.1	2/3	2.28	Industry – McKeel's Service – Rt. 68	91	2	3.89	Pine Grove Rd. & Doyle Rd.

SOUTHWEST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
13	11	1.49	Old Meyer Farm	84	11	8.35	Hancock Co. Senior Center
14	11	2.53	Hookstown Boro	85	12	5.73	2048 Rt. 30
48	10	16.40	Weirton Water Tower, Collier Way	92	12	2.81	Georgetown Rd. (Georgetown S.S.)
81	9	3.69	Millcreek United Presby. Church	95	10	2.37	McCleary & Pole Cat Hollow Rds.
83	10	4.26	735 Mill Creek Road				

Table 2-9

TLD – Group 1

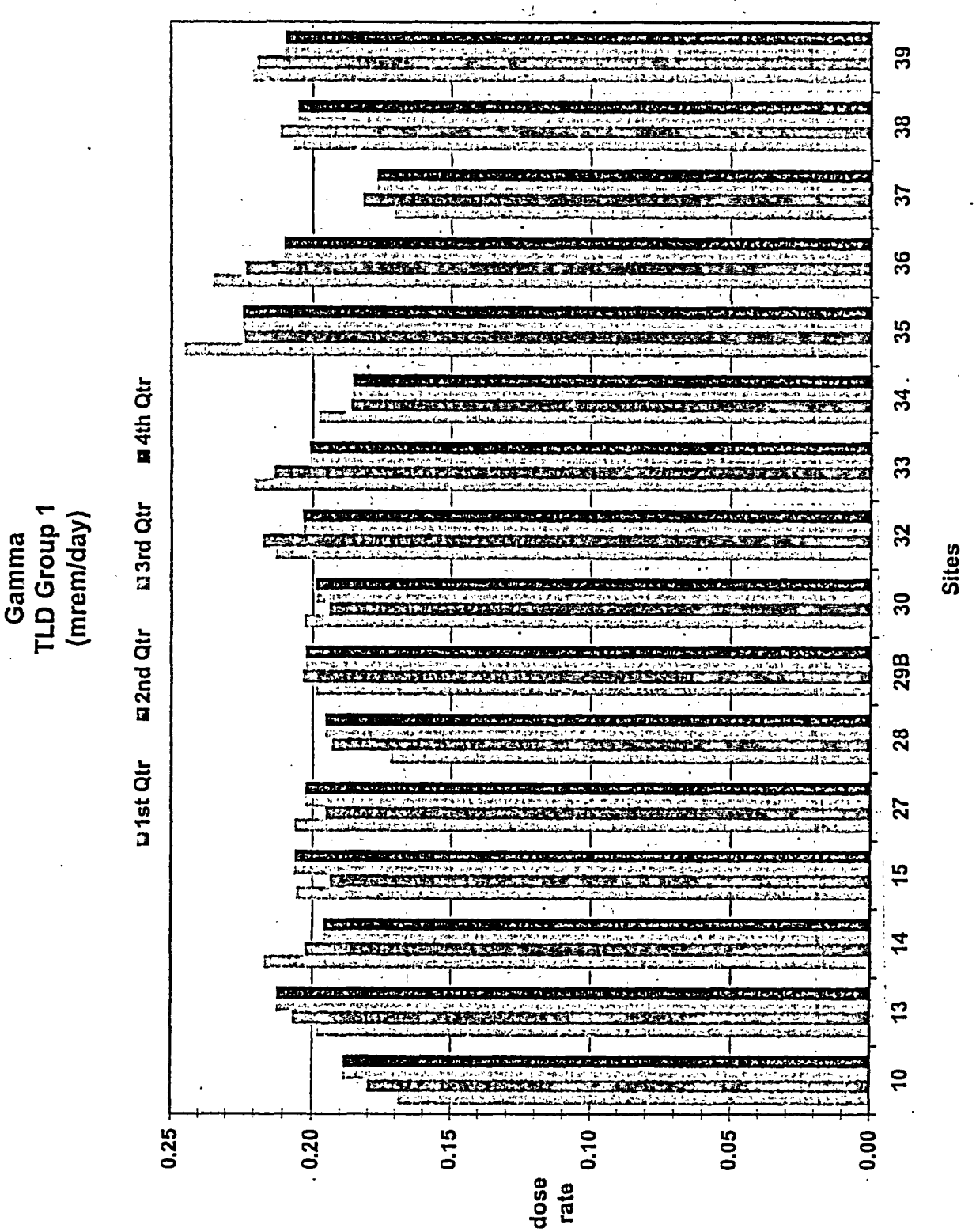


Table 2-10

TLD – Group 2

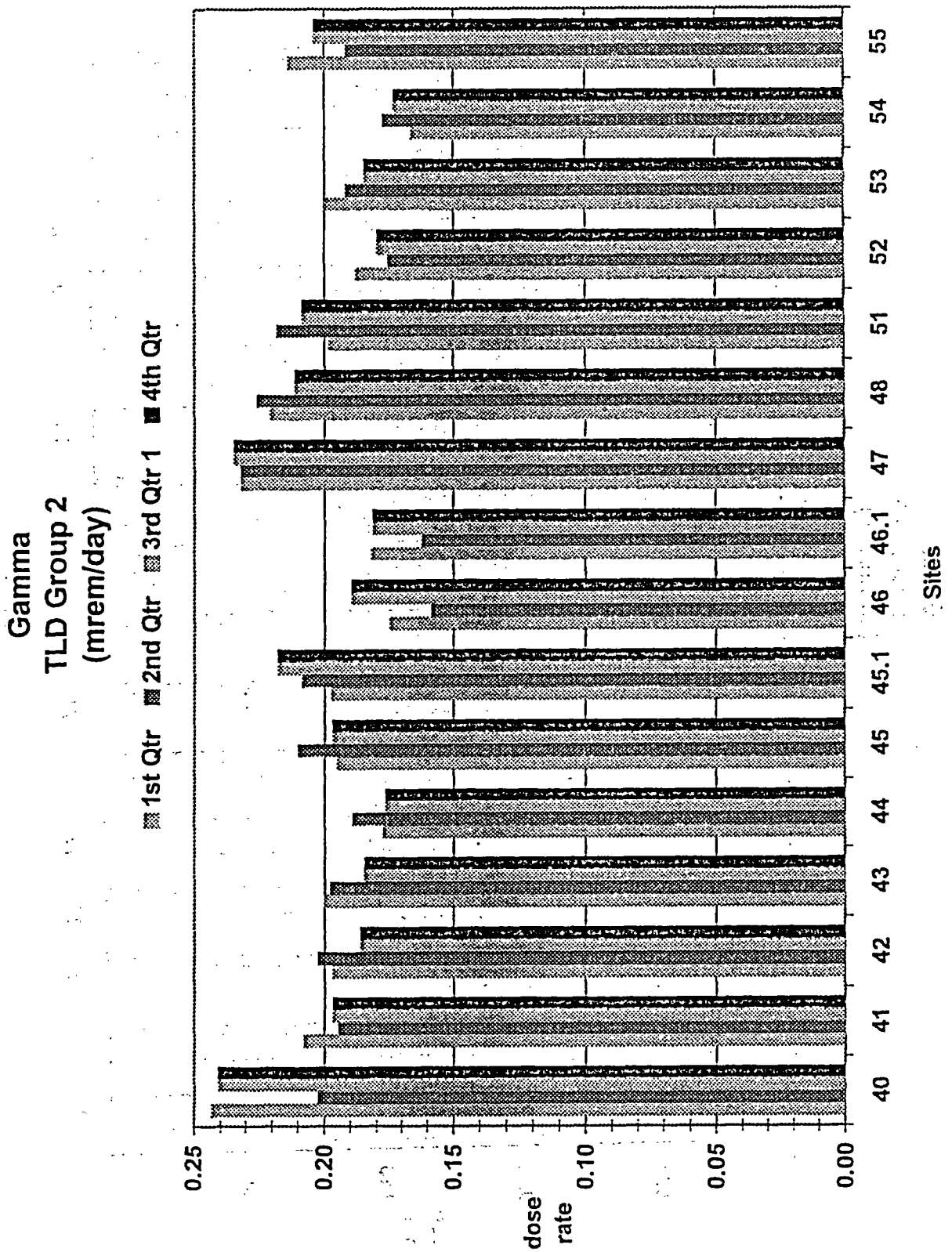


Table 2-11

TLD – Group 3

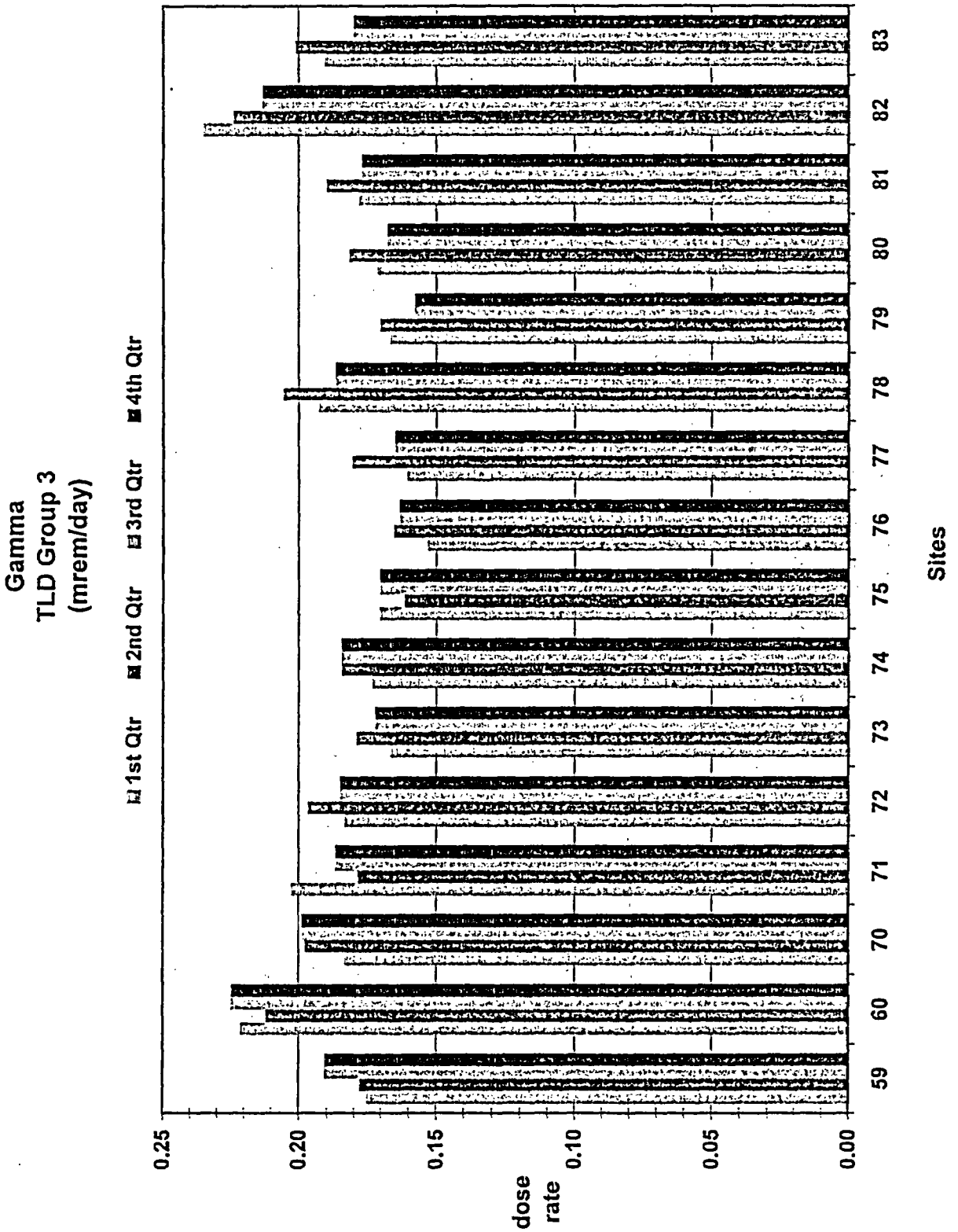
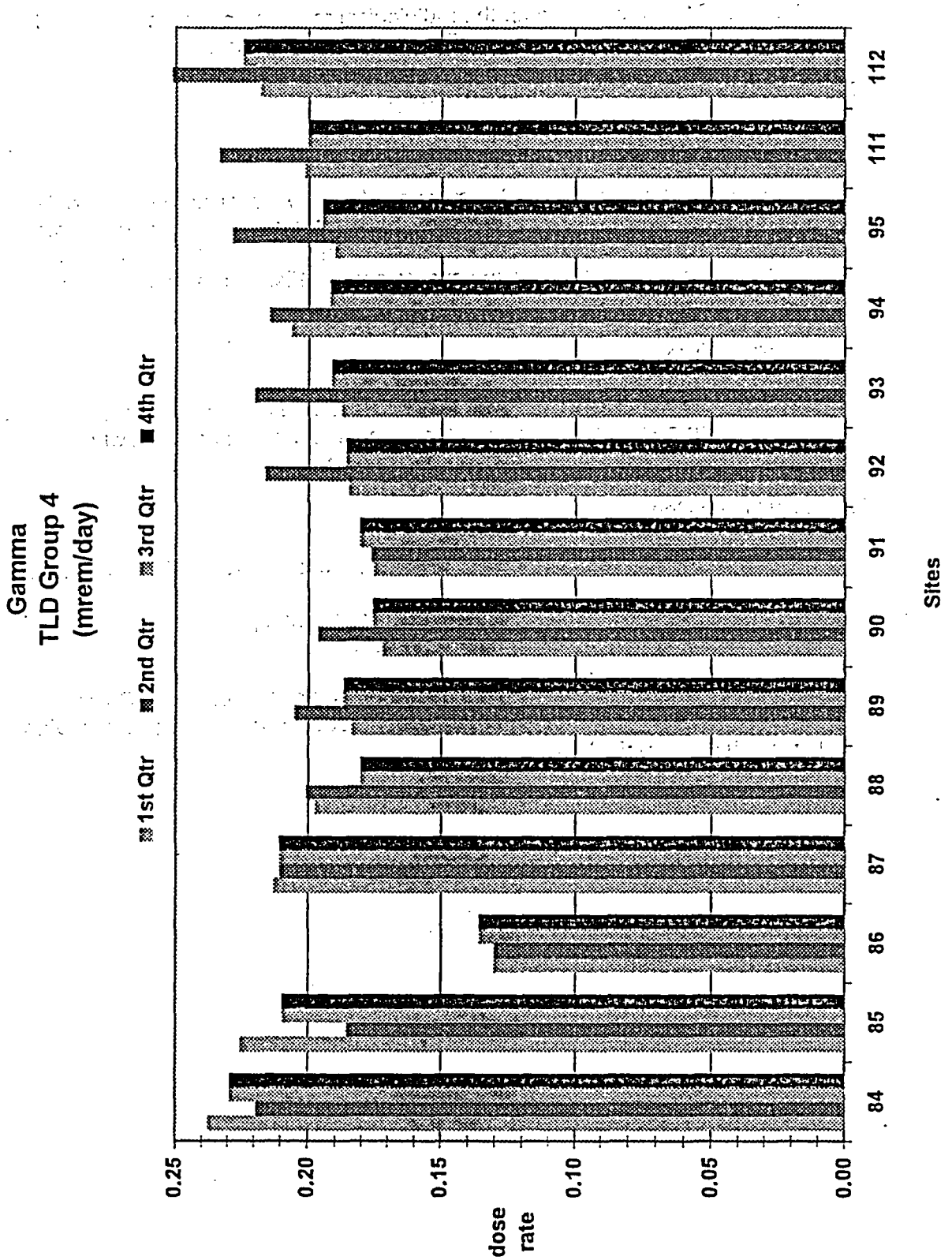


Table 2-12

TLD – Group 4



G. Monitoring of Fish

1. Description

   During 2004, fish collected for the radiological monitoring program included carp, channel catfish, bullhead catfish, sauger and sucker.

2. Sampling Program and Analytical Techniques

   a. Program

      Fish samples are collected semi-annually in the New Cumberland pool of the Ohio River at the Beaver Valley effluent discharge point and upstream of the Montgomery Dam. The edible portion of each different species caught is analyzed by gamma spectroscopy. Fish sampling locations are shown in Figure 2-7.

   b. Procedure

      A sample is prepared in a standard tared 300 ml plastic bottle and scanned for gamma emitting nuclides with gamma spectrometry system which utilizes a high resolution germanium detector.

