Report On The

PRE-OPERATIONAL ENVIRONMENTAL SURVEY IN THE VICINITY OF THE CONSOLIDATED EDISON COMPANY'S INDIAN POINT NUCLEAR ELECTRIC GENERATING PLANT

BUREAU OF ENVIRONMENTAL SANITATION

NEW YORK STATE DEPARTMENT OF HEALTH

HERMAN E. HILLEBOE, M. D.

COMMISSIONER

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Bureau of Environmental Sanitation
New York State Department of Health

Herman E. Hilleboe, M.D.
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HERMAN E. HILLEBOE, M. D.
COMMISSIONER

DIVISION OF LOCAL HEALTH SERVICES
V. A. VAN VOLKENBURGH, M. D.
ASSISTANT COMMISSIONER

BUREAU OF
ENVIRONMENTAL SANITATION
MEREDITH H. THOMPSON, D.ENG.
DIRECTOR

84 HOLLAND AVENUE
ALBANY 8

Dr. Meredith H. Thompson
Director
Bureau of Environmental Sanitation
84 Holland Avenue
Albany 8, New York

Re: Pre-Environmental Survey
Town of Buchanan, Westchester County

Dear Dr. Thompson:

This is the report of the pre-environmental survey in the vicinity of the proposed nuclear reactor to be located in the Town of Buchanan, Westchester County.

The survey was commenced in 1958 under the direction of Mr. Alexander Rihm, Formerly Chief, Radiological Health and Air Sanitation Section, and Mr. Richard D. Coleman, assigned to the New York State Department of Health by the United States Public Health Service. Since June 1958, the undersigned has been Chief of the Radiological Health Section.

Preparation of this report was under the direction of Mr. Kelleher, Senior Sanitary Engineer, Radiological Health Section. Other members of the Sanitation staff of the New York State Health Department were:

Mr. Ferdinand Wiener, Assistant Sanitary Engineer
Mr. Eugene Cassell, Assistant Sanitary Engineer
Mr. Harvey Prins, Assistant Sanitary Engineer
Mr. Allan E. Raymond, Senior Sanitary Engineer
Mr. Fred Wurtemberger, Assistant Sanitary Engineer

Field work was done by representatives of the New York State Conservation Department and Local Health Departments. Attached is a list of acknowledgments.

Very truly yours,

Sherwood Davies

Sherwood Davies, P.E.
Chief, Radiological
Health Section

Attachs.

ACKNOWLEDGMENTS

This survey was undertaken through the cooperation of the following state departments and local health departments and their representatives:

Local Health Departments - Establishment of sampling stations, collection of samples and supervision of sampling program.

Westchester County Health Department

Mr. Richard McLaughlin, Director, Division of Sanitation
Mr. Calvin Weber, Sanitary Engineer
Mr. John Meade (formerly of this department), Sanitary Engineer
Mr. E. V. Kennelly, Radiological Technician

Rockland County Health Department

Mr. Richard Sutherland (formerly Director, Division of Environmental Sanitation)
Mr. George O'Keefe, Director, Division of Environmental Sanitation
Mr. Donald Grosso, Assistant Director, Division of Environmental Sanitation
Mr. J. M. Jones, Sanitary Inspector
Mr. William B. Howell, Sanitary Inspector

Dutchess County Health Department

Mr. Henry Scoralick, Director, Division of Environmental Sanitation

Middletown District Office

Mr. Matthias Schleifer, District Sanitary Engineer
Mr. Donald Boyce, Assistant Sanitary Engineer
Mr. Maurice Grady, Senior Sanitary Engineer
Mr. Paul Brooks, District Sanitarian

Division of Laboratories and Research - Analysis of samples and assistance in the development of sampling program.

Mr. Wallace Sanderson, Assistant Director
Mr. Irving Sax, Associate Research Scientist

New York State Conservation Department, Poughkeepsie District Office - Collection of rabbit thyroid samples and Hudson River sampling of water, plankton, bottom mud and fish.

Mr. Cecil Heacox (formerly District Fisheries Manager)
Mr. Warren McKeon, District Game Manager
Mr. John Gould, District Fisheries Manager
Mr. Eli L. Dietsch, Conservation Biologist
Mr. Michael Rodak, Conservation Aide

New York State Conservation Department, Marine Fisheries Division - Special sampling of Hudson River.

Mr. Harold Udell, Marine Fisheries Sanitarian

Representatives of private industry and public water supply operators have also contributed their time and effort in the establishment of sampling stations and actual collection of samples. The cooperation of the following individuals has been appreciated:

Mr. William Lloyd, Manager of Arden Farms Dairy, for the maintenance of a fallout station

Mr. Richard A. Pfeil, Test Engineer, Lovett Plant, Orange-Rockland Utilities, for the collection of air samples

Mr. Clifford J. Konnerth, Union Carbide Nuclear Company, for the collection of air samples

Mr. Aristides Miliotes, Chief Health Physicist, Nuclear Development Corporation of America, for the collection of air samples

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Introduction

This report is a summary to date of the pre-operational environmental survey in the vicinity of the nuclear power reactor under construction at Indian Point in the Village of Buchanan, Westchester County, New York. This survey is being carried out in cooperation with the Consolidated Edison Company, owner and operator of the reactor who is also conducting separate environmental studies. Results of data collected from both surveys have been freely exchanged with all interested agencies.

The survey was undertaken to establish levels of radioactivity prior to the operation of the reactor. The levels of radioactivity found in the environmental samples are due to naturally occurring radioelements and fallout from atomic weapons testing. As the atomic energy industry expands, chemical processing facilities, and use of radioactive isotopes in the fields of nuclear reactor operation, accidental or routine releases from these operations may result in some increase in radioactivity in the environment. The measurement of existing levels of radioactivity and the ranges which might be expected will assist in the evaluation of the levels of radioactivity which may be added or allegedly added to the environment due to local sources of pollution.

The nuclear reactor being constructed at Indian Point is the first private power reactor in New York State. The reactor will be a pressurized water, thorium converter, enriched uranium, reactor with a nuclear power capacity of 163,000 kilowatts of electricity.

Description of Survey

The Consolidated Edison pre-operational survey covered sampling stations within a 25 mile radius of the reactor site. The locations of the sampling sites for the various types of samples are shown on maps within the report. A more complete description of the sampling stations and the numbering system can be found in the appendix.

Gross beta counts were made on most of the samples collected in 1958. It was apparent, since 1953, that fallout from nuclear weapons testing contributed a significant portion of the total radioactivity found in different phases of the environment. In order to better determine the concentration of biologically significant fission products, the Division of Laboratories and Research developed a more specific test known as "beta bone seekers". This method involves the chemical separation of the alkaline earths which include the fission products Sr^{89}, Sr^{90}-Y^{90}, Ba^{140}-La^{140}. This test is much less time consuming than a specific isotopic analysis for Sr^{90}. The beta bone seeker method was used for the radiological analysis of all samples, except air samples and rabbit thyroids, collected after mid-January 1959. Naturally occurring uranium and thorium and their daughters will contribute to the natural radioactivity as well as Potassium^{40}, Rubidium^{87} and others. The "beta bone seeker" method eliminates most of the naturally occurring radioelements.

Rabbit thyroids are the one exception where a specific isotopic analysis was made for I^{131} by gamma counting. To date, there has been no analyses made for alpha activity in environmental samples.

The results as reported in the tables are at the time of counting. Activities were not extrapolated to date of collection except for a series of air particulate samples collected in June 1958.

Analysis for some specific isotopes and gross beta analysis is planned in 1960 for selected samples. A more complete description of the methods of analysis used can be found in the appendix.

An aerial survey of the area surrounding Indian Point has been made. Since a prior report was made on the survey, it is not included in this report.

Air Samples On July 18, 1958 and July 24, 1958, air particulate samples were collected by local and state Health Department personnel from 14 and 12 respective stations. These samples were taken utilizing high volume air samplers of approximately 50 cubic feet per minute capacity and an 8 inch by 10 inch glass fibre filter. Since there were at least three days between sampling and counting, the results were not indicative of radon or thoron concentrations. The major part of the beta activity recorded was, therefore, due to fission products from weapons tests.

The operation and maintenance of air samplers on daily basis was found to be time consuming and was found to give only a little more information than a weekly continuous sampler. Since in an environmental survey of the type being made average results are considered to be the most significant, the decision was made to collect weekly samples. Consequently, 1 cubic feet per minute positive displacement "Gast" air pumps were utilized with a 2 inch diameter glass fibre filter. Five air sampling stations were established at locations around the reactor site (see Map #1). These samplers were operated for a period of seven days, the filter removed and sent to the laboratory for counting.

Fallout Six fallout sampling stations were established (see Map #2). The bucket is weighted at the bottom and is lined with a double polyethylene bag. The bag is sent in with the sample and processed with the sample so that dust collected is also counted. Difficulty with snow and ice has been experienced and some method of overcoming the problem of drifting snow is being considered.

Rabbit Thyroids Thyroid samples from cottontail rabbits killed within a 12 mile radius were counted for I^{131}. The rabbits were killed with a .22 calibre rifle, the thyroids extracted, and sent to the laboratory by the Conservation Department. The sampling areas were selected considering range of the animal and on the basis of being able to select future specimens from the same general area.

Soil Soil samples were taken at the same location as vegetation samples as shown on Map #4 and further described in the appendix. Soil samples were taken from the upper two inches using a 6-7/8 inch diameter core tool. The normal procedure was to shake the soil loose from the overlying vegetation. All large stones were also removed. To date, no soil samples have been analyzed. These samples are stored and will be available for analysis in the future if indicated.

Vegetation The vegetation normally sampled were laurel or planton although other types of samples have been obtained because of the lack of laurel or planton in the area being sampled. The season of the year also influenced the type of vegetation obtained. The vegetative samples were analyzed for beta bone seekers. It is to be noted that these samples collected in 1958 were not analyzed until 1959; consequently, one must consider the time between collection and actual counting in interpreting the results.

Water Samples Water samples were collected from all public water sources within a ten mile radius of Indian Point. In addition, some surface waters were sampled even though they were not public water sources. The sampling locations are shown on Map #5. In all cases, raw water samples were obtained either by dipping from a lake or by sampling the raw water tap. Some samples also have been taken from the Hudson River by the Conservation Department using a "Kemmerer" sampler. These are reported under Hudson River samples. The United States Public Health Service has been obtaining Hudson River weekly grab samples at Poughkeepsie and analyzing for dissolved and suspended beta radioactivity; results are shown in Table VII.

Water samples on which gross beta counts were made are reported with the counting error as shown in Table V. The counting error reported represents a 95% confidence limit.

The New York State Health Department has obtained weekly composites of daily samples of the Hudson River at Waterford, Glenmont and of the Mohawk River at Cohoes. Waterford is on the Hudson above the confluence of the Mohawk and Hudson, and Glenmont is below this confluence. Cohoes is on the Mohawk above the confluence of the Mohawk and Hudson Rivers.

Hudson River Samples Hudson River samples include water, bottom muds, plankton, and fish. The Conservation Department has obtained samples of water, and bottom muds at Manitou Beach and Croton Point as shown on Map #5. A plankton net was used to obtain plankton samples at both points. Fish were obtained by screening.

Milk A few milk samples have been collected to date; however, this report will not include such results because of the limited data available at this time. A supplementary report will be made covering milk samples collected in connection with this survey, and will include results of samples collected in the statewide Milk Surveillance Program for comparison.

Explanation of Units Used

The maximum allowable concentrations (M.A.C.) according to state and federal regulations are expressed in terms of micro curies times 10 to some negative exponent, i.e. 7×10^{-7} μc/ml. In order to reduce the possible error in reporting and transcribing results, the more convenient unit micro-micro curies was adopted. The units used for reporting results are listed as follows:

Air - $\mu\mu c/m^3$ - micro-micro curies per cubic meter of air

Fallout - $\mu\mu c/ft.^2/day$ - micro-micro curies per square foot of area per day.

Rabbit thyroid - μμc - micro-micro curies per thyroid

Vegetation - μμc/gm - micro-micro curies per gram of dry vegetation (dried at 103° C)

Water - μμc/ml - micro-micro curies per milliliter of water

Mud, Plankton, Fish - μμc/gm - micro-micro curies per gram of dry solids (dried at 103° C)

The results reported in all tables are at the time of counting, except for the high-volume air samples which are reported at the time of collection.

TABLE I-A

AIR

(High volume air samples)

Sampling Station	Sample Number	Date Collected	Area (sq. m.)	Gross Beta at time of collection μμc/M3
1002	A-1	6-18-58	>100	1.22
	A-2	6-24-58	>100	2.98
1103	A-1	6-18-58	60	1.30
	A-2	6-24-58	>100	2.80
1105	A-1	6-18-58	>100	1.20
	A-2	6-24-58	>100	3.10
1302	A-1	6-18-58	>100	1.06
1307	A-1	6-18-58	71	1.24
	A-2	6-24-58	>100	3.05
1401	A-1	6-18-58	44	1.15
	A-2	6-24-58	>100	2.71
1402	A-1	6-18-58	82	1.02
	A-2	6-24-58	>100	2.72
2002	A-1	6-18-58	76	1.38
	A-2	6-24-58	>100	2.75
2101	A-1	6-18-58	51	1.65
	A-2	6-24-58	>100	3.00
2202	A-1	6-18-58	56	1.48
	A-2	6-24-58	>100	2.85
2301	A-1	6-18-58	96	1.60
	A-2	6-24-58	>100	2.96
3302	A-1	6-18-58	46	1.45
2204	A-1	6-18-58	64	1.50
	A-2	6-24-58	>100	3.30
		Results of U.S.P.H.S.		
Albany, N.Y.		6-18-58	>100	0.73
		6-24-58	>100	4.05
Hartford, Conn.		6-18-58	>100	0.64
		6-24-58	>100	3.05

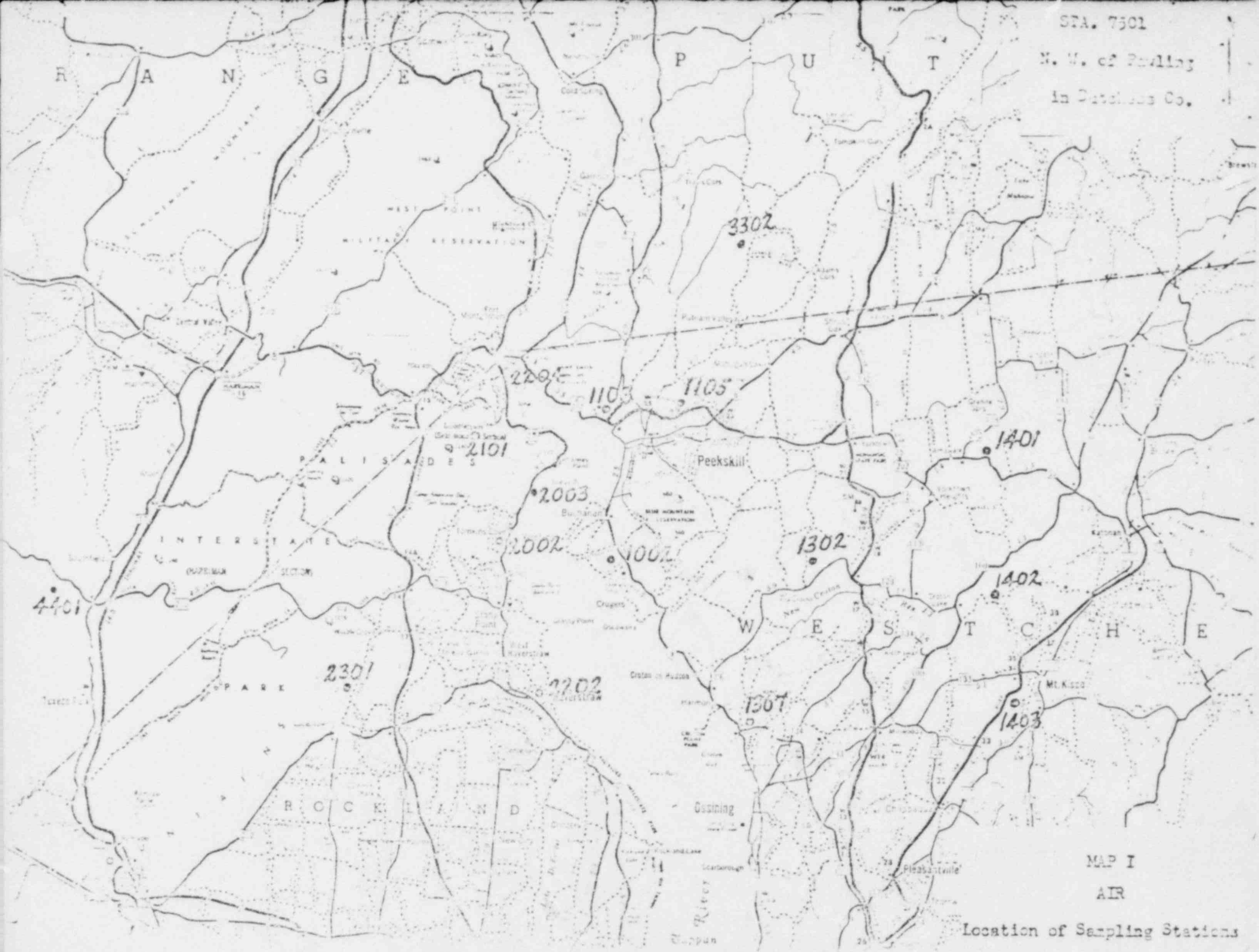
TABLE I-B

AIR
(Weekly Gross Air Pump Samples)