3. Results and Conclusions

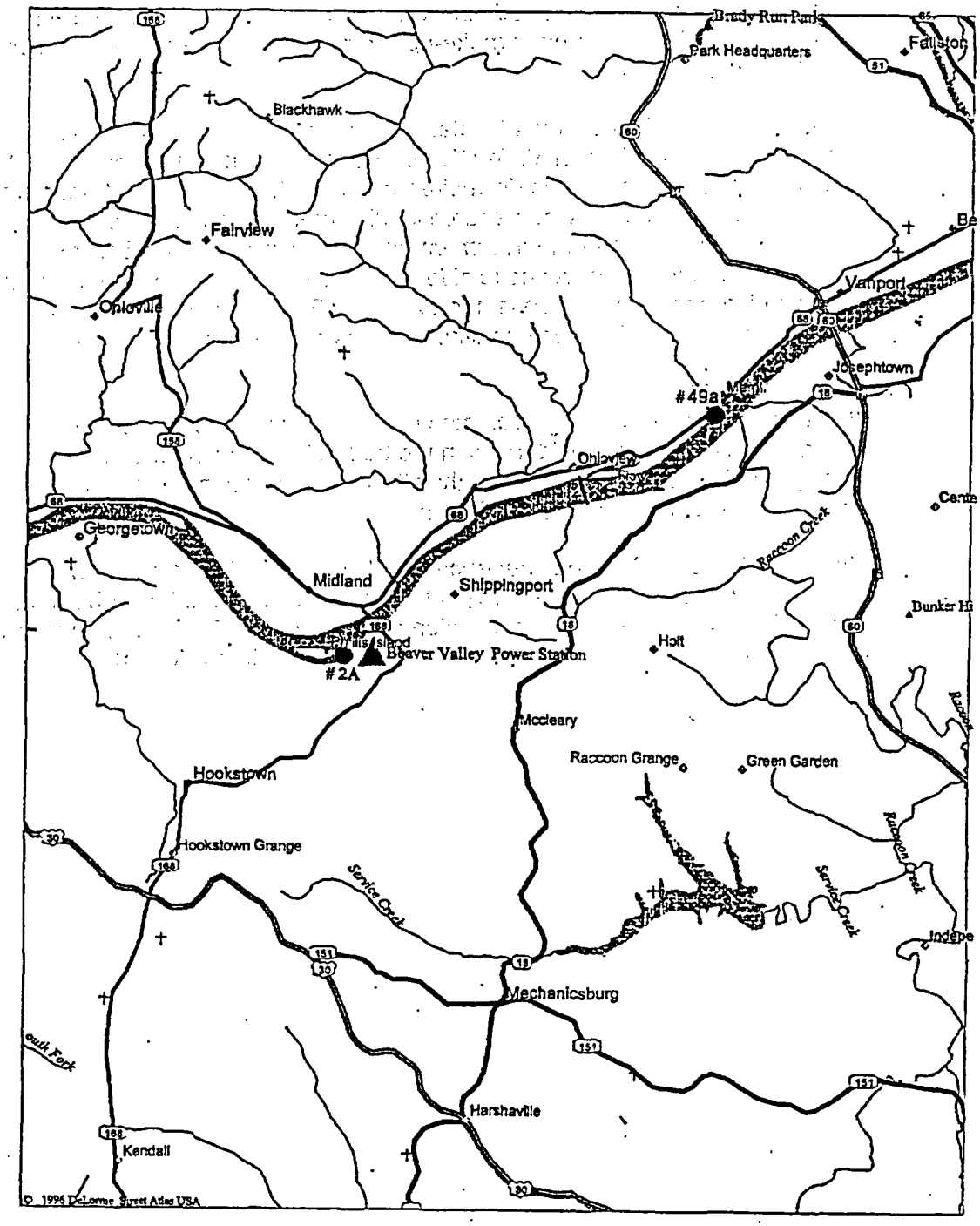
   A summary of the results of the fish monitoring data is provided in Table 2-2.

   A total of nine (9) samples were analyzed by gamma spectroscopy. No gamma emitting radionuclides were detected.

   Based on the analytical results, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the Ohio River fish population in 2004.

Figure 2-7

Environmental Monitoring Program - Fish Sampling Locations



Site No.	Sector	Distance (miles)	Location
2A	12	0.31	BVPS Outfall Vicinity
49a	3	4.93	Upstream of Montgomery Dam

H. Monitoring of Surface, Drinking, Ground Waters and Precipitation

1. Description of Water Sources

The Ohio River is the main body of water in the area. It is used by the Beaver Valley Power Station for plant make-up for the cooling tower and for receiving plant liquid effluents.

Ohio River water is a source of water for some towns both upstream and downstream of the Beaver Valley Power Station site. It is used by several municipalities and industries downstream of the site. The nearest user of the Ohio River as a potable water source is Midland Borough Municipal Water Authority. The intake of the treatment plant is approximately 1.5 miles downstream and on the opposite side of the river. The next downstream user is East Liverpool, Ohio which is approximately 6 miles downstream. The heavy industries in Midland, as well as others downstream use river water for cooling purposes.

Groundwater occurs in large volumes in the gravel terraces which lie along the river, and diminishes considerably in the bedrock underlying the site. Normal well yields in the bedrock are less than 10 gallons per minute (gpm) with occasional wells yielding up to 60 gpm.

In general, the BVPS site experiences cool winters and moderately warm summers with ample annual precipitation evenly distributed throughout the year. The average annual precipitation for the area is 37.85 inches based on 1971 to 2000 data collected at the Pittsburgh International Airport.

2. Sampling and Analytical Techniques

a. Surface (Raw River) Water

The sampling program of river water includes three (3) sampling points along the Ohio River. Raw water samples are normally collected at the East Liverpool (Ohio) Water Treatment Plant [River Mile 41.2] daily and composited into a weekly sample. One automatic river water sampler is located at J&L Steel's river water intake [River Mile 36.2]. The automatic sampler takes a 20-40 ml sample every 15 minutes and samples are collected on a weekly basis. A weekly grab sample is taken upstream of the Montgomery Dam [River Mile 29.6]. The weekly grab sample and automatic water sample are composited into monthly samples from each location. In addition, a quarterly composite sample is prepared for each sample point.

The weekly grab samples upstream of the Montgomery Dam are analyzed for I-131.

The monthly composites are analyzed for gamma emitters. The quarterly composites are analyzed for H-3.

Locations of each sample point are shown in Figure 2-8.

b. Drinking Water (Public Supplies)

Drinking (treated) water is collected at both Midland (PA) and East Liverpool (OH) Water Treating Plants. An automatic sampler at each location collects 20-40 ml every 20 minutes which is composited into a weekly sample. The weekly sample from each location is analyzed for I-131.

Monthly composites of the weekly samples are analyzed by gamma spectrometry. Quarterly composites are analyzed for H-3. Locations of each sample point are shown in Figure 2-8.

c. Groundwater

Semi-annual grab samples were collected from three (3) locations (see Figure 2-8) within four (4) miles of the site. These locations are:

One (1) well in Shippingport, PA

One (1) well in Hookstown, PA

One (1) well in Georgetown, PA

Each ground water sample is analyzed for tritium and by gamma spectroscopy.

d. Precipitation

Precipitation is collected at Shippingport, Pa., East Liverpool, Oh. and Weirton, W.Va. Precipitation, when available, is collected each week and then composited into quarterly samples. The quarterly composites are analyzed for H-3 and gamma emitters. Locations of each sample point are shown in Figure 2-8.