Sample Station Number	Dates Collected Start	Dates Collected Stop	Date Counted	Gross Beta (pc/m³)
7501	3-26-59	4-6-59	4-14-59	4.1
N.D.A., Pawling,	4-6-59	4-13-59	4-19-59	5.4
Dutchess County	4-13-59	4-20-59	5- 5-59	6.4
	4-20-59	4-27-59	5- 5-59	7.2
	4-27-59	5- 9-59	5-17-59	3.8
	5- 9-59	5-18-59	5-30-59	3.8
	5-18-59	5-25-59	6- 5-59	3.9
	5-25-59	6- 1-59	7- 3-59	4.6
	6- 1-59	6- 9-59	7-15-59	2.6
	6- 9-59	6-18-59	7-26-59	2.1
	6-18-59	7-13-59	8- 7-59	1.1
	7-13-59	7-20-59	8-17-59	0.4
	7-21-59	7-27-59	8-17-59	0.6
4401	3-26-59	4- 2-59	4-14-59	6.2
Union Carbide, Tuxedo,	4- 2-59	4-16-59	5- 5-59	4.9
Orange County	4-16-59	4-23-59	5- 5-59	7.6
	4-23-59	4-30-59	5- 5-59	6.2
	4-30-59	5-11-59	5-17-59	5.1
	5-11-59	5-18-59	5-30-59	3.5
	5-18-59	5-25-59	5-30-59	3.4
	5-25-59	6- 1-59	7- 3-59	5.7
	6- 1-59	6- 8-59	7-15-59	2.9
	6- 8-59	6-15-59	7-26-59	2.6
	6-15-59	6-22-59	7-29-59	2.3
	6-30-59	7- 6-59	8- 7-59	1.4
	7- 6-59	7-20-59	8-17-59	0.9
2003	3-27-59	4- 3-59	4-14-59	5.2
Tomkins Cove,	4- 3-59	4-10-59	4-19-59	6.9
Rockland County	4-10-59	4-17-59	5- 5-59	7.0
	4-17-59	4-24-59	5- 5-59	7.4
	4-24-59	5- 1-59	5- 5-59	6.3
	5- 1-59	5- 8-59	5-17-59	4.9
	5- 8-59	5-15-59	5-22-59	6.7
	5-15-59	5-22-59	5-30-59	4.4
	5-22-59	6- 1-59	7- 3-59	6.1
	6- 1-59	6- 8-59	7-15-59	3.0
	6- 8-59	6-15-59	7-26-59	2.8
	6-15-59	6-22-59	7-29-59	2.3
	6-22-59	6-29-59	8- 3-59	1.0
	6-29-59	7- 6-59	8- 7-59	1.4
	7- 6-59	7-13-59	8- 7-59	1.6
	7-13-59	7-20-59	8-13-59	0.6
	7-20-59	7-27-59	8-17-59	0.5

TABLE I-B, Continued

Sample Station, Number	Dates Collected Start	Stop	Date Counted	Gross Beta $\mu\mu c/M^3$
1305	1-15-59	1-22-59	2-13-59	3.0
Peekskill, Westchester	1-22-59	1-29-59	2-13-59	3.7
County	1-29-59	2- 4-59	2-18-59	3.6
	2- 4-59	2-11-59	2-27-59	6.2
	2-11-59	2-19-59	3- 7-59	6.2
	2-19-59	2-26-59	3-10-59	5.3
	2-26-59	3- 5-59	3-18-59	5.8
	3- 5-59	3-12-59	3-27-59	3.6
	3-12-59	3-19-59	4-29-59	3.8
	3-19-59	3-26-59	4- 5-59	6.6
	3-26-59	4- 3-59	4-14-59	5.6
	4- 3-59	4-10-59	4-19-59	5.8
	4-10-59	4-16-59	5- 5-59	5.0
	4-16-59	4-24-59	5- 5-59	6.6
	4-24-59	4-30-59	5- 5-59	5.6
	4-30-59	5- 7-59	5-17-59	3.8
	5- 7-59	5-21-59	5-22-59	6.1
	5-21-59	5-28-59	7- 3-59	4.6
	5-28-59	6- 4-59	7-15-59	2.3
	6- 4-59	6-11-59	7-26-59	2.9
	6-11-59	6-18-59	7-26-59	2.0
	6-18-59	6-26-59	8- 3-59	1.7
	6-26-59	7- 2-59	8- 3-59	0.6
	7- 2-59	7- 9-59	8- 7-59	1.8
	7- 9-59	7-17-59	8-13-59	0.7
	7-17-59	7-24-59	8-17-59	0.4
1307	3-12-59	3-19-59	3-27-59	3.9
Ossining, Westchester	3-19-59	3-26-59	4- 5-59	7.0
County	3-26-59	4- 3-59	4-14-59	5.7
	4- 3-59	4-10-59	5-30-59	3.7
	4-10-59	4-16-59	5- 5-59	4.9
	4-16-59	4-24-59	5- 5-59	6.5
	4-24-59	4-30-59	5- 5-59	5.8
	4-30-59	5- 7-59	5-19-59	4.0
	5- 7-59	5-18-59	5-22-59	5.7
	5-18-59	5-21-59	5-30-59	3.8
	5-21-59	5-28-59	7- 3-59	5.9
	5-28-59	6- 4-59	7-15-59	2.1
	6- 4-59	6-11-59	7-26-59	3.3
	6-11-59	6-18-59	7-26-59	2.0
	6-18-59	6-26-59	7-29-59	2.0
	6-26-59	7- 2-59	8- 3-59	0.6
	7- 2-59	7- 9-59	8- 7-59	1.8
	7- 9-59	7-17-59	8-13-59	0.3
	7-17-59	7-24-59	8-17-59	0.3
	7-24-59	7-30-59	8-20-59	0.6



MAP I

AIR

Location of Sampling Stations

TABLE II-A

FALLOUT

Station Number	Collection Period Start	Collection Period Stop	Date Counted	Gross Beta μμc/ft.²/day	Beta Bone Seekers μμc/ft.²/day
1103 Camp Smith	10- 9-58	10-25-58	11- 9-58	515	
	10-25-58	11-10-58	11-20-58	1200	
	11-10-58	11-24-58	12-15-58	212	
	11-24-58	12-17-58	1- 6-59	210	
	1- 6-59	1-22-59	2-16-59	408	
	1-22-59	2- 4-59	2-27-59		147
	2- 4-59	2-20-59	3-10-59		290
	2-20-59	3- 5-59	3-27-59		150
	3- 5-59	3-19-59	4- 5-59		274
	3-19-59	4- 3-59	4-19-59		355
	4- 3-59	4-16-59	5- 2-59		140
	4-16-59	4-30-59	5-17-59		206
	4-30-59	5-14-59	5-30-59		118
	5-14-59	5-28-59	7-15-59		43
	5-28-59	6-12-59	7-26-59		48
	6-12-59	6-26-59	8-10-59		122
	6-26-59	7- 9-59	8- 7-59		19
	7- 9-59	7-27-59	8- 7-59		34
	7-27-59	8- 6-59	8-28-59		33
	8- 6-59	8-20-59	9- 2-59		10
	8-20-59	9- 3-59	9-22-59		9
	9- 3-59	9-17-59	9-28-59		4
1105 Peekskill	10- 9-58	10-25-58	11- 9-58	485	
	10-25-58	11-10-58	11-20-58	590	
	11-10-58	11-24-58	12-15-58	200	
	11-24-58	12-17-58	1-16-59	172	
	1- 6-59	1-22-59	2-16-59	480	
	1-22-59	2- 4-59	2-27-59		122
	4- 4-59	2-20-59	3-14-59		205
	2-20-59	3- 5-59	3-27-59		156
	3- 5-59	3-19-59	4- 5-59		103
	3-19-59	4- 3-59	4-19-59		452
	4- 3-59	4-16-59	5- 2-59		159
	4-16-59	4-30-59	5-17-59		314
	4-30-59	5-14-59	5-30-59		78
	5-14-59	5-28-59	7-15-59		56
	5-28-59	6-12-59	7-26-59		40
	6-12-59	6-26-59	8-10-59		117
	6-26-59	7- 9-59	8- 7-59		18
	7- 9-59	7-27-59	8-16-59		21
	7-27-59	8- 6-59	8-28-59		36
	8- 6-59	8-20-59	9- 2-59		12
	8-20-59	9- 3-59	9-22-59		5
	9- 3-59	9-17-59	9-28-59		3

TABLE II-A (Con't)

FALLOUT

Station Number	Collection Period Start	Collection Period Stop	Date Counted	Gross Beta μμc/ft.²/day	Beta Bone Geckers μμc/ft.²/day
1307 Ossining	11-10-58	11-24-58	12-15-58	153	
	11-24-58	12-17-58	1-16-59	204	
	1- 6-59	1-22-59	2-16-59	396	
	1-22-59	2- 4-59	2-27-59		200
	2- 4-59	2-20-59	3-10-59		250
	2-20-59	3- 5-59	3-27-59		195
	3- 5-59	3-19-59	4- 5-59		253
	3-19-59	4- 3-59	4-29-59		378
	4- 3-59	4-16-59	5- 2-59		149
	4-16-59	4-30-59	5-17-59		275
	4-30-59	5-14-59	5-30-59		123
	5-14-59	5-28-59	7-15-59		41
	5-28-59	6-12-59	7-26-59		56
	6-12-59	6-27-59	8-10-59		107
	6-26-59	7- 9-59	8- 7-59		29
	7- 9-59	7-27-59	8-16-59		5
	7-27-59	8- 5-59	8-28-59		7
	8- 5-59	8-20-59	9- 2-59		10
	8-20-59	9- 3-59	9-22-59		5
	9- 3-59	9-17-59	9-28-59		3
2002 Stony Point	10-16-58	10-30-58	11-9 -58	900	
	10-30-58	11-13-58	11-30-58	110	
	11-13-58	11-26-58	12-18-58	158	
	11-28-58	12-11-58	1- 2-59	268	
	12-11-58	1-7 -59	1-26-59	187	
	1-8 -59	1-21-59	2-16-59	174	
	1-21-59	2- 4-59	2-27-59		101
	2- 4-59	2-19-59	3-10-59		370
	3- 4-59	3-18-59	4- 5-59		501
	3-18-59	4- 2-59	4-29-59		186
	4- 1-59	4-15-59	5- 2-59		538
	4-15-59	4-30-59	5-17-59		269
	5- 1-59	5-13-59	5-30-59		48
	5-13-59	5-27-59	6-22-59		67
	5-27-59	6-10-59	7-26-59		20
	6-10-59	6-24-59	7-29-59		33
	6-24-59	7- 8-59	8- 7-59		40
	7- 8-59	7-22-59	8-16-59		7
	7-22-59	8- 5-59	8-28-59		17
	8- 5-59	8-19-59	8-31-59		11
	8-19-59	9- 2-59	9-19-59		6
	9- 2-59	9-16-59	9-28-59		2
	9-16-59	9-29-59	10-19-59		1

TABLE II-A (Con't)

FALLOUT

Station Number	Collection Period Start	Collection Period Stop	Date Counted	Gross Beta mc/ft.^{2}/day	Beta Done Seekers mc/ft.^{2}/day
2202 Haverstraw	10-16-58	10-30-58	11- 9-58	2,000	
	10-30-58	11-13-58	12-6- 58	445	
	11-13-58	11-26-58	12-18-58	273	
	11-26-58	12-11-58	1- 2-59	286	
	12-11-58	12-24-58	1-12-59	87	
	12-29-58	1- 7-59	1-26-59	332	
	1- 7-59	1-21-59	2-26-59	372	
	1-21-59	2- 4-59	2-27-59		173
	2- 4-59	2-18-59	3-10-59		410
	2-18-59	3- 4-59	3-27-59		260
	3- 4-59	3-18-59	4- 5-59		450
	3-18-59	4- 1-59	4-19-59		210
	4- 1-59	4-15-59	5- 2-59		362
	4-15-59	4-30-59	5-17-59		235
	4-30-59	5-13-59	5-30-59		34
	5-27-59	6-10-59	7-26-59		56
	6-10-59	6-24-59	7-29-59		23
	6-24-59	7- 8-59	8- 7-59		32
	7- 8-59	7-22-59	8-17-59		7
	7-22-59	8- 5-59	8-28-59		8
	8- 5-59	8-19-59	8-31-59		8
	8-19-59	9- 2-59	9-19-59		5
	9- 2-59	9-16-59	9-28-59		4
	9-16-59	9-29-59	10-19-59		1
4301 Echo Lake	1-16-59	1-30-59	3- 7-59		86
	1-30-59	2-13-59	3- 7-59		84
	2-13-59	2-27-59	3-18-59		126
	2-27-59	3-13-59	4- 5-59		350
	3-13-59	3-27-59	4-19-59		285
	3-27-59	4-10-59	4-29-59		180
	4-10-59	4-24-59	5-17-59		102
	5- 8-59	5-22-59	6-22-59		133
	5-22-59	6- 5-59	7-15-59		16
	6- 5-59	6-19-59	7-26-59		78
	7- 3-59	7-17-59	8-20-59		14
	7-17-59	7-31-59	8-28-59		6
	7-31-59	8-14-59	8-31-59		4
	8-14-59	8-28-59	9-13-59		3
	8-28-59	9-11-59	9-25-59		5
	9-11-59	9-25-59	10-19-59		2

TABLE II-B

MONTHLY FALLOUT AVERAGES
Con. Ed. Survey-Collected bi-weekly
Remainder State-Collected weekly
μμc/ft.^{2}/day

Station	Gross Beta Oct'58	Nov.	Dec.	Jan'59	Beta Bone Seekers Feb.	Mar.	Apr.	May	June	Jul.	Aug.
1103 Camp Smith	720	508	---	---	230	290	184	76	78	30	13
1105 Peekskill	520	310	---	---	180	255	248	63	72	23	13
1307 Ossining	---	---	---	---	227	298	256	245	75	12	8
2002 Stony Pt.	800	150	213	178	---	---	393	221	33	28	10
2202 Haverstraw	1,300	425	215	359	325	323	288	40	35	13	7
4301 Echo Lake	--	--	--	--	125	297	---	---	---	--	4
Average - 6 Sta.'s	825	348	214	269	218	293	274	129	59	21	9
Albany	1520	452	110	200	112	232	267	132	72	25	14
Binghampton	--	236	115	197	59	250	154	117	73	12	8
Lockport	1080	264	132	120	240	150	256	76	29	9	4
Plattsburgh	--	---	183	153	46	102	96	134	48	10	10
Schenectady	--	---	---	---	152	190	219	265	86	12	16
Syracuse	1100	376	162	165	208	180	210	---	--	26	12
Average 6 Sta's	1233	332	140	167	136	184	200	145	62	16	11

MAP 2

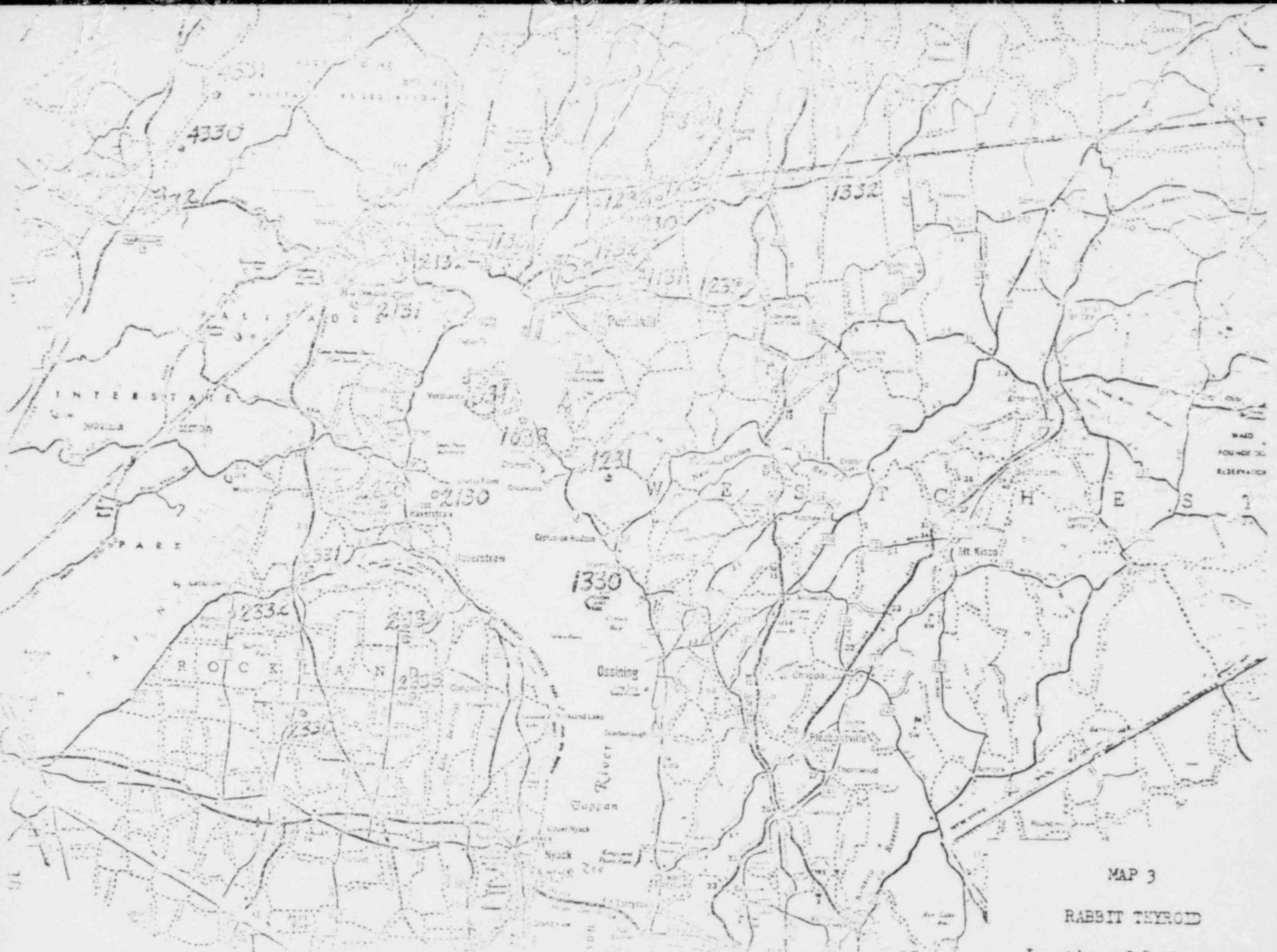
FALLOUT

Location of Collection

TABLE III

RABBIT THYROID

Health Department Number	Conservation Department Number	Date Killed	Date Counted	I-131 mμc
1030-R-1	5	9-10-58	9-19-58	0
1030-R-2	37	8-21-59	8-27-59	0
1031-R-1	9	10-25-58	10-28-58	Low Level
1031-R-2	29	1-28-59	1-30-59	20.3
1031-R-3	23	3-10-59	4- 7-59	0
1032-R-1	27	5- 2-59	5- 5-59	0
1033-R-1	38	9- 6-59	9-14-59	0
1130-R-1	4	9-10-58	9-19-58	0
1131-R-1	10	12-27-58	12-31-58	0
1132-R-1	21	3- 4-59	4- 6-59	0
1132-R-2	30	7- 8-59	7-15-59	0
1230-R-1	1	9- 8-58	9-19-58	0
1231-R-1	11	12-27-58	12-31-58	0
1232-R-1	14	1-11-59	1-16-59	0
1233-R-1	24	3-24-59	4- 7-59	0
1234-R-1	36	8-12-59	8-17-59	0
1330-R-1	3	9- 9-58	9-19-58	0
1330-R-2	12	12-28-58	12-31-58	0
1330-R-3	31	7-10-59	7-15-59	0
1332-R-1	22	3- 6-59	4- 7-59	0
2130-R-1	15	1-17-59	1-22-59	0
2131-R-1	18	1-27-59	1-29-59	13.5
2230-R-1	7	9-15- 58	9-19-58	0
2230-R-2	27	4- 6-59	4-14-59	0
2230-R-3	34	8- 5-59	8-11-59	0
2330-R-1	8	9-16-58	9-19-58	0
2331-R-1	13	1- 7-59	1-16-59	0
2332-R-1	25	3-26-59	4- 7-59	0
2333-R-1	28	4- 7-59	4-14-59	0
2334-R-1	35	8- 5-59	8-11-59	0
3330-R-1	2	9- 9-58	9-19-58	0
3330-R-2	39	9- 8-59	9-14-59	0
3331-R-1	16	1-18-59	1-26-59	17.6
3331-R-2	26	3-27-59	4- 7-59	0
4330-R-1	6	9-15-58	9-19-58	0
4331-R-1	6A	9-13-58	9-19-58	0
4332-R-1	17	1-23-59	1-26-59	1.4
4332-R-2	20	3- 2-59	4- 7-59	0



MAP 3

RABBIT THYROID

TABLE IV

VEGETATION
Westchester County

Sample Number		Date Collected	Date Examined	*Type of Vegetation	μμc/gram Beta Bone Ceeker
1001	V-1	6-30-58	9-16-59	P	7
	V-2	11-20-58	8-25-59	?	27
	V-3	3-21-59	9-2 -59	E	102
	V-4	6- 4-59	9- 2-59	F	56
1002	V-1	6-30-58	9-16-59	P	9
	V-2	11-20-58	8-25-59	P	88
	V-3	3-26-59	9- 2-59	E	50
	V-4	6- 4-59	9- 2-59	F	35
1101	V-1	6-30-58	9-16-59	P	17
	V-2	11-20-58	8-25-59	P	40
	V-3	4- 6-59	9- 2-59	F	103
	V-4	5-27-59	9- 8-59	P	61
1102	V-1	6-30-58	9-16-59	P	14
	V-2	11-20-58	8-25-59	H.B.	40
	V-3	3-26-59	9- 2-59	P	110
	V-4	6- 4-59	9-13-59	P	45
1103	V-1	7-18-58	9-16-59	P	23
	V-2	11-25-58	8-25-59	P	66
	V-3	4- 3-59	9- 2-59	P	198
	V-4	5-27-59	9-13-59	P	78
1104	V-1	7-18-58	9-16-59	P	10
	V-2	11-26-58	8-25-59	F	68
	V-3	4- 3-59	9- 2-59	F	106
	V-4	5-27-59	9-13-59	F	43
1105	V-1	7-18-58	9-16-59	P	13
	V-2	11-25-58	8-25-59	P	56
	V-3	4- 3-59	9- 2-59	C	61
	V-4	5-27-59	9-13-59	P	37
1201	V-1	7-18-58	9-16-59	P	15
	V-2	11-26-58	8-25-59	L	19
	V-3	4- 3-59	9- 2-59	L	58
	V-4	5-26-59	9-13-59	L	39

* P= Planton
E= Evergreen
F= Fern
L= Laurel
?= Not Identified

O.L.= Oak Leaf
H.B.= Hemlock Bough
C= Cedar
H.S.= Honey Suckle
I = Ivy

S.C.= Skunk Cabbage
S= Spruce
M=Mullen Plant
G= Grass
W= Weeds

TABLE IV

Wayne County (cont'd) Page 2

Sample Number		Date Collected	Date Examined	Type of Vegetation	µµc/gram Bone Seeker
1202	V-1	7-18-58	9-16-59	P	12
	V-2	11-25-58	8-25-59	P	106
	V-3	4- 3-59	9- 2-59	F	150
	V-4	5-27-59	9-13-59	P	37
1301	V-1	7-22-58	9-16-59	P	26
	V-2	11-28-58	8-25-59	P	115
	V-3	4- 1-59	9- 2-59	F	181
	V-4	6- 4-59	9-13-59	P	27
1302	V-1	7-18-58	9-16-59	P	14
	V-2	11-28-58	8-25-59	M	23
	V-3	4- 6-59	9- 2-59	E	95
	V-4	5-25-59	9-13-59	P	26
1303	V-1	8-14-58	9-16-59	P	16
	V-2	12- 1-58	8-25-59	F	70
	V-3	4- 2-59	9- 2-59	E	78
	V-4	5-26-59	9-13-59	P	68
1304	V-1	7-21-58	9-16-59	P	35
	V-2	12-1 -58	8-25-59	F	13
	V-3	4- 1-59	9- 2-59	F	124
	V-4	5-26-59	9-13-59	P	37
1305	V-1	7-21-58	9-16-59	P	34
	V-2	12- 1-58	8-25-59	P	14
	V-3	4- 1-59	9- 2-59	P	109
	V-4	5-25-59	9-13-59	P	41
1306	V-1	7-22-58	9-16-59	P	20
	V-2	12-2-58	8-25-59	P	17
	V-3	3-26-59	9- 2-59	E	89
	V-4	5-27-59	9-13-59	P	50
1307	V-1	6-30-58	9-16-59	P	21
	V-2	11-24-58	8-25-59	P	43
	V-3	4- 2-59	9- 2-59	P	55
	V-4	5-26-59	9-13-59	P	32
1308	V-1	7-22-58	9-16-59	P	22
	V-2	12- 2-58	8-25-59	P	107
	V-3	4- 1-59	9- 2-59	G	76
	V-4	5-27-59	9-13-59	P	44

TABLE IV

Westchester County (Con't) Page 3

Sample Number		Date Collected	Date Examined	Type of Vegetation	µµc/gram Beta Bone Ash
1309	V-1	7-22-58	9-16-59	P	27
	V-2	12- 2-58	8-25-59	P	67
	V-3	4- 7-59	9- 2-59	G	71
	V-4	5-29-59	9-16-59	P	40
1310	V-1	7-21-58	9-16=59	P	25
	V-2	12- 9-58	8-25-59	L	10
	V-3	4- 6-59	9- 2-59	P	166
	V-4	5-25-59	9-16-59	P	164
1401	V-1	7-22-58	9-22-59	P	5
	V-2	12- 9-58	8-25-59	M	110
	V-3	4- 7-59	9- 2-59	W	168
	V-4	5-22-59	9-16-59	P	37
1402	V-1	7-22-58	9-22-59	P	5
	V-2	12-11-58	8-25-59	?	[illegible]
	V-3	4- [illegible]-59	[illegible] 2-59	F	74
	V-4	5-29-59	9-16-59	P	41
1403	V-1	7-23-58	9-22-59	P	16
	V-2	12-11-58	8-25-59	E	21
	V-3	4- 8-59	9- 2-59	L	72
	V-4	5-25-59	9-16-59	L	56
1404	V-1	6-30-58	9-22-59	P	5
	V-2	12-12-58	8-25-59	H	9
	V-3	4- 6-59	9- 2-59	E	32
	V-4	6-21-59	9-16-59	P	28
1405	V-1	7-22-58	9-22-59	P	7
	V-2	12-12-58	8-25-59	E	47
	V-3	4- 9-59	9- 2-59	E	62
	V-4	6- 2-59	9-16-59	P	39
1406	V-1	7-28-58	9-22-59	P	21
	V-2	12-12-58	8-25-59	H.S.	39
	V-3	4- 3-59	8-25-59	P	187
1407	V-1	7-29-58	9-22-59	P	7
	V-2	12-17-58	8-25-59	P	72
	V-3	4- 8-59	9- 2-59	F	100
	V-4	6- 4-59	9-16-59	P	16
1408	V-1	7-23-58	9-22-59	P	11
	V-2	12- 5-58	8-25-59	P	59
	V-3	4- 8-59	9- 2-59	S.C.	141
	V-4	6- 2-59	9-16-59	P	58

TABLE IV

Westchester County (Con't)

Sample Number		Date Collected	Date Examined	Type of Vegetation	µµc/gram Beta Bone Ash
1409	V-1	8-14-58	9-22-59	P	4
	V-2	12-18-58	8-25-59	F	49
	V-3	4- 7-59	9- 2-59	L	120
	V-4	5-25-59	9-16-59	P	86
1410	V-1	7-28-58	9-22-59	P	7
	V-2	12-19-58	8-25-59	F	47
	V-3	4- 9-59	9- 2-59	F	319
	V-4	6- 2-59	9-16-59	P	64
1411	V-1	7-28-58	9-22-59	P	39
	V-2	12-19-58	8-25-59	S	11
	V-3	4- 9-59	9- 2-59	S	86
	V-4	6- 2-59	9-16-59	P	162
1412	V-1	7-28-58	9-22-59	P	14
	V-2	12-19-58	8-25-59	E	17
	V-3	4- 8-59	9- 2-59	F	9
	V-4	6- 2-59	9-16-59	P	49

TABLE IV

VEGETATION SAMPLES

ROCKLAND COUNTY

Sample Number		Date Collected	Date Examined	Type of Vegetation	uuc/gram Beta Long Lesher
2001	V-1	10-30-58	9-22-59	L	45
	V-2	6-19-59	9- 2-59	L	13
	V-3	9-13-59	10- 5-59	L	11
2002	V-1	10-30-58	9-22-59	L	78
	V-2	6-19-59	9- 2-59	L	34
	V-3	9-18-59	10- 5-59	L	34
2101	V-1	10-30-58	9-22-59	O.L.	68
	V-2	6-19-59	9- 2-59	L	35
	V-3	9-18-59	10- 5-59	L	28
2102	V-1	10-30-58	8-25-59	L	55
	V-2	6-19-59	9- 2-59	L	51
	V-3	9-18-59	10- 5-59	L	29
2103	V-1	10-30-58	8-25-59	L	13
	V-2	3- 5-59	8-25-59	I	31
	V-3	6-19-59	9-2- 59	L	20
	V-4	9-18-59	10-14-59	L	13
2201	V-1	10-30-58	8-25-59	L	93
	V-2	6-19-59	9- 2-59	L	20
	V-3	9-18-59	10-14-59	L	10
2202	V-1	10-30-58	8-25-59	L	43
	V-2	6-19-59	9- 2-59	L	29
	V-3	9-18-59	10-14-59	L	4
2301	V-1	10-30-58	8-25-59	L	23
	V-2	3- 5-59	8-25-59	L	30
	V-3	6-19-59	9- 2-59	L	45
	V-4	9-18-59	10-14-59	L	35
2302	V-1	10-30-58	8-25-59	?	46
	V-2	3- 5-59	8-25-59	L	27
	V-3	6-19-59	9- 2-59	L	26
	V-4	9-18-59	10-14-59	L	14