e. Procedures

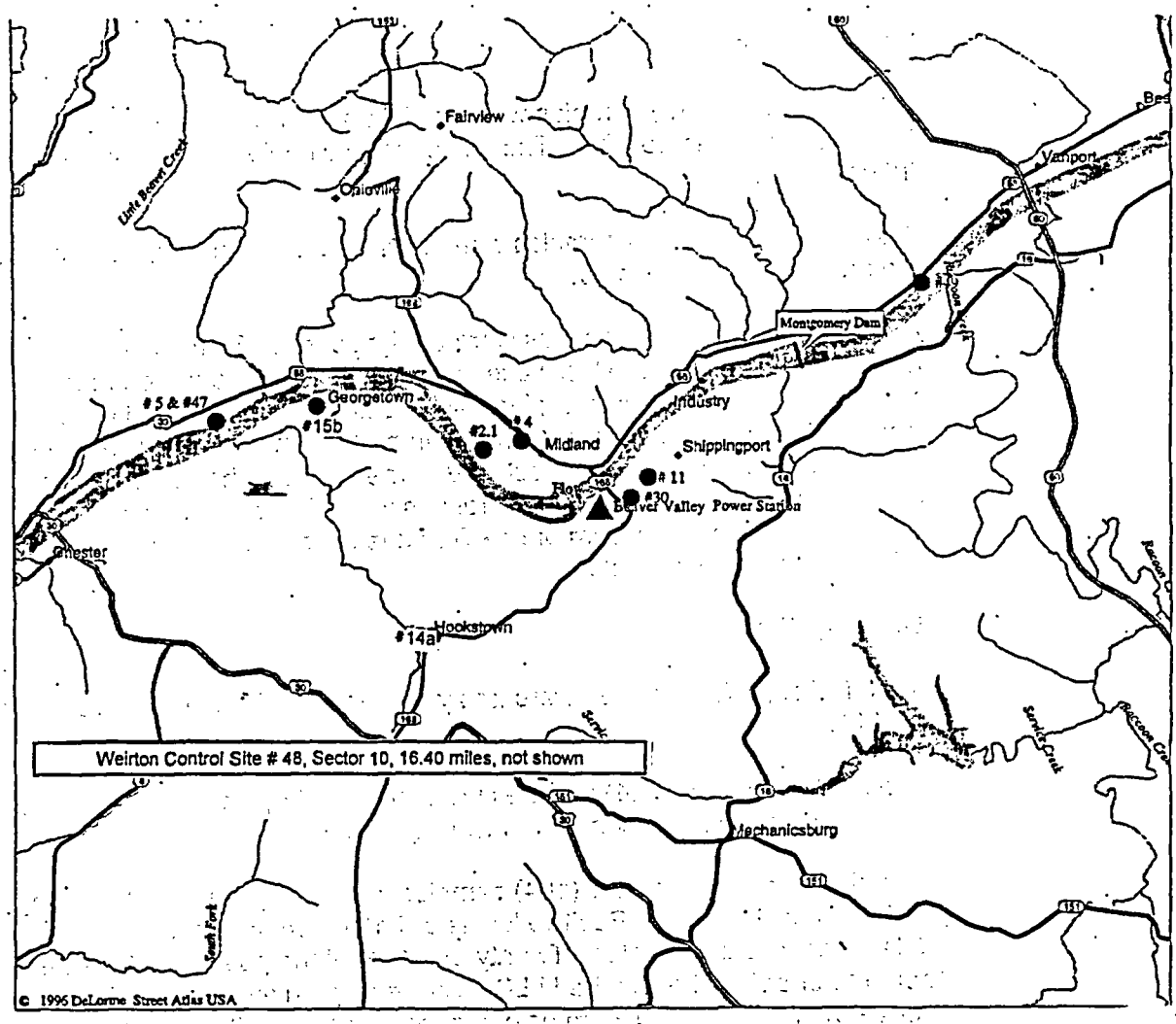
Gamma analysis is performed on water samples by placing one liter of the sample into a Marinelli container and counting the sample on a high resolution germanium gamma spectrometry system.

Tritium is determined in water samples by liquid scintillation counting.

Radioiodine (I-131) analysis in water was normally performed using chemically prepared samples and analyzed with a low-level beta counting system.

Figure 2-8

Environmental Monitoring Stations Locations - Ground, Surface Water, Drinking Water and Precipitation



Sample Type	Site No.	Sector	Distance (miles)	Description
Surface	2.1	14	1.43	Midland – ATI Allegheny Ludlam
Surface	5	14	4.90	East Liverpool Water Dept.
Surface	49	3	4.92	Upstream of Montgomery Dam
Drinking	4	15	1.26	Midland Water Dept.
Drinking	5	14	4.90	East Liverpool Water Dept.
Ground	11	3	0.94	Shippingport Boro
Ground	14a	11	2.61	Hookstown Boro
Ground	15b	14	3.75	Georgetown Boro
Precipitation	30	4	0.43	Shippingport (Cook's Ferry S.S.)
Precipitation	47	14	4.88	East Liverpool Water Dept.
Precipitation	48	10	16.40	Weirton Water Tower, Collier Way

3. Results and Conclusions

A summary of results of all analyses of water samples (surface, drinking, ground and precipitation) are provided by sample type and analysis in Table 2-2. These are discussed below.

a. Surface Water

A total of twelve (12) samples were analyzed quarterly for H-3. One of the twelve results was positive. The value was well below the required LLD for tritium in water.

A total of thirty-six (36) samples were analyzed by gamma spectrometry. No nuclides were detected.

A total of fifty-two (52) samples were analyzed for I-131 using a radiochemical method. Positive levels of I-131 were measured in thirty-seven (37) of the weekly samples. The positive results ranged in values from 0.30 to 1.80 pCi/liter, a decrease in both number of positive results as well as a reduction in the highest values measured. The results are similar to previous years. These positive results were detected at a Control location five miles upstream of BVPS and is considered outside the influence of BVPS operation.

b. Drinking Water

A total of eight (8) samples were analyzed for H-3. All results were below the LLD.

A total of twenty-four (24) samples were analyzed by gamma spectrometry. No gamma-emitting radionuclides were detected.

A total of one hundred-four (104) samples were analyzed for I-131 using a radiochemical method. Positive levels of I-131 were measured in fifty-four (54) of the weekly samples. Twenty-one (21) of the positive values were equal to or below the required LLD. The remaining thirty three (33) values above the required LLD were below reportable levels. The positive results were detected at both the Midland and East Liverpool plants at similar concentrations. As discussed in last year's report, I-131 continued to be found in the upstream surface water control location in similar concentrations and frequencies. Additional calculations based on plant effluent data indicated that sample concentrations at the water plants would be less than LLD.

c. Groundwater

A total of six (6) samples were each analyzed for H-3 and by gamma spectrometry. No gamma-emitting radionuclides were detected. All six tritium results were less than LLD.

d. Precipitation

A total of twelve (12) samples were analyzed for H-3 and by gamma spectrometry. Five (5) positive tritium results detected were within normal levels. No gamma emitting radionuclides were detected.

e. Deviations from required sampling schedule and analysis

None

f. Summary

The data from water analyses demonstrates that the Beaver Valley Power Station did not contribute a significant increase of radioactivity in local river, drinking, well waters or precipitation. The analytical results confirm that the station assessments, prior to authorizing radioactive discharges, are adequate and that the environmental monitoring program is sufficiently sensitive.