TABLE IV

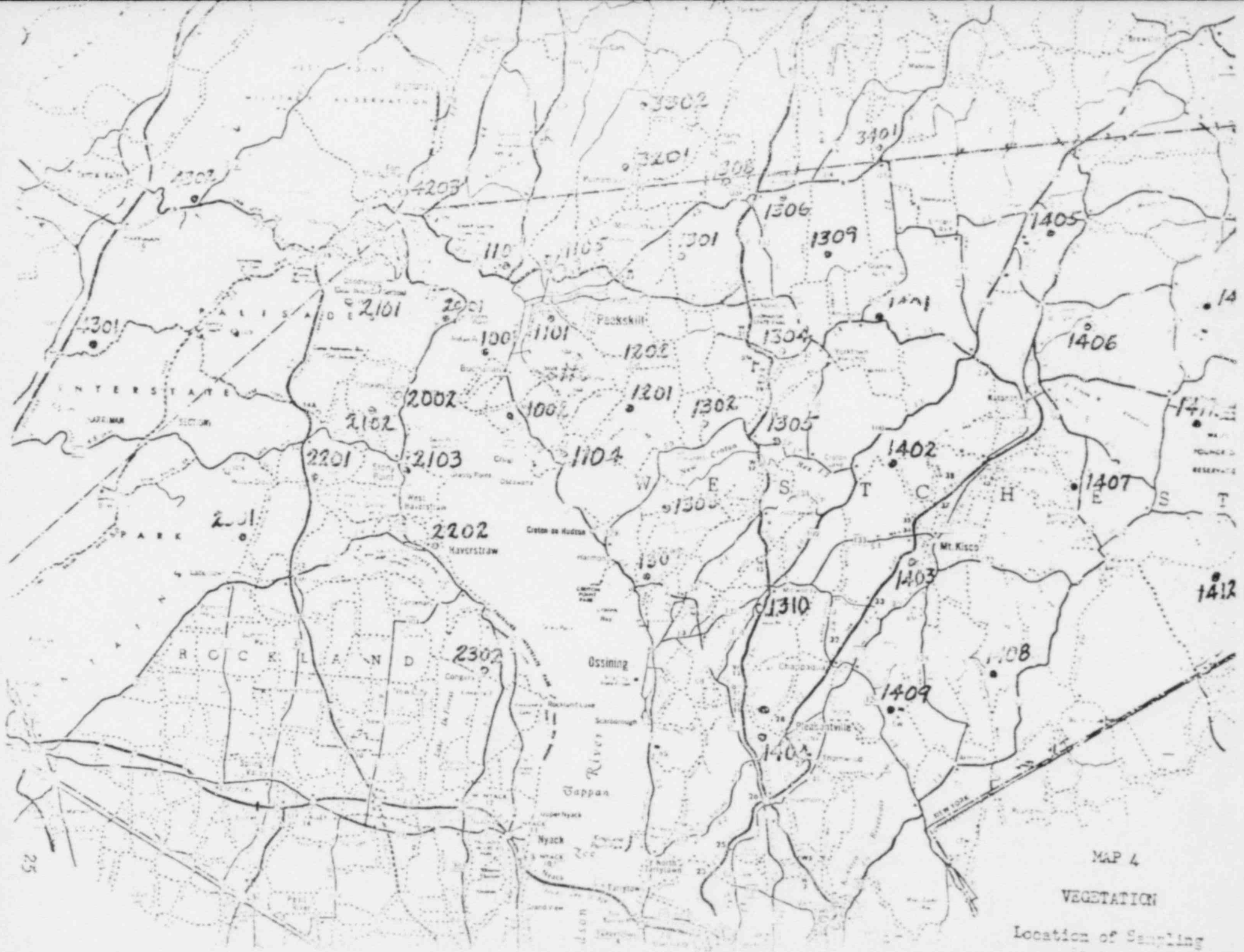
VEGETATION SAMPLES

Orange County

Sample Number		Date Collected	Date Examined	Type of Vegetation	µµc/gram Beta Bone Seeker
4203	V-1	10- 9-58	9-16-59	P	24
4301	V-1	10- 9-58	9-16-59	F	26
4302	V-1	10- 9-58	9-16-59	L	9
	V-2	4- 3-59	9-16-59	L	66

Putnam County

3201	V-1	10- 8-58	9-16-59	P	15
	V-2	5- 8-59	9-16-59	P	105
3302	V-1	10- 8-58	9-16-59	P	29
3401	V-1	10- 8-58	9-16-59	P	21
	V-2	5- 8-59	9-16-59	P	36



MAP 4

VEGETATION

Location of Sampling

TABLE V
Water
Westchester County

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Beta Rose Seekers μμc/l
1001	W-1	8-12-58	12- 3-58	0.007± 0.005	
	W-2	11-20-58	1-12-59	0.015 ± 0.002	
	W-3	4- 7-59	6-29-59		0.019
	W-4	6- 9-59	7-15-59		0.009
1101	W-1	8-12-58	12- 6-58	0.015 ± 0.006	
	W-2	11-20-58	1-12-59	0.077 ± 0.005	
	W-3	4- 7-59	6-22-59		0.035
	W-4	6- 9-59	7-26-59		0.025
1102	W-1	8-12-58	12- 3-58	0.004 ± 0.005	
	W-2	11-20-58	1-12-59	0.009 ± 0.002	
	W-3	4- 7-59	6-22-59		0.021
	W-4	6- 9-59	7-15-59		0.009
1103	W-1	8-14-58	12- 6-58	0.002 ± 0.006	
	W-2	11-25-58	1-12-59	0.007 ± 0.002	
	W-3	4- 7-59	6-22-59		0.012
	W-4	6- 9-59	7-15-59		0.006
1104	W-1	8-12-58	12-3 -58	0.006 ± 0.006	
	W-2	11-26-58	1-12-59	0.025 ± 0.002	
	W-3	4- 7-59	6-29-59		0.008
	W-4	6- 9-59	7-15-59		0.001
1105	W-1	8-12-58	12- 6-58	0.005 ± 0.006	
	W-2	11-25-58		0.004 ± 0.002	
	W-3	4- 7-59	6-29-59		0.013
	W-4	6- 9-59	7-26-59		0.006
1201	W-1	8-13-58	12-6-58	0.015 ± 0.006	
	W-2	11-26-58	1-12-59	0.040 ± 0.003	
	W-3	4- 7-59	6-22-59		0.025
	W-4	6- 9-59	7-15-59		0.016
1301	W-1	8-12-58	12- 6-58	0.023 ± 0.006	
	W-2	11-28-58	1-12-59	0.018 ± 0.002	
	W-3	4- 7-59	6-22-59		0.025
	W-4	6- 9-59	7-26-59		0.014
1302	W-1	8-13-58	12-3 -58	0.009 ± 0.005	
	W-2	11-28-58	1-12-59	0.009 ± 0.002	
	W-3	4- 8-59	6-22-59		0.009
	W-4	6- 9-59	7-26-59		0.011

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Beta Bone Seekers μμc/ml
1303	W-1	8-14-58	12-6 -58	0.008 ± 0.006	
	W-2	12- 1-58	1-12-59	0.049 ± 0.004	
	W-3	4- 7-59	6-22-59		0.017
	W-4	6- 9-59	7-26-59		0.017
1304	W-1	8-13-58	12- 3-58	0.010 ± 0.005	
	W-2	12- 1-58	1-12-59	0.027 ± 0.002	
	W-3	4- 7-59	6-29-59		0.017
	W-4	6- 9-59	7-15-59		0.001
1305	W-1	8-13-58	11-30-58	0.009 ± 0.006	
	W-2	12- 1-58	1-12-59	0.018 ± 0.002	
	W-3	4- 7-59	6-22-59		0.012
	W-4	6- 9-59	7-26-59		0.011
1306	W-1	8-13-58	12- 3-58	0.005 ± 0.005	
	W-2	12- 2-58	1-12-59	0.014 ± 0.002	
	W-3	4- 7-59	6-22-59		0.017
	W-4	6- 9-59	7-15-59		0.009
1307	W-1	8-13-58	12- 3-59	0.007 ± 0.005	
	W-2	11-24-58	1-12-59	0.016 ± 0.002	
	W-3	4- 7-59	6-29-59		0.014
	W-4	6- 9-59	7-15-59		0.011
1308	W-1	8-12-58	12- 6-58	0.002 ± 0.006	
G*	W-2	12- 2-58	1-12-59	0.002 ± 0.002	
	W-3	4- 8-59	6-29-59		0.002
	W-4	6-10-59	7-26-59		0.001
1309	W-1	8-14-58	11-30-58	0.004 ± 0.006	
	W-2	12- 2-58	1-12-59	0.023 ± 0.002	
	W-3	4- 8-59	6-29-59		0.005
	W-4	6-10-59	7-15-59		0.010
1310	W-1	8-14-58	12- 6-58	0.031 ± 0.007	
	W-2	12- 2-58	1-12-59	0.005 ± 0.002	
	W-3	4- 8-59	6-22-59		0.005
	W-4	6-10-59	7-26-59		0.010
1401	W-1	8-12-58	11-30-58	0.009 ± 0.006	
	W-2	12- 9-58	1-12-59	0.012 ± 0.002	
	W-3	4- 6-59	6-22-59		0.013
	W-4	6-10-59	7-26-59		0.010

*(G-ground water supply)

TABLE V

Westchester County, continued

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Beta Bone Seekers μμc/ml
1402	W-1	8-12-58	11-30-58	0.008 ± 0.006	
	W-2	12-11-58	1-12-59	0.006 ± 0.002	
	W-3	4- 8-59	6-22-59		0.006
	W-4	6-10-59	7-15-59		0.009
1404	W-1	8-14-58	12- 3-58	0.005 ± 0.006	
*G	W-2	12-12-58	1-12-59	0.004 ± 0.002	
	W-3	4- 8-59	6-29-59		0.000
	W-4	6-10-59	7-15-59		0.001
1405	W-1	8-12-58	11-28-58	0.015 ± 0.006	
	W-2	12-12-58	1-12-59	0.011 ± 0.002	
	W-3	4- 6-59	6-29-59		0.013
	W-4	6- 9-59	7-15-59		0.014
1406	W-1	8-12-58	11-28-58	0.002 ± 0.005	
	W-2	12-12-58	1-12-59	0.061 ± 0.004	
	W-3	4- 6-59	7- 3-59		0.061
	W-4	6- 9-59	7-26-59		0.020
1407	W-1	8-12-58	11-28-58	0.009 ± 0.005	
	W-2	12-17-58	1-12-59	0.005 ± 0.002	
	W-3	4- 6-59	6-29-59		0.008
	W-4	6-10-59	7-15-59		0.012
1408	W-1	8-18-58	11-28-58	0.010 ± 0.005	
	W-2	12-18-58	1-12-59	0.018 ± 0.002	
	W-3	4-25-59	6-29-59		0.011
	W-4	6- 9-59	7-26-59		0.012
1409	W-1	8-14-58	12- 6-58	0.012 ± 0.006	
	W-2	12-18-58	1- 2-59	0.012 ± 0.002	
	W-3	4- 8-59	6-22-59		0.023
	W-4	6- 9-59	7-15-59		0.015
1410	W-1	8-12-58	11-28-58	0.025 ± 0.006	
	W-2	12-19-58	1-12-59	0.008 ± 0.002	
	W-3	4- 8-59	6-22-59		0.012
	W-4	6- 9-59	7-15-59		0.010
1412	W-1	8-18-58	12- 3-58	0.018 ± 0.005	
	W-2	12-19-58	1-12-59	0.028 ± 0.003	
	W-3	4- 8-59	6-29-59		0.021
	W-4	6- 9-59	7-15-59		0.019

* (G-ground water supply)

TABLE V (Con't.)

ROCKLAND COUNTY

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Beta Bone Seekers μμc/ml
2110	W-1	8-19-58	11-22-58	0.007 ± 0.005	
	W-2	11-18-58	12-12-58	0.009 ± 0.002	
G*	W-3	3-20-59	4-14-59		0.003
	W-4	6-26-59	8- 3-59		0.002
2210	W-1	8-19-58	11-26-58	0.001 ± 0.006	
	W-2	11-17-58	12-12-58	0.000 ± 0.001	
G*	W-3	3-20-59	4-19-59		0.001
	W-4	6-26-59	7-29-59		0.000
2211	W-1	8-19-58	11-26-58	0.003 ± 0.006	
	W-2	11-17-58	12-12-58	0.001 ± 0.001	
G*	W-3	3-20-59	4-14-59		0.001
	W-4	6-26-59	8- 3-59		0.000
2212	W-1	8-19-58	10-26-58	0.005 ± 0.002	
	W-2	11-17-58	12-12-58	0.010 ± 0.002	
	W-3	3-20-59	4-14-59		0.008
	W-4	6-26-59	7-29-59		0.003
2213	W-1	8-19-58	10-26-58	0.006 ± 0.003	
	W-2	11-18-58	12- 6-58	0.005 ± 0.006	
G*	W-3	3-20-59	4-14-59		0.001
	W-4	6-26-59	8- 3-59		0.000
2310	W-1	8-19-58	11-26-58	0.015 ± 0.005	
	W-2	11-19-58	12- 8-58	0.020 ± 0.005	
	W-3	3-20-59	4-14-59		0.014
	W-4	6-26-59	7-29-59		0.013
2311	W-1	8-19-58	11-26-58	0.000 ± 0.005	
G*	W-2	11-17-58	12-12-58	0.001 ± 0.001	
2312	W-1	8-19-58	11-26-58	0.000 ± 0.006	
	W-2	11-19-58	12-12-58	0.001 ± 0.001	
G*	W-3	3-20-59	4-14-59		0.001
	W-4	6-26-59	8- 3-59		0.001
2313	W-1	8-19-58	11-26-58	0.001 ± 0.006	
	W-2	11-19-58	12-12-58	0.005 ± 0.002	
G*	W-3	3-20-59	4-16-59		0.001
	W-4	6-26-59	8- 3-59		0.000

* (G-ground water supply)

TABLE V

ROCKLAND COUNTY (Con't)

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Beta Bone Seekers μμc/ml
2314	W-1	8-19-58	11-26-58	0.002 ± 0.006	
G*	W-2	11-19-58	12 -6-58	0.005 ± 0.007	
2315	W-1	8-18-58	11-28-58	0.014 ± 0.006	
	W-2	5-18-59	6-29-59		0.020
	W-3	7-29-59	8-20-59		0.008
2316	W-1	8-21-58	11-26-58	0.005 ± 0.005	
	W-2	5-18-59	6-29-59		0.027
	W-3	7-29-59	8-20-59		0.009
2317	W-1	3-20-59	4-14-59		0.020
	W-2	6-26-59	8- 3-59		0.039
2318	W-1	3-20-59	4-14-59		0.013
	W-2	6-26-59	8- 3-59		0.007
2319	W-1	3-20-59	4-14-59		0.023
	W-2	6-26-59	8- 3-59		0.022
2410	W-1	8-19-58	10-26-58	0.001 ± 0.001	
	W-2	11-19-58	12- 6-58	0.001 ± 0.006	
G*	W-3	3-20-59	4-14-59		0.001
	W-4	6-23-59	8- 3-59		0.001
2411	W-1	8-19-58	11-26-58	0.009 ± 0.005	
	W-2	11-19-58	12-12-58	0.012 ± 0.002	
	W-3	3-20-59	4-14-59		0.019
	W-4	6-26-59	8- 3-59		0.008
2412	W-1	8-19-58		0.001 ± 0.008	
	W-2	11-19-58	12-12-58	0.009 ± 0.002	
G*	W-3	3-20-59	4-14-59		0.002
	W-4	6-26-59	8- 3-59		0.001
2413	W-1	8-18-58	11-28-58	0.009 ± 0.005	
	W-2	5-18-59	6-29-59		0.017
	W-3	7-29-59	8-20-59		0.006

*(G-ground water supply)

TABLE V (Con't)

ORANGE COUNTY

Sample Number		Date Collected	Date Examined	Gross Beta μμc/ml	Bone Seekers μμc/ml
4210	W-1	8-21-58	12-8-58	0.026 ± 0.006	
	W-2	5-18-59	6-29-59		0.013
	W-3	7-29-59	8-20-59		0.005
4310	W-1	10- 9-58	11-28-58	0.004 ± 0.005	
	W-2	4-10-59	5- 2-59		0.034
	W-3	7-21-59	8-16-59		0.005
4311	W-1	1-19-59	1-29-59	0.015 ± 0.002	
	W-2	3-18-59	4-14-59		0.014
	W-3	4-15-59	5-11-59		0.006
	W-4	7-21-59	8-20-59		0.004
4312	W-1	8-18-58	11-28-58	0.008 ± 0.005	
	W-2	5-18-59	6-29-59		0.011
	W-3	7-29-59	8-20-59		0.006
4313	W-1	8-21-58	11-28-58	0.008 ± 0.005	
	W-2	5-17-59	6-29-59		0.064
	W-3	7-29-59	8-20-59		0.008
4314	W-1	8-13-58	10-26-58	0.009 ± 0.002	
	W-2	5-18-59	6-29-59		0.017
	W-3	7-29-59	8-20-59		0.006
4315	W-1	1-26-59	2-16-59	0.025 ± 0.002	
	W-2	3-19-59	4-14-59		0.034
	W-3	7-22-59	8-16-59		0.006
4410 *G	W-1	1-16-59	1-29-59	0.0009 ± 0.0018	
4411	W-1	1-19-59	1-29-59	0.014 ± 0.002	
	W-2	4-15-59	5-11-59		0.017
	W-3	7-21-59	8-20-59		0.010
4412	W-1	8-13-58	10-26-58	0.007 ± 0.002	
	W-2	5-18-59	6-29-59		0.017
	W-3	7-29-59	8-20-59		0.005
4413	W-1	1-26-59	2-18-59	0.001 ± 0.001	
	W-2	3-17-59	4-14-59		0.000
*G	W-3	7-27-59	8-20-59		0.001

*(G-ground water supply)

4413
4411
4313
4312
4210
4212
2214
2316
2315
2212
2311
2412
2411
2417
1001
1101
1102
1103
1104
1105
1201
1202
1301
1302
1306
1308
1309
1310
1401
1402
1403
1405
1406
1407
1408
R O C K L A N D
W E S T C H E S T
Peekskill
Haverstraw
Ossining
River
Mt. Kisco

TABLE VI

HUDSON RIVER SAMPLES - MUD, PLANKTON, FISH, WATER

At Croton Point

Type Sample	Depth-ft.	Date Collected	Date Counted	Beta-Bone Seekers μμc/gm	Beta-Bone Seekers μμc/ml	Gross Beta μμc/ml
Mud	23'(#12 Bouy)	9-4-58	9-22-59	4		
"	10'(N-Cove)	"	"	4		
"	10'	5-25-59	"	9		
"	30'	"	"	5		
Plankton	--	9-4-58	9-22-59	10		
"	10'	5-25-59	"	30		
Fish	North Cove	9-4-58	9-22-59	0.7		
"	" "	5-25-59	"	0.9		
Water	12' in 23'	9- 4-58	12-12-58			0.038
"	6' in 10'	9- 4-58	"			0.025
"	0.5'	4- 7-59	6-22-59		0.012	
"	15' in 30'	5-25-59	6-29-59		0.006	
"	6' in 10'	5-25-59	6-29-59		0.005	
"	0.5'	6-10-59	7-15-59		0.007	

At Manitou Beach

Mud	5	9- 4-58	9-22-59	5		
"	80	"	"	4		
"	-	5-25-59	"	39		
"	-	"	9-27-59	52		
Plankton	-	10-4-58	9-22-59	16		
"	75	5-25-59	"	26		
Fish	-	9-14-59	9-22-59	1.0		
"	-	5-25-59	"	1.0		
River Water	50 in 80	9- 5-58	12-12-58			0.019

TABLE VII

HUDSON RIVER WATER RESULTS AS POSTED
BY U.S.P.H.S., AT I.B.M. PLANT, POUGHKEEPSIE

Date Collected	Date Counted	Gross Beta Count - μμc/ml Suspended	Dissolved	Total
6- 9-58	6-16-58	0.007	0.021	0.028
6-16-58	6-20-58	0.002	0.025	0.027
6-23-58	6-30-58	0.004	0.002	0.006
6-30-58	7- 9-58	0.009	0.024	0.033
7- 7-58	7-11-58	0.001	0.008	0.009
7-14-58	7-23-58	0.003	0.010	0.013
7-21-58	8- 1-58	0.000	0.004	0.004
7-28-58	8- 7-58	0.004	0.087	0.091
8-11-58	8-20-58	0.001	0.014	0.015
8-18-58	8-29-58	0.000	0.009	0.009
8-25-58	9- 2-58	0.005	0.028	0.033
9- 2-58	9-11-58	0.006	0.017	0.017
9- 8-58	9-16-58	0.002	0.016	0.018
10- 6-58	10-15-58	0.002	0.021	0.023
10-20-58	10-28-58	0.000	0.010	0.010
10-27-58	11- 5-58	0.017	0.054	0.071
11- 3-58	11-14-58	0.156	0.100	0.256
	11-26-58	0.110	0.075	0.185
	12- 2-58	0.103	0.073	0.176
	12- 8-58	0.089	0.073	0.162
	12-16-58	0.075	0.046	0.121
11-10-58	11-21-58	0.013	0.044	0.057
11-17-58	11-28-58	0.003	0.033	0.036
11-24-58	12- 9-58	0.027	0.028	0.055
12- 1-58	12-12-58	0.005	0.015	0.020
12- 8-58	12-23-58	0.046	0.021	0.067
12-15-58	12-24-58	0.008	0.022	0.030
12-22-58	1-6- 59	0.004	0.032	0.036
12-29-58	1-14-59	0.008	0.016	0.024
1- 5-59	1-22-59	0.000	0.008	0.008
1-12-59	1-29-59	0.001	0.019	0.020
1-21-59	2-9- 59	0.000	0.010	0.010
1-28-59	2-11-59	0.033	0.066	0.099
2- 4-59	2-18-59	0.177	0.085	0.262
2- 9-59	2-27-59	0.051	0.049	0.100
2-16-59	3- 5-59	0.029	0.046	0.075
2-25-59	3-11-59	0.044	0.066	0.110
3- 4-59	3-16-59	0.036	0.069	0.107
3- 9-59	3-20-59	0.044	0.056	0.100
3-16-59	3-27-59	0.068	0.089	0.157
3-25-59	4- 3-59	0.079	0.093	0.172
4- 1-59	4-13-59	0.016	0.034	0.050
4- 6-59	4-20-59	0.036	0.043	0.079
4-13-59	4-27-59	0.026	0.078	0.104
4-20-59	4-30-59	0.076	0.021	0.097

TABLE VII (Con't)

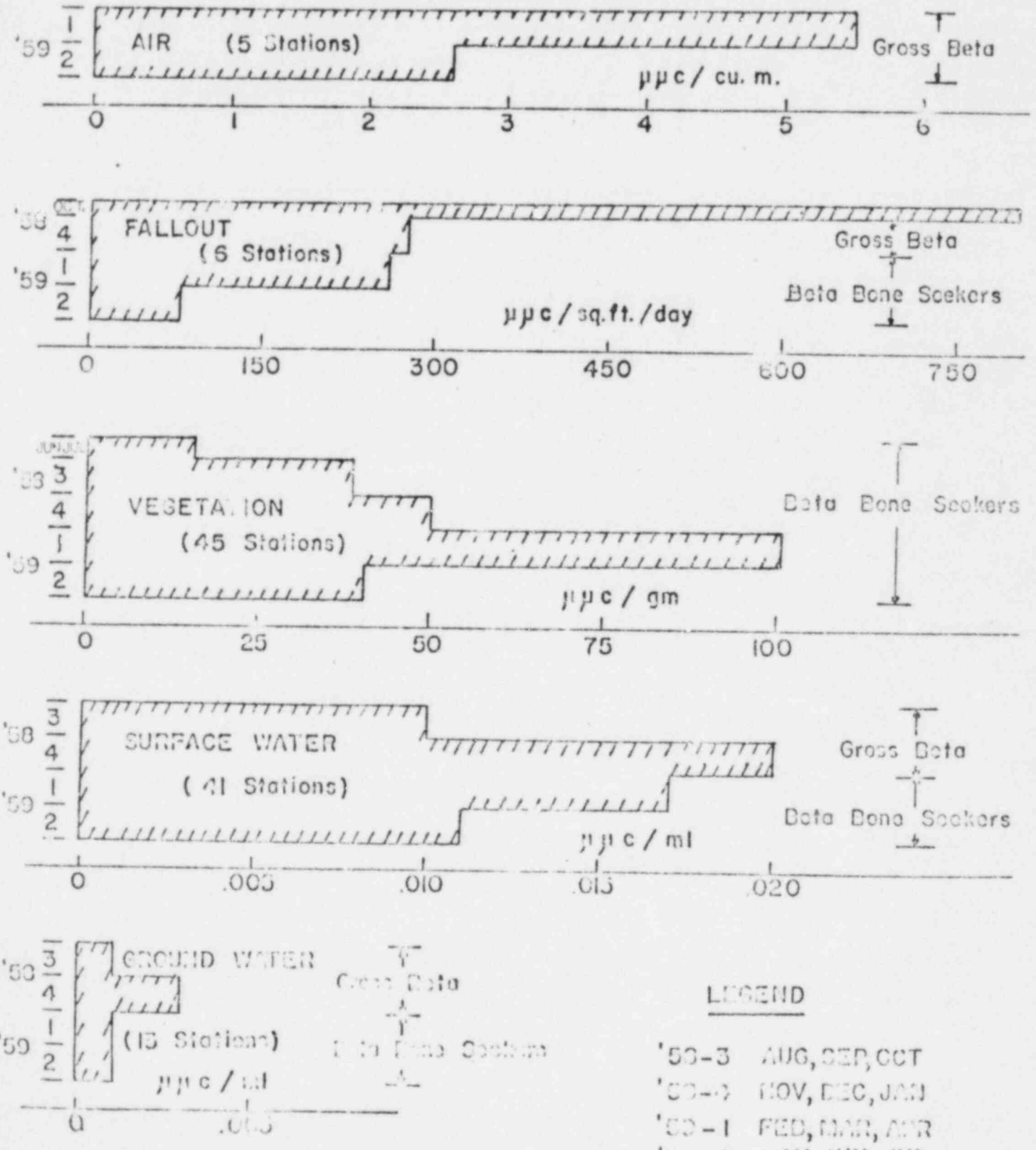
HUDSON RIVER WATER RESULTS REPORTED

BY U.S.P.H.S. AT J.B.M. PLANT, POUGHKEEPSIE

Date Sampled	Date Counted	Suspended	uuc/ml - B. Count Dissolved	Total
4-27-59	5-12-59	0.006	0.009	0.015
5- 6-59	5-21-59	0.000	0.000	0.000
5-13-59	5-25-59	0.118	0.143	0.261
5-20-59	6- 1-59	0.007	0.034	0.041
5-27-59	6- 9-59	0.043	0.030	0.073
6- 1-59	6-16-59	0.017	0.049	0.066
6- 8-59	6-19-59	0.005	0.009	0.014
6-15-59	7- 7-59	0.010	0.029	0.039
6-22-59	7- 9-59	0.007	0.052	0.059
6-29-59	7-12-59	0.000	0.001	0.001
7- 6-59	8- 6-59	0.015	0.003	0.018
7-13-59	8- 7-59	0.000	0.009	0.009
7-20-59	8- 7-59	0.007	0.001	0.008
7-29-59	8-10-59	0.002	0.009	0.011
8- 5-59	8-11-59	0.006	0.026	0.032
8-12-59	8-20-59	0.004	0.018	0.022
8-19-59	8-31-59	0.000	0.000	0.000
8-26-59	9- 3-59	0.012	0.005	0.017
9- 9-59	9-21-59	0.003	0.011	0.014
9-23-59	10- 5-59	0.001	0. 2	0.003
9-30-59	10- 9-59	0.000	0.006	0.006
10-14-59	10-26-59	0.000	0.002	0.002

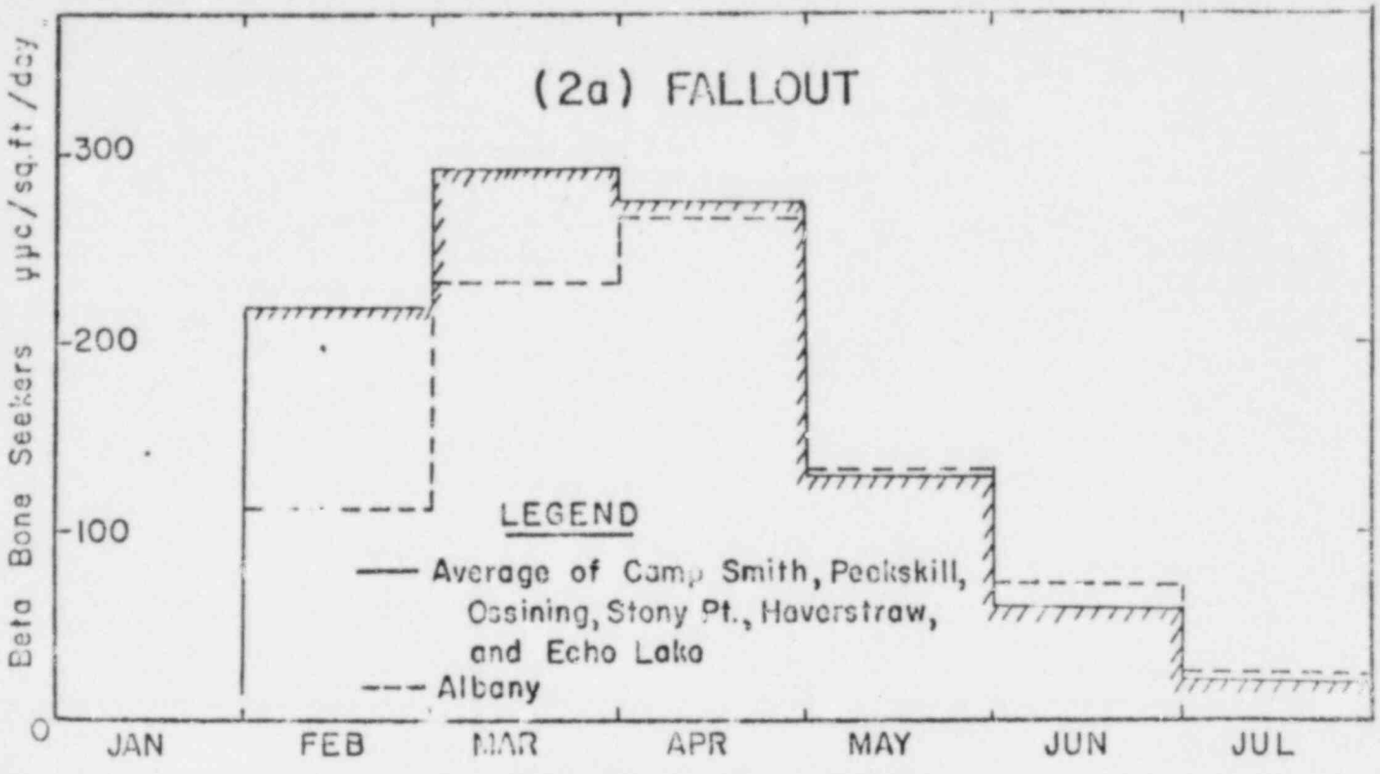
FIGURE 1

AIR, FALLOUT, VEGETATION, and WATER
Gross Beta and Beta Bone Seekers
BY THREE MONTH PERIODS FROM JUNE 1958



LEGEND

'58-3 AUG, SEP, OCT
'58-4 NOV, DEC, JAN
'59-1 FEB, MAR, APR
'59-2 MAY, JUN, JUL



FIGURES 2a and 2b

FALLOUT and AIR (Gross Data and Beta Bone Seekers)
CONSOLIDATED EDISON STATIONS and ALBANY (From Jan '59)