Table 2-13

Drinking Water I-131 – Annual

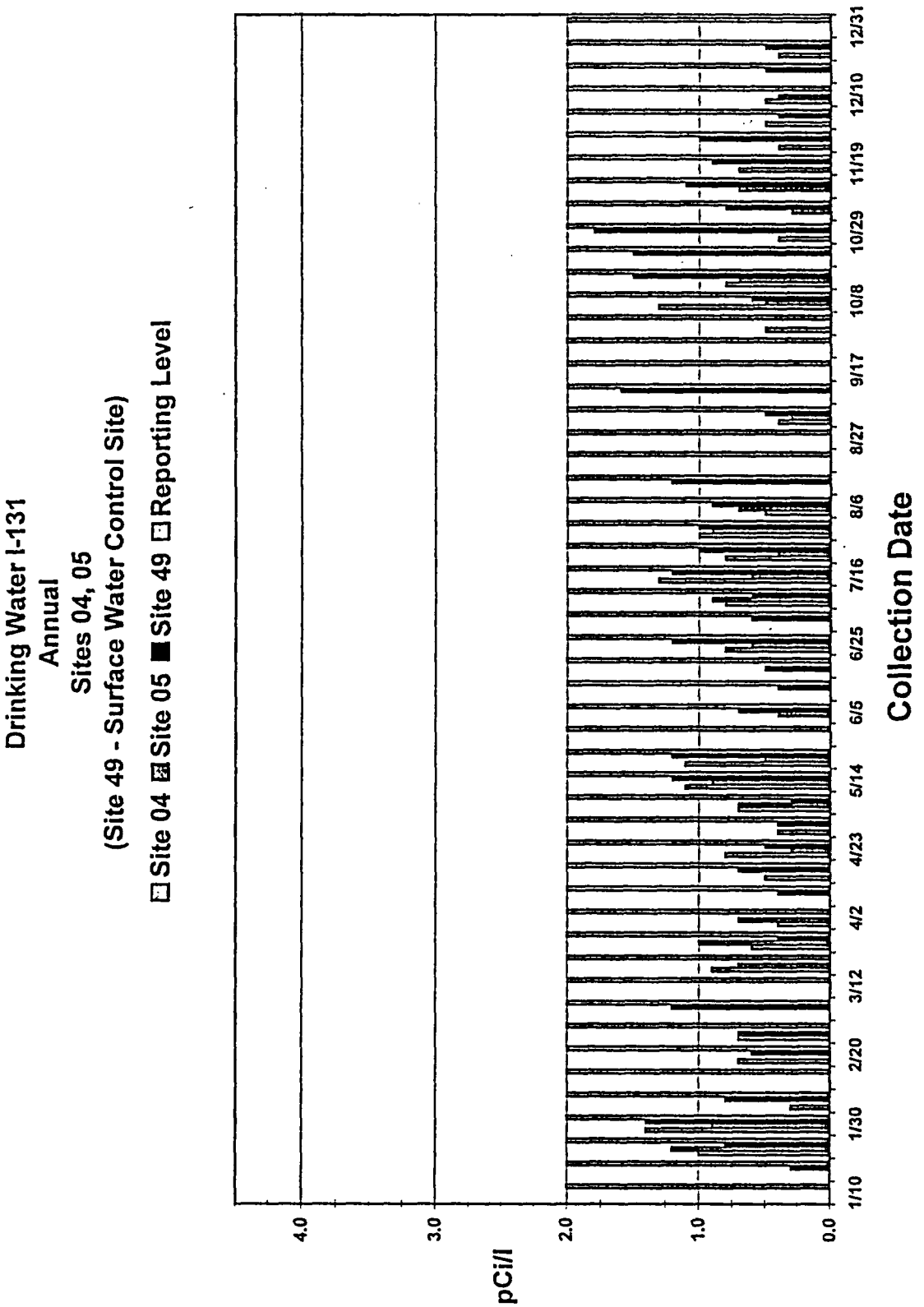


Table 2-14

Drinking Water I-131 – 1st Quarter

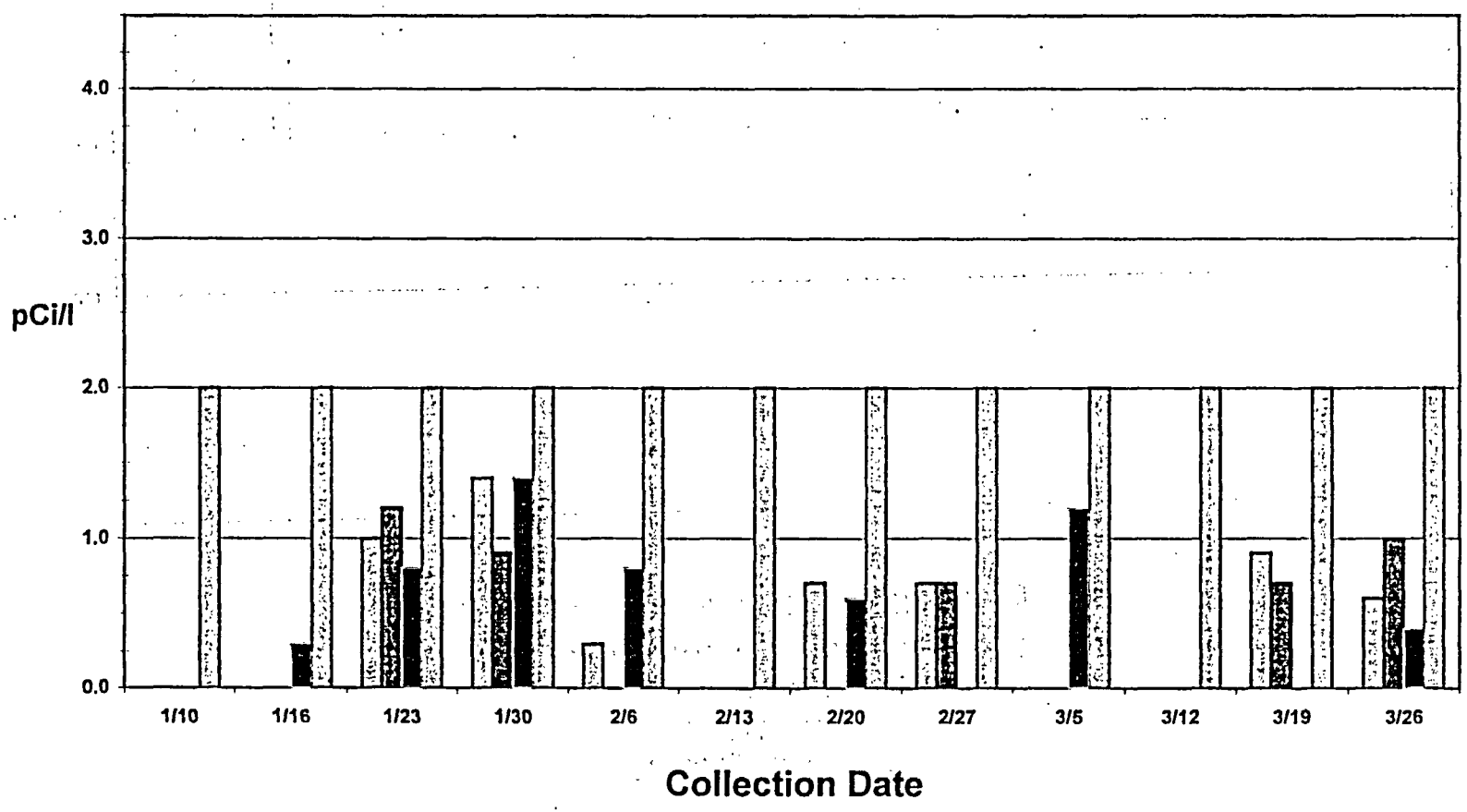


Table 2-15

Drinking Water I-131 – 2nd Quarter

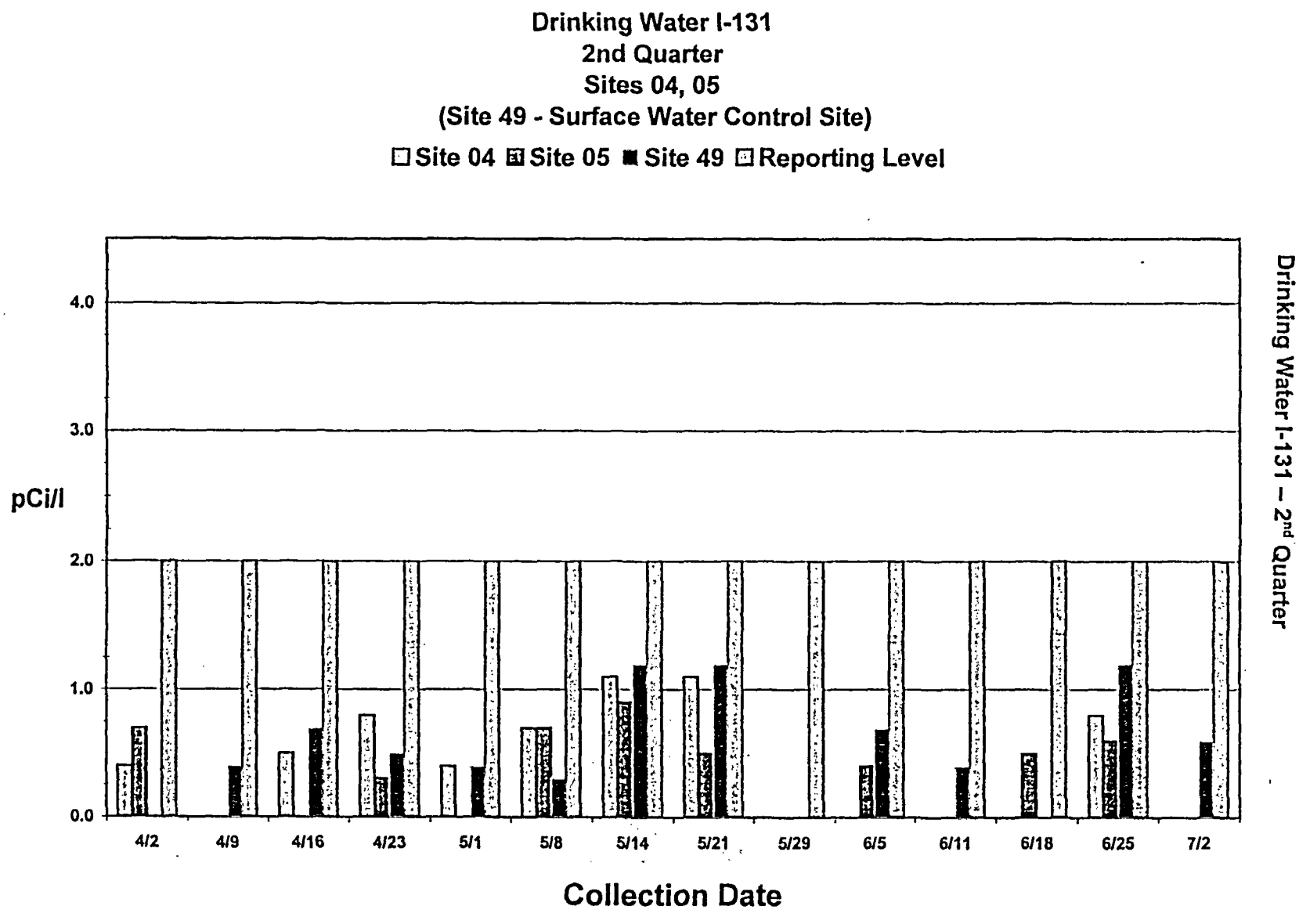


Table 2-16

Drinking Water I-131 – 3rd Quarter

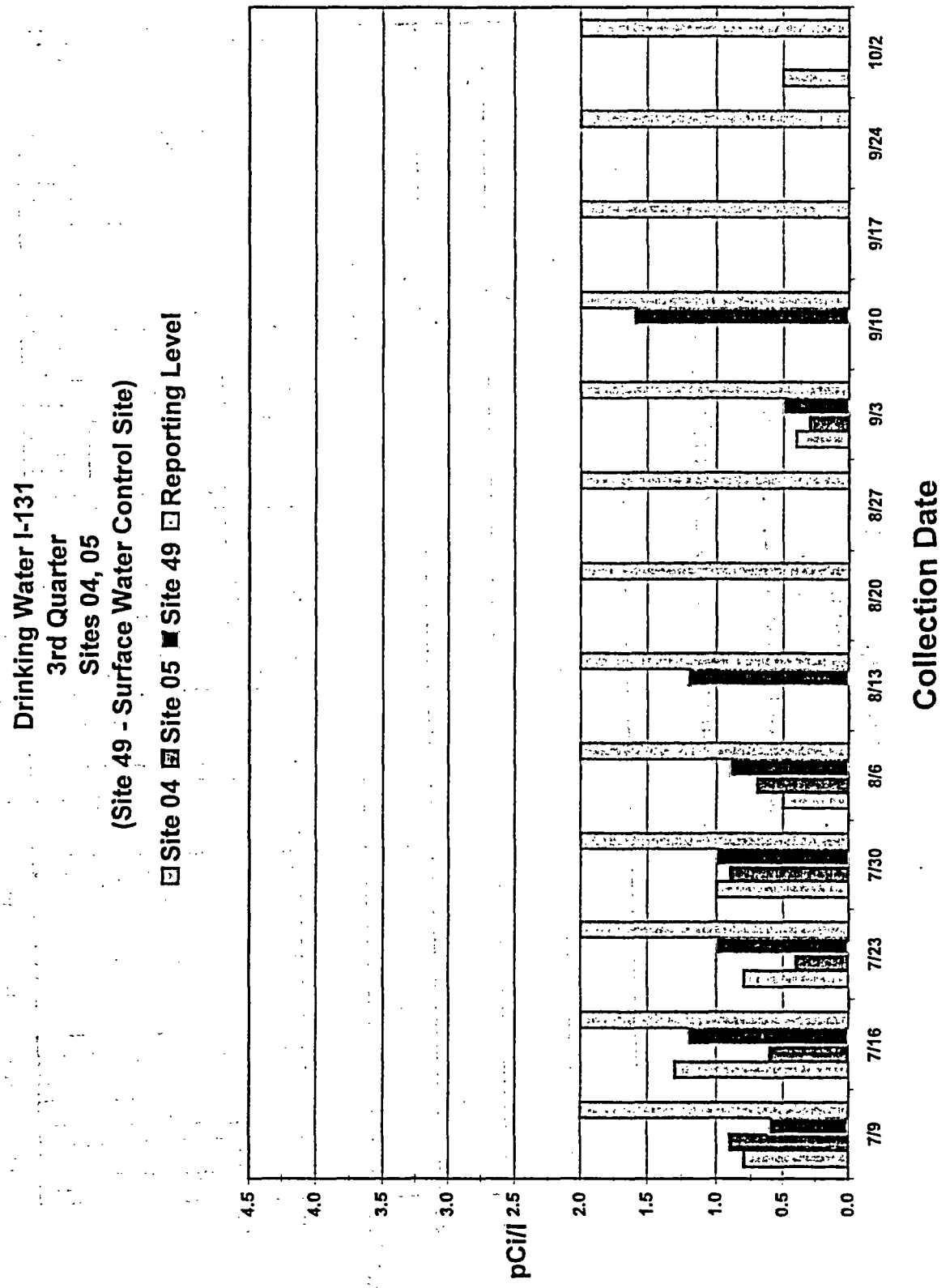
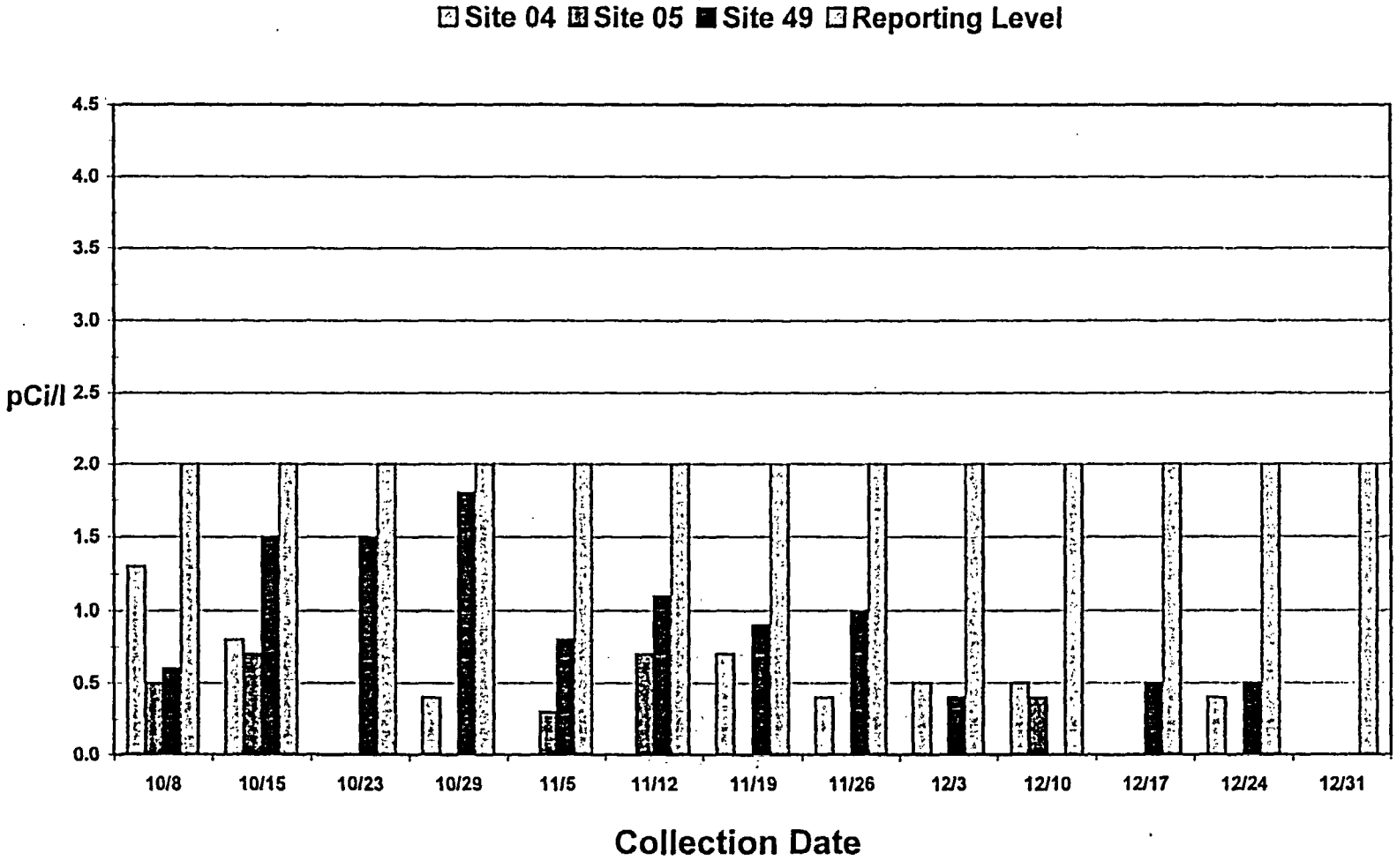