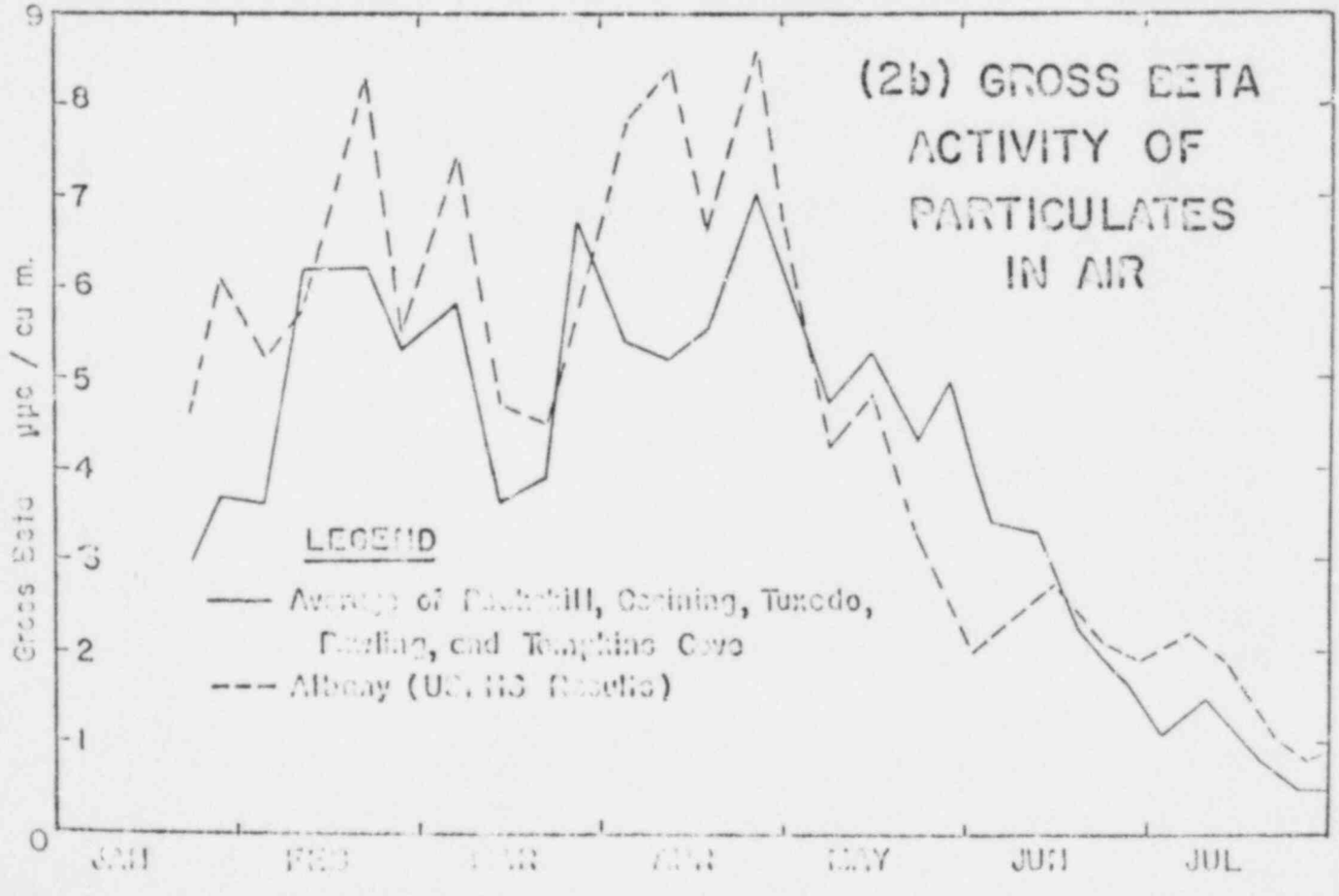


FIGURE 3

FALLOUT (Gross Data and Data Done Seekers)

CONSOLIDATED EDISON STATIONS AND STATEWIDE CITIES

From Oct. 1958

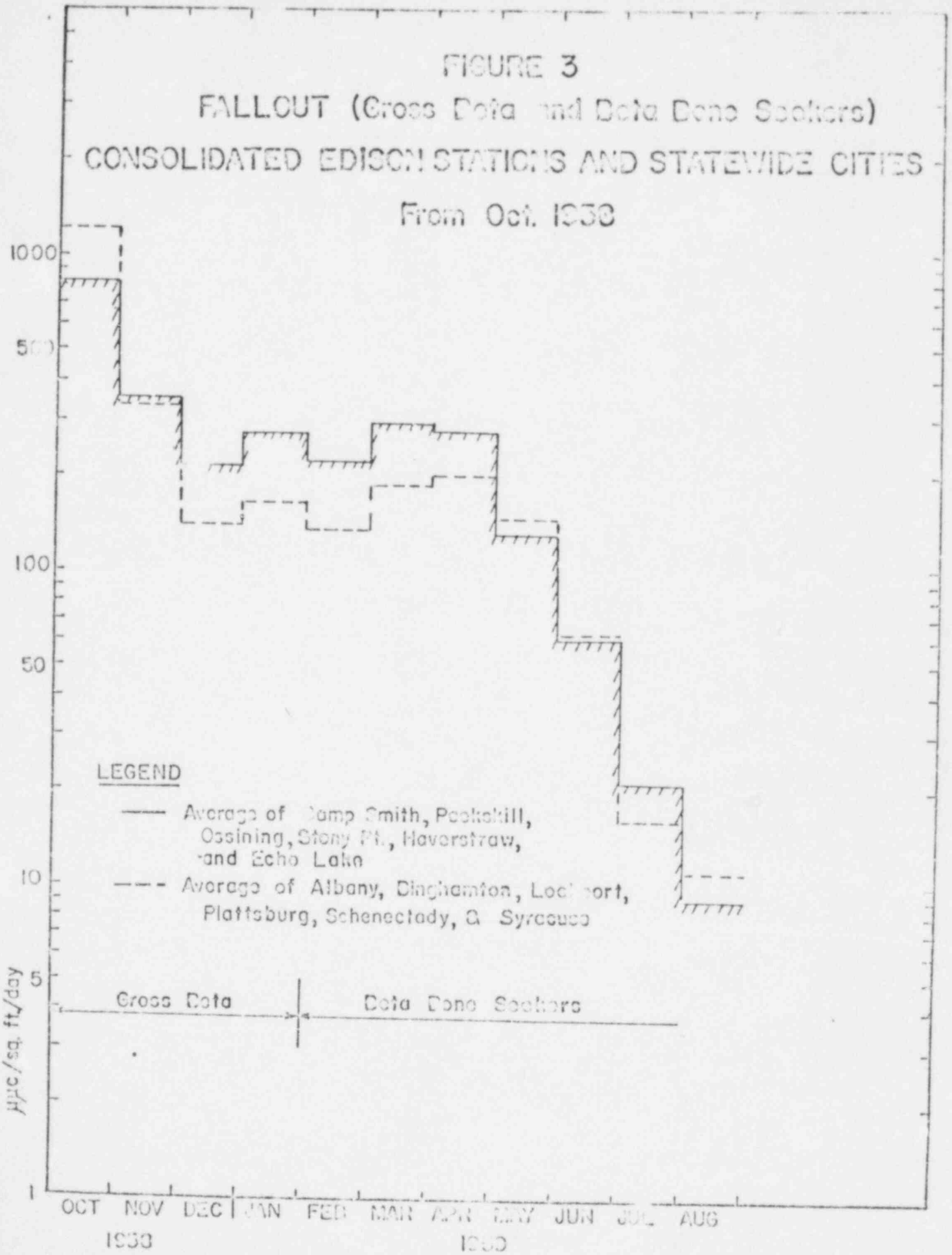


FIGURE 4a
BETA BONE SEEKER ACTIVITY
ALBANY TREATED WATER -- From July 1958

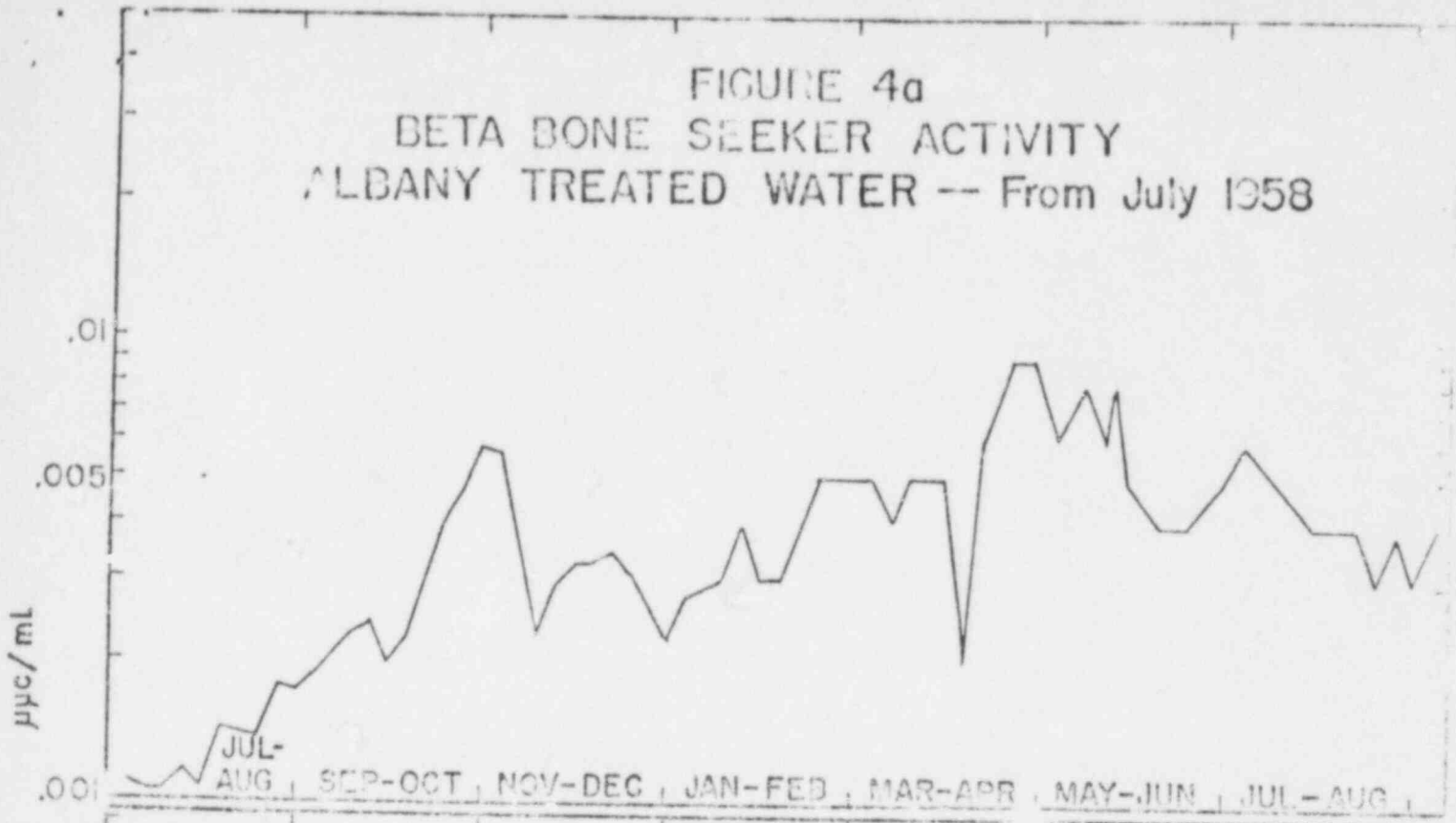


FIGURE 4b
BETA BONE SEEKER ACTIVITY
HUDSON and MOHAWK RIVER WATER
From Jan 1959

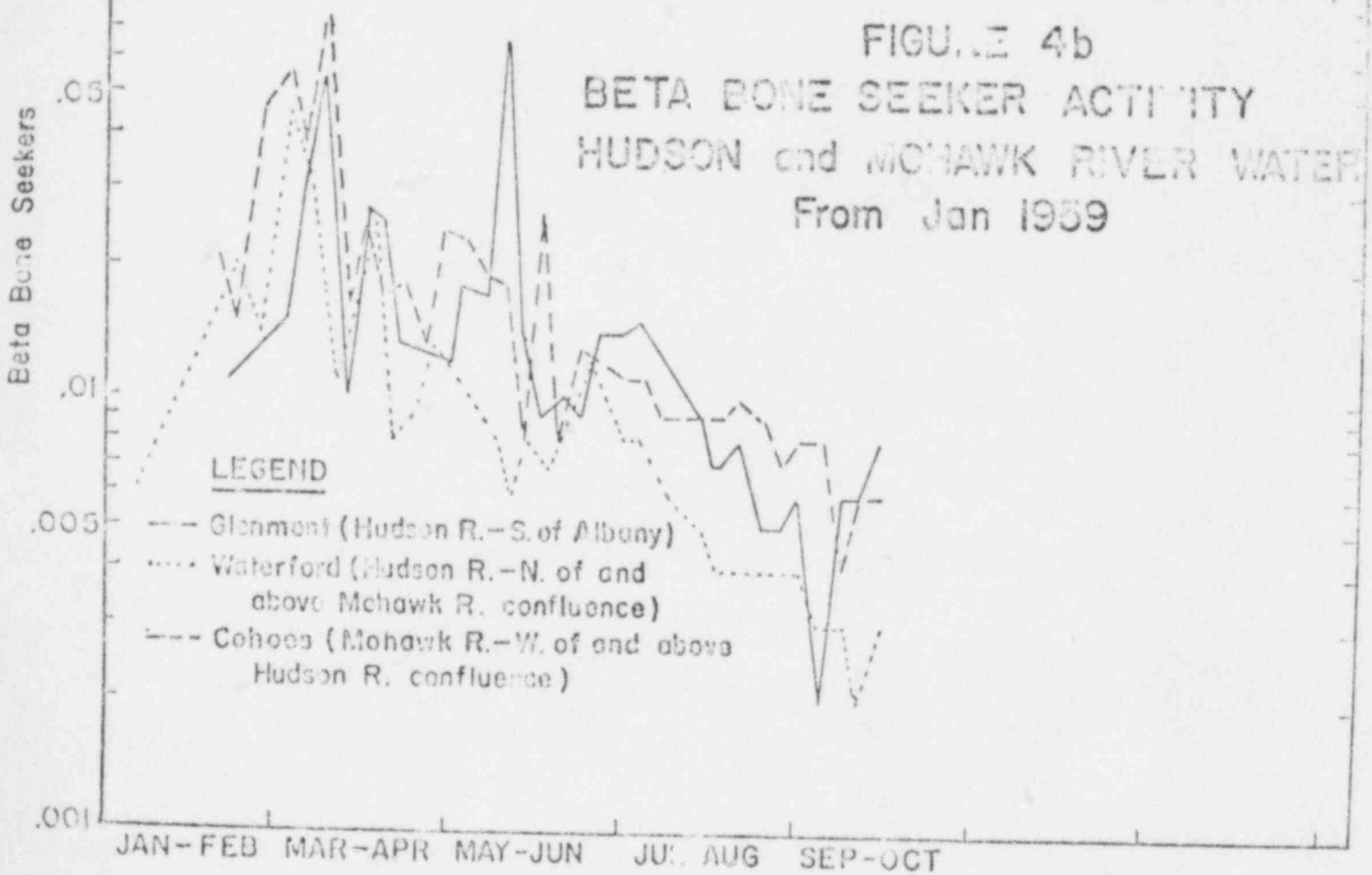
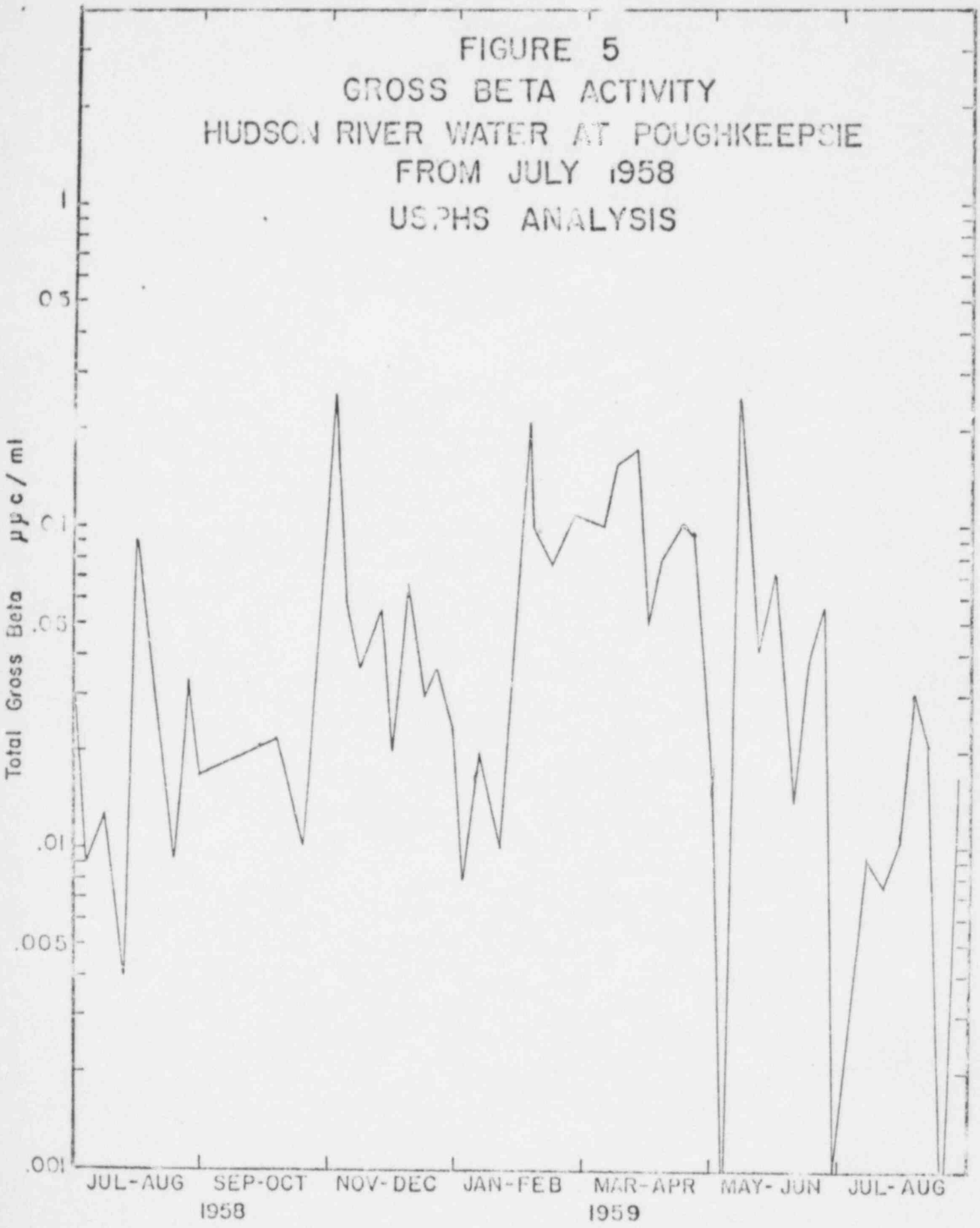