Table 2-17

Drinking Water I-131 – 4th Quarter

Drinking Water I-131
4th Quarter
Sites 04, 05
(Site 49 - Surface Water Control Site)



I. Estimates of Radiation Dose to Man

1. Pathways to Man - Calculational Models

The radiation doses to man as a result of Beaver Valley operations were calculated for both gaseous and liquid effluent pathways using codes for the ARERAS/MIDAS computer system equivalent to NRC computer codes XOQDOQ2, GASPAR, and LADTAP. Dose factors listed in the ODCM were used to calculate doses from radioactive noble gases in discharge plumes. Beaver Valley effluent data, based on sample analysis were used as the radionuclide activity input.

Radionuclides contained in the Annual Radioactive Effluent Release Report (noble gases, particulates, radioiodines and tritium) were included as source terms.

All gaseous effluent releases were included in dose assessments. The release activities are based on laboratory analysis. Meteorological data collected by the Beaver Valley Power Station Meteorology System was used as input to code equivalent to XOQDOQ2 which in turn provided input for the GASPAR equivalent. Except when more recent or specific data was available, all inputs were the same as used in the Beaver Valley Power Station Environmental Statements or in Regulatory Guide 1.109. The airborne pathways evaluated were beta and gamma doses from noble gas plumes inhalation, the "cow-milk-child", and other ingestion pathways.

All potentially radioactive liquid effluents are released by batch mode after analysis by gamma spectrometry using intrinsic germanium detectors. Each batch is diluted by cooling tower blowdown water prior to discharge into the Ohio River at the Beaver Valley Power Station outfall (River Mile 35.0). The actual data from these analyses are tabulated and used as the radionuclide activity input term in code equivalent to LADTAP. Except when more recent or specific data for the period is available, all other input are obtained from the Beaver Valley Power Station Environmental Statement or Regulatory Guide 1.109. Pathways, which were evaluated, are drinking water, fish consumption, and shoreline recreation.

2. Results of Calculated Population Dose to Man - Liquid Releases

The 2004 calculated dose to the entire population of about 4 million people within 50 miles of the plant is presented in Table 2-18.

Table 2-18

Comparison of Natural Radiation Exposure Versus Calculated Population Dose to Man - Liquid Releases

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE(a)		
Ambient Gamma Radiation	:	58
Radionuclides in Body	:	40
Global Fallout	:	< 1
Radon	:	198
TOTAL mRem/year	:	296

(a) National Academy of Sciences, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," BEIR Report, 1990

Population Dose from BVPS Liquid Releases		
Organ	**Man-Millirems**	**Largest Isotope Contributor**
Total Body	1704	H-3 1702 Man-Millirems
Liver	1704	H-3 1702 Man-Millirems

3. Results of Calculated Population Dose to Man - Atmospheric Releases

The results of the calculated 50 mile population dose for BVPS airborne radioactive effluents during 2004 are provided in Table 2-19. The doses include the contribution of all pathways.

Table 2-19

Comparison of Natural Background Exposure Versus Calculated Population Dose to Man - Atmospheric Releases

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE(a)		
Ambient Gamma Radiation	:	58
Radionuclides in Body	:	40
Global Fallout	:	< 1
Radon	:	198
TOTAL mRem/year	:	296

(a) National Academy of Sciences, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," BEIR Report, 1990

Population Dose from BVPS Atmospheric Releases	
Organ	50-Mile Population Dose man-rem
TOTAL BODY	0.316
THYROID	0.316

4. Conclusions

Based upon the estimated dose to individuals from the natural background radiation exposure in Tables 2-18 and 2-19, the incremental increase in total body dose to the 50-mile population (approximately 4 million people), from the operation of Beaver Valley Power Station - Unit 1 and 2, is less than 0.00003% of the annual background dose.

The calculated doses to the public from the operation of Beaver Valley Power Station - Unit 1 and 2, are below BVPS annual limits and resulted in only a small incremental dose to that which area residents already received as a result of natural background. The doses constituted no meaningful risk to the public.

SECTION 3 - LAND USE CENSUS

A Land Use Census was conducted July 1 through August 5, 2004 to comply with Unit 1 and Unit 2 Technical Specification 6.8.6b, and ODCM procedure 1/2-ODC-3.03, Attachment R, Control 3.12.2, Action b. The census results are summarized in Table 3-1.

During December 2004 and January 2005, the site locations in REMP were evaluated using the Global Positioning Satellite (GPS) system. Sites included in the 2004 Annual Land Use Census were also evaluated. This evaluation was performed as an overall effort to improve the accuracy of REMP sample locations. The details of the evaluation are documented in Condition Report No. CR04-00049-12.

Also, Table 3-1 in this section was expanded to include beef cattle (although not sampled via the REMP). Per the Annual Land Use Census, gardens with green leafy vegetables have the largest number of locations. Beef cattle are the second largest category. Beef cattle data obtained from the Annual Land Use Census are also used in the annual gaseous release dose calculations as noted in Section 2-I of this report. The distances in Table 3-1 have also been modified where needed based on the GPS data.

Table 3-1 reflects changes in the Land Use Census data from 2003, the more accurate GPS data, and the fact that previous distances for REMP locations were measured from the center of the Unit 1 Reactor Containment Building. The measurements using the GPS system were based on the midpoint between the Unit 1 Reactor Containment Building and the Unit 2 Reactor Containment Building.

Table 3-1

Location of Nearest Residence, Beef Animal, Garden, and Milch Animal

SECTOR	RESIDENCE (miles)	BEEF ANIMAL (miles) [2]	GARDEN (miles) [1]	MILCH ANIMALS (miles) [2]
N	1.58	3.46	2.90	None
NNE	1.60	3.11	None	None
NE	0.41	3.17	2.71	None
ENE	0.43	1.40	1.03	None
E	0.48	2.62	1.98	3.40
ESE	0.89	2.95	1.71	4.28
SE	1.58	2.09	2.44	2.29
SSE	1.10	3.50	2.13	3.12
S	1.40	3.85	2.35	3.85
SSW	0.76	1.83	1.88	1.88
SW	1.45	1.45	1.45	2.12
WSW	1.39	2.32	2.84	3.31
W	2.20	3.18	2.70	None
WNW	2.74	None	None	4.97
NW	0.89	4.28	1.03	5.12
NNW	0.91	2.42	1.35	2.44

(1) Gardens greater than 500 square feet producing fresh leafy vegetables within 3 miles.

(2) Animals within five miles.

SECTION 4 - SPLIT SAMPLE, SPIKE SAMPLE, AND INTER LABORATORY COMPARISON PROGRAM

A. Split Sample and Spike Sample Program

Beaver Valley conducts a split sample program. Split samples (milk (1), surface water (3), sediment (1), fish (1), food crops (2)) and co-located sample data (air particulate (4), air iodine (4), TLDs (24)) are shared with Pennsylvania Department of Environmental Protection (PADEP) in support of their nuclear power plant monitoring program.

The NRC criteria listed in NRC Inspection Procedure 84750, 12/4/90, Inspection Guidance 84750-03 is used as the acceptance criteria for comparisons of results of spiked samples between the Contractor Lab and the Independent Lab. These comparisons are performed by dividing the comparison standard (Independent Lab result) by its associated uncertainty to obtain the resolution. The comparison standard value is multiplied by the ratio values obtained from the following table to find the acceptance band for the result to be compared. Note that in the case where the counting precision of the standard yields a resolution of less than 4, a valid comparison cannot be made.

Resolution	Ratio
< 4	–
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.8 - 1.25
> 200	0.85 - 1.18

B. Inter Laboratory Comparison Program

Participation in an Inter Laboratory Comparison Program is required by BV-1 and BV-2 Technical Specification 6.8.6b, Item 3. For 2004, this requirement was fulfilled by the Contractor Lab (Environmental, Inc. – Northbrook, IL) analyzing high quality (NIST traceable) spiked samples supplied by a Beaver Valley Power Station contracted vendor (Analytics – Atlanta, GA).