FIGURE 5
GROSS BETA ACTIVITY
HUDSON RIVER WATER AT POUGHKEEPSIE
FROM JULY 1958
US.PHS ANALYSIS



Discussion of Results

In evaluating the results contained in this report, it is apparent that fission products in the atmosphere as a result of nuclear weapons testing contribute a large portion of the radioactivity found in all surface samples. As an overall means of comparison, Figure 1 has been prepared which graphically illustrates the average results for three month increments for air, fallout, water and vegetative samples. The series of nuclear weapons tests in October of 1958 account for the marked increase in the radioactivity of samples collected during the fourth period of 1958 and the first period of 1959. The decline of radioactivity in the second period of 1959 is a result of cessation of weapons testing. Data now being collected, but not included in this report, show a further decline to the point where it is becoming difficult to detect the low levels of radioactivity present.

A more careful analysis of the data indicates high levels of activity in the latter part of October and early November of 1958 with some decline in December 1958 and early January 1959. About mid-January, an increasing trend in radioactivity was noted. About this same time, I^{131} was found in rabbit thyroids although previous thyroid samples indicated no I^{131}. Because of the lack of information concerning the amounts of, or behavior of fission products deposited in the stratosphere from weapons testing, it is difficult to assess the variations noted in results between October 1958 and the Spring of 1959.

Air Comparison of the data obtained at the different air sampling locations indicates no significant differences between the stations. The

average results of the five air sampling stations show a high value of 7.0 micro microcuries per cubic meter for the latter part of April 1959 and a low value of 0.5 during the latter part of July 1959. Figure 2b graphically illustrates the average values for the five stations and for the weekly averages of the United States Public Health Service results at Albany. Both plottings follow each other closely. Fallout results have also been plotted in Figure 2a for comparison purposes.

Since radon and thoron daughters were not being measured, no conclusions can be made as to the natural radioactivity in the air at the sampling stations. It does appear, however, that there will be no significant difference between sampling stations for fission product contamination originating from nuclear weapons testing.

Fallout Figure 3 compares the average monthly values of fallout at the six sampling stations with the average results of fallout from six cities located in various geographical areas of the State. A tabular comparison has also been made in Table II-B. The amount and frequency of precipitation, heavy snowfall, and differences between time of sampling and counting are some factors which influence the results. Considering these factors, there appears to be no appreciable difference between the results of fallout obtained in the Lower Hudson Valley and other areas in New York State on the basis of sampling for relatively long periods of time. Some variations, within relatively short sampling periods have been noted and continuation of a limited number of stations is desirable.

Rabbit Thyroids The only samples showing I^{131} were 4 samples collected in the latter half of January 1959. This coincided with an increase of radioactivity in air, Hudson River water and fallout.

Vegetation Reference is made to Figure 1 for a comparison of results of vegetative samples. The results are similar to other types of samples in that they reflect the influence of nuclear weapons testing and subsequent cessation of these tests. An important factor which does not make for a good valid comparison is the long time between collection and counting for those samples collected in 1958. It would appear that more frequent sampling of vegetation from the same area will give a better indication of the influence of fallout.

Water The graphical comparison of Figure 1 clearly indicates the influence of fallout from nuclear bomb tests on surface water samples. The ground water results, as would be expected, do not show this influence. Except for the Hudson River, most of the surface water samples come from lakes or reservoirs of various impounding capacities.

Results of gross beta on Hudson River water at Poughkeepsie are plotted in Figure 5. Because of direct run-off, one would expect a fairly immediate rise of radioactivity in the water following a heavy fallout. The general trend of a rise in radioactivity in early November 1958 followed by a decline in December 1958 and a subsequent rise again in the latter part of January 1959 was apparent. The radioactivity also remained somewhat elevated as late as the end of May 1959.

Figure 4a shows beta bone seeker results on Albany treated water. This has been presented because it is the only water supply on which the beta bone seeker analysis was made previous to 1959. The effect of fallout is considerably dampened because of the storage capacity of the Alcove Reservoir. This supply is located approximately 15 miles southwest of Albany. Figure 5b shows typical beta bone seeker results of waters of the

Mohawk and Hudson Rivers in the Albany Area. As for the Hudson River at Poughkeepsie, the results did not start a substantial decline until May of 1959.

Hudson River Samples To date there has not been sufficient data obtained on mud, plankton and fish samples to draw any conclusions as to how fallout might influence the results. The information given in Table VI will, of course, be of value in future sampling. The Hudson River water samples reported in Table VI are in general agreement with results reported by the United States Public Health Service at Poughkeepsie.

APPENDIX - A

CONSOLIDATED EDISON ISR OPERATIONAL SURVEY

SAMPLING STATIONS SUMMARY

Sampling Items	Period	Westchester County Stas.	Westchester County Samps.	Rockland County Stas.	Rockland County Samps.	Putnam County Stas.	Putnam County Samps.	Orange County Stas.	Orange County Samps.	Total all Counties Stas.	Total all Counties Samps.
Air	3-26-59 to 7-30-59	2	46	1	17	—	—	1	13	5*	89*
Fallout	10-9-58 to 9-29-59	3	64	2	47	—	—	1	16	6	127
Rabbits	9-8-58 to 9-8-59	14	20	9	10	2	4	3	4	27	38
Soil	10-58 to 9-10-59	31	124	9	35	3	6	3	6	46	171
Vegetation	6-30-58 to 9-18-59	31	123	9	30	3	5	3	4	46	162
Ground Water	8-12-58 to 7-29-59	3	12	10	36	—	—	2	4	15	52
Surface Water	8-12-58 to 7-29-59	24	96	8	24	—	—	9	28	41	148
Hudson R. Fish	9-4-58 to 5-25-59	1	2	—	—	1	2	—	—	2	4
Mud	4-58 to 5-25-59	1	4	—	—	1	4	—	—	2	8
Plankton	9-4-58 to 5-25-59	1	2	—	—	1	2	—	—	2	4
Water	9-4-58 to 6-10-59	1	6	—	—	1	1	—	—	2	7

*Includes 13 air samples from 1 sampling station in Dutchess County

APPENDIX A (Con't)

SAMPLE STATION KEY

All station numbers will consist of four digits:

The thousands digit will refer to the county or special area in which the station is located.

THOUSANDS	COUNTY OR LOCATION
1_ _ _	Westchester County
2_ _ _	Rockland County
3_ _ _	Putnam County
4_ _ _	Orange County
5_ _ _	Above site on Hudson
6_ _ _	Below site on Hudson
7_ _ _-9_ _ _	Special samples

The hundreds digit will refer to specific distance sectors from the site.

_0_ _ will be stations within 2 miles.

_1_ _ " " " between 2 and 4 miles.

_2_ _ " 4 and 6 miles.

_3_ _ " 6 and 10 miles.

_4_ _ " 10 and 20 miles.

The tens & units digits will be arbitrarily assigned to stations within the specific county and distance sectors in order to distinguish individual stations.

Thus, as examples, the station at Camp Smith will be numbered:

Westchester County ⟶ 1101 ⟵ The first arbitrary station # > 2 mi. < 4 mi. at this distance in West. Co.

and the station at Peekskill will be:

Westchester County ⟶ 1102 ⟵ Second arbitrary station # > 2 mi. < 4 mi.

New Croton Reservoir:

Westchester County ⟶ 1202 ⟵ Second station in area > 4 mi.

APPENDIX A - Continued

Westchester County

Station Number	Latitude	Longitude	Elev.	Description
1301 V, SW, S	41°-18'-10"	73°-50'-45"	445'	Mohegan Lake in southwest area
1302 A, V, SW, S	41°-15'-00"	73°-50'-10"	220'	Sarnoff residence located on Hunter Rd. east of Croton Reservoir
1303 V, SW, S	41°-13'-00"	73°-51'-45"	320'	Newbury Pond at intersection of Ossining Rd. and Quaker Ridge Road
1304 V, SW, S	41°-17'-00"	73°-48'-30"	460'	Lake Mohansic at south end where Mohansic Ave. crosses the lake
1305 V, SW, S	41°-15'-10"	73°-45'-15"	170'	Croton Reservoir at intersection of Taconic Parkway and Hunterville Dam Road
1306 V, SW, S	41°-20'-10"	73°-48'-10"	420'	Lake Osceola at north shore
1307 A, F, V, SW, S	41°-11'-30"	73°-51'-50"	220'	Indian Brook Reservoir at south east end
1308 V, GI, S	41°-20'-00"	73°-50'-00"	420'	Shrub Oak Wells north of Jefferson Valley Rd. and west of the high school
1309 V, SW, S	41°-18'-30"	73°-47'-10"	500'	Sparkle Lake at north east end

APPENDIX A - Continued

Westchester County

Station Number	Latitude	Longitude	Elev.	Description
1310 V, SW, S	41°-11'-15"	73°-48'-15"	340'	Echo Lake at north end
1401 A, V, SW, S	41°-17'-15"	73°-45'-30"	400'	Amawalk Reservoir at southeast end.
1402 A, V, SW, S	41°-14'-50"	73°-45'-15"	170'	Croton Lake north of Lakeside Road and east of Laurelton Road
1403 A, V, S,	41°-11'-15"	73°-44'-10"	280'	Mount Kisco Country Club near entrance
1404 V, GW, S	41°-08'-00"	73°-48'-30"	240'	Briarcliff Manor Wells District No. 1 east of well #3
1405 V, SW, S	41°-19'-30"	73°-40'-00"	270'	Lake Purdy at south end.
1406 V, SW, S	41°-17'-00"	73°-38'-45"	330'	Lake Katonah at north end
1407 V, SW, S	41°-13'-15"	73°-40'-00"	320'	Pond on Matthews Hill Road at north end
1408 V, SW, S	41°-09'-15"	73°-41'-30"	455'	Byram Lake Pump House
1409 V, SW, S	41°-07'-30"	73°-45'-00"	520'	Wippoorwill Lake
1410 V, SW, S	41°-17'-45"	73°-35'-00"	465'	Waccabuc Lake
1411 V, S,	41°-10'-10"	73°- 35'-30"	440'	Ward Pond Ridge Reservoir
1412 V, SW, S	45°-12'-00"	73°-35' 45"	480'	Blue Heron Lake near southeast shore line

APPENDIX A - Continued

Rockland County

Station Number	Latitude	Longitude	Elev.	Description
2001 V, S	41°-16'-58"	73°-57'-40"	10'	Dundenburg Mountain at Jones Point near abandon school
2002 A, F, V, S,	41°-15'-10"	73°-59'-34"	300'	Buckburg School
2003 A	41°-15'-30"	73°-58'-45"	50'	Roof of Orange - Rockland Utilities, Lovett Plant, Tonkins Cove.
2101 A, V, S	41°-17'-56"	73°-59'-30"	310'	Doodletown School
2102 V,S	41°-14'-55"	73°-59'-54"	260'	Boy Scout Camp Bullowa at Fanger's Home
2103 V, S	41°-13'-50"	73°-59'-21"	180'	North of Route 210 at intersection of Jay St. and Orchard St.
2110 G, A	41°-17'-55"	74°-00'-15"	500'	Iona Island Infiltration - Galleries located near Doodletown P.W.S.
2201 V, S,	41°-13'-10"	74°-01'-31"	420'	Intersection of Willow Grove Rd. and Letchworth Rd. at N.Y.S. Letchworth Mental Hospital
2202 A, F, V, S	41°-12'-00"	73°-58'-00"	80'	Haverstraw High School

APPENDIX A - Continued

Rockland County (Con't)

Station Number	Latitude	Longitude	Elev.	Description
2204 A	41°-18'-40"	73°-59'-00"	2180'	Palisades State Park Adm. Building
2210 GW	41°-12'-35"	71°-00'-40"	320'	N.Y. Water Service Well at Thiells P.W.S.
2211 GW	41°-12'-25"	73°-59'-25"	200'	N.Y. Water Service Well at Garnerville P.W.S.
2212 SW	41°-14'-30"	74°-01'-30"	220'	N.Y. Water Service Reservoir at Rt. 210 P.W.S.
2213 GW	41°-12'-50"	73°-59'-10"	145'	Garnerville Holding Co. Well P.W.S.
2301 A,V,S,	41°-11'-55"	74°-03'-45"	200'	Call's Hallow Road in town of Haverstraw.
2302 V, S	41°-08'-50"	73°-55'-47"	180'	East New York Ave. and south of Lake Rd.
2310 SW	41°-12'-55"	74°-03'-30"	680'	Letchworth Village Reservoir P.W.S.
2311 GW	41°-11'-00"	71°-00'-20"	140'	Wells near Lake Lucille Hackensack Water Co. P.W.S.
2312 GW	41°-10'-15"	74°-01'-55"	225'	Summit Park Lab. Wells, Spring Valley Water Works, P.W.S.

Rockland County (Con't)

Station Number	Latitude	Longitude	Elev.	Description
2313 GW	41°-10'-00"	74°-03'-40"	500'	Hillside Estates Well Spring Valley Water Works, P.W.S.
2314 GW	41°-07'-50"	73°-56'-15"	220'	Conger Realty Corp. Well, P.W.S.
2315 SW	41°-12'-35"	74°-[illegible]'-35"	1083'	Breakneck Lake P.W.S. P.I.P.
2316 SW	41°- 13'-40"	74°-04'-25"	1000'	Lake Welch P.W.S. P.I.P.
2317 SW	41°- 08'-30"	73°- 55'-30"	160'	Rockland Lake
2318 SW	41°-11'-00"	71°-00'-20"	140'	Lake Lucille
2319 SW	41°-08'-15"	73°-56'-20"	1[illegible]'	Congers Lake
2410 GW	41°- 07'-40"	74°-05'-20"	600'	Welfare Home Well Spring Valley Water Works, P.W.S.
2411 SW	41°-06'-30"	73°-58'-00"	80'	Lake DeForest at Congers Hackensack Water Co., P.W.S.
2412 GW	41°-07'-20"	73°-56'-50"	140'	Fullo Water Supply P.W.S.
2413 SW	41°-12'-55"	74°-07'-50"	772'	Sebago Lake P.W.S., P.I.P.