1. Contractor Lab

   The high quality (NIST traceable) spiked samples include air particulate, charcoal filters water, and milk. The samples were submitted to the Contractor Lab for analysis. The "spiked to" values are used for calculating comparison acceptance criteria

   A total of 52 nuclide analyses were performed on water samples with no (0) analyses or 0.0% not meeting acceptance criteria. A total of 48 nuclide analyses were performed on milk samples with no (0) analyses or 0.0% not meeting acceptance criteria.

   - Comparison of results of the spiked milk and water samples showed good results. As part of the offsite radiological environmental monitoring program spiked water and milk QC samples are prepared by a vendor and are sent to the vendor lab BVPS uses for sample analysis. The analysis lab does not know the concentration of the radionuclides in the milk and water sample (there are 12 radionuclides in each spiked milk sample and 13 radionuclides in each spiked water sample) prior to analysis. All results for both water and milk were found acceptable. The spiked water sample results are reported in Table 4-1. The spiked milk sample results are reported in Table 4-2.

   - Comparison of results of the spiked air particulate filters (2) and charcoal cartridge filters (2) showed good results. All four results met the acceptance criteria. The results are reported in Table 4-3.

C. Conclusions

Based on all available Inter Laboratory Comparison data, the Radiological Environmental Monitoring Program (REMP) for 2004 is acceptable with respect to both accuracy and measurement.

Table 4-1

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Water Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
03/25/2004	Water E 4113-93 SPW-1157	Sr-89	123 ± 4	112 ± 4
		Sr-90	15 ± 1	16 ± 1
		I-131	90 ± 3	90 ± 8
		Ce-141	85 ± 3	84 ± 7
		Cr-51	326 ± 11	336 ± 36
		Cs-134	90 ± 3	80 ± 3
		Cs-137	185 ± 6	185 ± 5
		Co-58	112 ± 4	112 ± 4
		Mn-54	114 ± 4	114 ± 4
		Fe-59	57 ± 2	60 ± 4
		Zn-65	143 ± 5	144 ± 10
		Co-60	153 ± 5	150 ± 3
03/25/2004	Water E 4113-93 SPW-1157	H-3	4700 ± 300	4907 ± 210
06/17/2004	Water E 4180-93 SPW-30117	Sr-89	112 ± 4	100 ± 4
		Sr-90	16 ± 1	217 ± 1
		I-131	84 ± 3	885 ± 8
		Ce-141	172 ± 6	175 ± 8
		Cr-51	250 ± 8	231 ± 20
		Cs-134	111 ± 4	105 ± 3
		Cs-137	171 ± 6	170 ± 6
		Co-58	51 ± 2	50 ± 1
		Mn-54	77 ± 3	78 ± 5
		Fe-59	49 ± 2	153 ± 5
		Zn-65	109 ± 4	113 ± 8
		Co-60	189 ± 6	183 ± 4
06/17/2004	Water E 4179-93 SPW-3016	H-3	11900 ± 400	12196 ± 230

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence coefficient.

(Table 4-1 continued on next page)

Table 4-1 (Continued)

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Water Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
	Water E 4275-93 SPW-5280	Sr-89	57 ± 2	53 ± 3
		Sr-90	13 ± 0	14 ± 1
		I-131	71 ± 2	64 ± 1
		Ce-141	250 ± 8	243 ± 10
		Cr-51	223 ± 8	220 ± 44
		Cs-134	96 ± 3	100 ± 9
		Cs-137	215 ± 7	214 ± 6
		Co-58	95 ± 3	93 ± 5
		Mn-54	181 ± 6	185 ± 6
		Fe-59	92 ± 3	93 ± 7
		Zn-65	178 ± 6	173 ± 30
		Co-60	125 ± 4	121 ± 3
09/16/2004	Water E 4274-93 SPW-5281	H-3	12000 ± 400	12089 ± 221
12/9/2004	Water E 4378-93 SPW-7241	Sr-89	98 ± 3	93 ± 4
		Sr-90	11 ± 0	14 ± 1
		I-131	92 ± 3	149 ± 1
		Ce-141	149 ± 5	362 ± 9
		Cr-51	362 ± 12	156 ± 39
		Cs-134	164 ± 5	121 ± 5
		Cs-137	121 ± 4	138 ± 6
		Co-58	141 ± 5	132 ± 5
		Mn-54	131 ± 4	122 ± 6
		Fe-59	117 ± 4	191 ± 7
		Zn-65	189 ± 6	181 ± 11
		Co-60	168 ± 6	166 ± 4
12/9/2004	Water E 4377-93 SPW-7239	H-3	8060 ± 270	8244 ± 235

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence coefficient.

Table 4-2

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Milk Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
03/25/2004	Milk E 4115-93 SPM1-1158	Sr-89	103 ± 3	88 ± 3
		Sr-90	12 ± 0	12 ± 1
		I-131	78 ± 3	76 ± 8
		Ce-141	85 ± 3	90 ± 9
		Cr-51	327 ± 11	316 ± 43
		Cs-134	90 ± 3	83 ± 4
		Cs-137	185 ± 6	184 ± 6
		Co-58	112 ± 4	111 ± 5
		Mn-54	114 ± 4	114 ± 6
		Fe-59	57 ± 2	59 ± 2
		Zn-65	143 ± 5	141 ± 8
		Co-60	153 ± 5	146 ± 4
06/17/2004	Milk E 4181-93 SPM1-3015	Sr-89	88 ± 3	81 ± 3
		Sr-90	13 ± 0	12 ± 1
		I-131	58 ± 2	56 ± 7
		Ce-141	157 ± 5	158 ± 8
		Cr-51	228 ± 8	227 ± 37
		Cs-134	101 ± 3	94 ± 3
		Cs-137	156 ±5	149 ± 6
		Co-58	46 ± 2	45 ±5
		Mn-54	70 ± 2	72 ± 5
		Fe-59	44 ± 2	46 ± 6
		Zn-65	99 ± 3	101 ± 11
		Co-60	172 ± 6	165 ± 4

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence coefficient.

(Table 4-2 continued on next page)

Table 4-2 (Continued)

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Water Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
09/16/2004	Milk E 4276-93 SPMI-5282	Sr-89	102 ± 3	86 ± 4
		Sr-90	25 ± 1	24 ± 1
		I-131	84 ± 3	76 ± 1
		Ce-141	235 ± 8	232 ± 10
		Cr-51	210 ± 7	188 ± 41
		Cs-134	91 ± 3	81 ± 5
		Cs-137	202 ± 7	202 ± 6
		Co-58	89 ± 3	87 ± 5
		Mn-54	171 ± 6	168 ± 6
		Fe-59	86 ± 3	86 ± 7
		Zn-65	167 ± 6	156 ± 10
		Co-60	118 ± 4	112 ± 4
12/9/2004	Milk E 4379-93 SPM1-7241	Sr-89	99 ± 3	93 ± 4
		Sr-90	11 ± 0	14 ± 1
		I-131	67 ± 2	81 ± 1
		Ce-141	155 ± 5	149 ± 9
		Cr-51	379 ± 13	362 ± 39
		Cs-134	170 ± 6	156 ± 5
		Cs-137	126 ± 4	121 ± 6
		Co-58	146 ± 5	138 ± 5
		Mn-54	136 ± 5	132 ± 6
		Fe-59	121 ± 4	122 ± 7
		Zn-65	196 ± 7	191 ± 11
		Co-60	175 ± 6	166 ± 4

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence coefficient.

Table 4-3

Interlaboratory Comparison Program
Contractor/Quality Control Laboratory
Comparison Spiked Air Particulate/Charcoal Filters

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)	Units
03/25/2004	Air Particulate Filter E 4116-93 SPAP-1159	Gross Beta	142 ± 5	164 ± 1	pCi/m^3
09/16/2004	Air Particulate Filter E 4277-93 SPAP-5283	Gross Beta	208 ± 7	232 ± 5	pCi/m^3
03/25/2004	Air Charcoal Filter E 4117-93 SPCH-1160	I-131	97 ± 3	95 ± 3	pCi/m^3
09/16/2004	Air Charcoal Filter E 4278-93 SPCH-5284	I-131	77 ± 3	70 ± 4	pCi/m^3

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence coefficient.