* P.I.P.-Palisade Interstate Park
P.W.S.-Public Water Supply

APPENDIX A - Continued

Putnam County

Station Number	Latitude	Longitude	Elev.	Description
3201 V, S,	41°-20'-20"	73°-53'-05"	280'	Lake Peekskill rear of Geriale residence
3302 A, V, S	41°-21'-40"	73°-52'-10"	500'	0.3 miles south of Craft Corners, east side of Oscawana Lake Road at Ground Observer Corp. Station
3401 V, S	1°-20'-50"	73°-45'-15"	620'	Baldwin Place Railroad Station

Orange County

4203 V, S	41°-19'-30"	73°-59'-25"	140'	Intersection of Ft. Montgomery Road and Route 9W
4210 SW	41°-19'-40"	74°-01'-30"	460'	Lake Queensboro P.W.S., P.I.P.
4301 F, V, S	41°-16'-15"	75°-08'-10"	710'	Echo Lake
4302 V, S	41°-19'-15"	74°-5'-15"	960'	Intersection of Routes 293 and 6
4310 SW	41°-16'-20"	74°-08'-20"	709'	Echo Lake, P.W.S.
4311 SW	41°-22'-35"	73°-59'-10"	560'	Highland Falls, P.W.S.
4312 SW	41°-17'-40"	74°-03'-30"	720'	Silver Mine Lake P.W.S., P.I.P.
4313 SW	41°-18'-50"	74°-05'-40"	1067'	Summit Lake, P.W.S., P.I.P.
4314 SW	41°-16'-30"	74°-05'-20"	1032'	Lake Tiorati, P.W.S. P.I.P.

Station Number	Latitude	Longitude	Elev.	Description
4315 SW	41°-24'-25"	74°-00'-55"	1000'	Alec Meadow Reservoir P.W.S.
4401 A	41°-14'-15"	74°-12'-42"	700	North westerly side of Long Swamp Road approximately ½ mile south of Route 17A
4410 GW	41°-18'-40"	74°-08'-45"	540'	Harriman Water Supply P.W.S.
4411 SW	41°-20'-45"	74°-08'-45"	743'	Town Woodbury, Cromwell Lake, P.W.S.
4412 SW	41°-14'-00"	74°-09'-50"	715'	Lake Stahahe, P.W.S., P.I.P.
4413 GW	41°-21'-15"	74°-08'-00"	800'	Skyline Trails Well Supply, Highland Mills
7501 A	41°-35'-36"	73°-38'-57"	760'	Generator Building of N.D.A. Experimental Laboratories north of the intersection of routes 55 and 216

RABBIT KILL LOCATIONS

1030	41°-16'-00"	73°-56'-00"	20'	South of Peekskill, N.E. of Buchonan
1031	41°-15'-45"	73°-57'-40"	100'	S. of Indian Point, N. of Verplanck
1032	41°-15'-30"	73°-56'-20"	120'	W. of Route 9, N. of Montrose
1033	41°-15'-00"	73°-56'-00"	120'	W. of Route 9, S. of Montrose

APPENDIX A - Continued

Rabbit Kill Locations, (Con't)

Station Number	Latitude	Longitude	Elev.	Description
1130	41°-18'-30"	73°-56'-40"	150'	Camp Smith
1131	41°-17'-45"	73°-53'-00"	380'	Bear Mt. Parkway near Locust Avenue
1132	41°-18'-00"	73°-54'-20"	400'	Bear Mt. Parkway west of Locust Avenue
1230	41°-19'-15"	73°-53'-00"	200'	N.E. of Van Cortlandville
1231	41°-13'-30"	73°-53'-20"	300'	E. of Route 9, S. of Furnace Road
1232	41°-18'-00"	73°-54'-00"	300'	N. of Peekskill Hallow Creek, W. of Catskill Aqueduct
1233	41°-17'-30"	73°-51'-00"	320'	Bear Mt. Parkway near road to Mohegan Lake
1234	41°-19'-45"	73°-52'-20"	200'	S. of Putnam County, Westchester County Line, E. of Road to Putnam Valley
1330	41°-11'-00"	73°-54'-00"	40'	Croton Point Park
1332	41°-20-15"	73°-47'-20"	480'	Route 6 east of Route 6N,
2130	41°-13'-00"	73°-58'-20"	10'	S.W. of Grassy Point
2131	41°-17'-30"	73°-59'-40"	500'	Palisades Park, S. of Doodletown
2132	41°-18'-15"	73°-59'-20"	350'	Palisades Park, N.E. of Doodletown
2230	41°-13'-00"	74°-00'-00"	200'	W. of West Haverstraw, S. Willow Grove Road
2330	41°-08'-30"	74°-02'-00"	540'	E. of Route 45, S. of New Hempstead Road
2331	41°-11'-30"	74°-02'-00"	420'	N.E. of Mount Ivy

APPENDIX A - Continued

Rabbit Kill Locations

Station Number	Latitude	Longitude	Elev.	Description
2332	41°-10'-30"	74°-04'-00"	480'	Route 306 N. of Pomona Heights
2333	41°-08'-45"	73°-59'-00"	200'	N.E. of New City, W. of Brewery Road
2334	41°-10'-00"	73°-59'-20"	140'	S.E. of Int. of Route 304 and Zuror Road
3330	41°-22'-00"	73°-54'-30"	700'	E. of Route 9 and S. of Fort Defiance Hill
3331	41°-21'-00"	73°-51'-00"	400'	S.W. of Int. of Kramers Road and Church Road
4330	41°-20'-30"	74°-06'-00"	700'	E. of Clove Road, W. of Lake Frederick
4331	41°-21'-45"	74°-05'-00"	600'	S. of Mineral Spring Brook, W. of Popolopen Lake
4332	41°-19'-30"	74°-07'-20"	500'	W. of Thruway, E. of Route 6, S. of Central Valley

APPENDIX B

Division of Laboratories and Research
New York State Department of Health

Determination of Bone-Seeking Radioisotopes In Milk

The objective of this procedure is to prepare for low background beta counting the bone-seeking activities including strontium, calcium, barium, yttrium, and lanthanum. These are precipitated as a group in the form of oxalates and ignited to carbonates and oxides prior to counting. No attempt is made to separate individual isotopes from the group.

Reagents:

1. HNO_3 conc. (ACS grade).

2. Strontium-yttrium carrier solution. To a mixture of 12.7 grams of Y_2O_3 (A.D. Mackay, Inc., New York, 99.9% pure) and 30.4 grams of $SrCl_2.6H_2O$ (ACS grade), add 500 ml. of water, 50 ml. of conc. HCl and heat to dissolve. Cool and make up to 1 liter in a volumetric flask. The final solution contains 10 mg. of Sr^{++} and 10 mg. of Y^{++}+per ml.

3. NH_4CH conc. (28%)(ACS grade).

4. Dilute NH_4CH (1-1). Mix equal volumes of conc. NH_4CH and distilled water.

5. Dilute HNO_3. Dilute 100 ml. of conc. HNO_3 to 1 liter with distilled water.

6. Ammonium oxalate. (ACS grade, powdered).

7. Ammonium oxalate, 1% solution. 10 grams of $(NH_4)_2C_2O_4 \cdot H_2O$ per liter.

Procedure:

To 450 grams of milk, add with stirring 50 ml. of concentrated HNO_3 and 10 ml. of strontium-yttrium carrier solution. Boil the mixture for two hours after foaming subsides and maintain the volume by addition of distilled H_2O when necessary.

Cool and filter rapidly through 250 mm. retentive qualitative paper (A.H. Thomas #5160 is satisfactory). Wash the fatty residue with dilute HNO_3. Add the washings to the filtrate and discard the residue.

Neutralize the acidity with conc. NH_4OH, adding it slowly and with stirring until the solution becomes slightly cloudy. Adjust the pH to 3.0 with dilute HNO_3 or 1-1 NH_4OH. A pH meter with temperature compensation control is required for pH adjustment.

Add 20 grams of powdered ammonium oxalate, heat to boiling and simmer for one hour. Allow to stand overnight before filtering through Whatman #5 paper (240 mm. diameter). Wash the precipitate on the filter with 1% ammonium oxalate solution.

Dry in an oven. Transfer the filter with the residue to a platinum dish. Char the paper by heating the dish gently over a Meker-type burner taking care that the paper does not burn with a flame. Ignite in a muffle furnace at 600°C. - 700°C. until the ash is pure white. One hour of heating time is usually sufficient.

Transfer the ash to a glassine paper for weighing and then to a 1" x $\frac{1}{4}$" stainless steel planchet for counting. Cover the planchet with "Saran wrap"* and count in the Baird-Atomic low background anti-coincidence Geiger type beta counter vs. a $K^{40}Cl$ standard of equal weight.

*Procedure - Saran wrap seal for planchets

1. Cut square of Saran wrap to size and place on a piece of cheesecloth.

2. Weigh sample and put it in planchet.

3. Paint a layer of glue around the outside of the planchet.

4. Put Saran wrap over planchet and pull tightly around the bottom with a spinning motion in order to provide a taut film over the open face of the planchet.

5. Holding twisted ends, rotate the planchet slowly in a gentle flow of steam for approximately 10 seconds.

6. Let Saran wrap dry and trim off excess with a razor blade.

Division of Laboratories and Research
New York State Department of Health

Determination of Bone Seeking Radioisotopes In Water and Sewage

The objective of this procedure is to prepare for automatic gas flow thin window proportional counting of bone-seeking activities including stontium, yttrium, calcium, barium, and lanthanum. These are precipitated as a group in the form of oxalates and ignited to oxides and carbonated prior to counting. No attempt is made to separate individual isotopes from the group.

Reagents:

1. Nitric acid conc. (ACS grade)

2. Strontium-yttrium-calcium carrier solution. To a mixture of 12.7 grams of Y_2O_3 (A.D. Mackay, Inc., New York, 99.9% pure), 30.4 grams of $SrCl_2.6\ H_2O$ (ACS grade) and 36.8 grams of $CaCl_2.2\ H_2O$ (reagent grade) add 500 ml. of water, 50 ml. of conc. HCl, and heat to dissolve. Cool and make up to 1 liter in a volumetric flask. The final solution contains 10 mg. of Sr^{++} and 10 mg. of Y^{+++} per ml.

3. NH_4CH conc. (28%, ACS grade)

4. Dilute NH_4CH (1-1). Mix equal volumes of conc. NH_4CH and distilled water.

5. Dilute HNO_3 (10%). Add 100 ml. of conc. HNO_3 to 500 ml. of water and make up to 1 liter.

6. Ammonium oxalate (ACS grade, powder).

7. Ammonium oxalate, 1% solution. Dissolve 10 grams of $(NH_4)_2\ C_2O_4.H_2O$ (ACS grade) in water and make up to 1 liter.

Procedure:

To two liters of sample (if less sample is available, measure the volume to the nearest 100 ml.) add 50 ml. of conc. HNO_3 (100 ml. if the sample is sewage) and 10 ml. of strontium-yttrium-calcium carrier solution. Add a few Teflon boiling chips and vigorously boil the mixture for one hour. Filter the solution rapidly through 250 mm. retentive qualitative paper (A. H. Thomas #5160 is satisfactory). Solution may be filtered while hot.

APPENDIX B - 4 (Cont'd)

Neutralize the solution with conc. NH_4OH adding it slowly and with stirring. Use methyl orange as an indicator and approach the endpoint from the alkaline side. Check the pH finally with a meter having a temperature compensator and adjust to pH 2.5-3.0 using dilute HNO_3 and dilute NH_4OH solutions for adjustment.

Add 4 grams of powdered ammonium oxalate and heat to boiling and simmer for 1 hour at 90°C.

Allow to stand overnight before filtering through Whatman #5 filter paper (240 mm. diameter). Wash the precipitate on the filter with 1 per cent ammonium oxalate solution.

Dry in an oven. Transfer the filter with the residue to a platinum dish. Char the paper by heating the dish gently over a Meker type burner, taking care that the paper does not burst into flame. (An infrared lamp may be used in place of oven drying). Ignite in a muffle furnace at 600-700°C. until the ash is pure white. One hour of heating is usually sufficient.

Transfer the ash into a weighed 2-inch stainless steel planchet and reweigh. Cover the planchet with Saran wrap* and count in the Baird-Atomic automatic gas flow proportional counter vs. a $K^{40}Cl$ standard of equal weight.

*Procedure - Saran wrap seal for planchets

1. Cut square of Saran wrap to size and place on a piece of cheesecloth.

2. Weigh sample and put it in planchet.

3. Paint a layer of glue around the outside of the planchet.

4. Put Saran wrap over planchet and pull tightly around the bottom with a spinning motion in order to provide a taut film over the open face of the planchet.

5. Holding twisted ends, rotate the planchet slowly in a gentle flow of steam for approximately 10 seconds.

6. Let Saran wrap dry and trim off excess with a razor blade.

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Determination of Bone-seeking Radioisotopes in Vegetation, Tissue, Plankton, Fish

The objective of this procedure is to prepare for automatic gas flow thin window proportional counting of bone-seeking activities including strontium, yttrium, calcium, barium, and lanthanum. These are precipitated as a group in the form of oxalates and ignited to oxides and carbonates prior to counting. No attempt is made to separate individual isotopes from the group.

Reagents:

1. HNO_3 conc. (ACS grade)

2. Strontium-yttrium carrier solution. To a mixture of 12.7 grams of Y_2O_3 (A.D. Mackay, Inc., New York, 99.9% pure) and 30.4 grams of $SrCl_2.6H_2O$ (ACS grade) add 500 ml. of water, 50 ml. of conc. HCl and heat to dissolve. Cool and make up to 1 liter in a volumetric flask. The final solution contains 10 mg. of Sr^{++} and 10 mg. of Y^{+++} per ml.

3. NH_4OH conc. (28%)(ACS grade).

4. Dilute NH_4OH (1 + 1). Mix equal volumes of conc. NH_4OH and distilled water.

5. Dilute HNO_3. Dilute 100 ml. of conc. HNO_3 to 1 liter with distilled water.

6. Ammonium oxalate (ACS grade, powdered).

7. Ammonium oxalate, 1% solution. 10 grams of $(NH_4)_2C_2O_4.H_2O$ per liter.

Procedure:

If the physical state of the sample is homogeneous, select a well mixed portion for analysis, otherwise, put the sample through a Waring blender for 5 minutes. If the vegetation sample has considerable soil attached to the roots, this should be shaken off. Do not wash the dirt off since there is possibility thereby of loss of activity clinging to the stalks and leaves. A little distilled water in the blender with the sample aids in the disintegration process.

Dry the homogeneous material to constant weight in an oven at 103°C. Transfer a portion (10 - 20 grams) to a Waring blender. Operate the blender until sample is pulverized. Leave the cover on the blender for at least 5 minutes to allow the dust to settle.

Weigh out 10 - 20 grams of the powdered sample into a porcelain dish and char it carefully over a Meker-type burner taking

care that it does not burn with a flame. An infrared lamp may be substituted for the Meker burner. Transfer to a muffle furnace and ignite at 600°-700°C until completely ashed.

Transfer the ash to an 800-ml. beaker, add slowly 200 ml. of 10% HNO_3 and 10 ml. of carrier solution. Cover the beaker and boil gently for one hour, maintaining the volume with distilled H_2O. Use Teflon chips in the beaker to prevent bumping. Filter the solution while hot through paper (A. H. Thomas #5160, 15 cm. diameter is satisfactory). Wash the residue with 10% nitric acid and discard the paper and residue.

Neutralize the filtrate with 1-1 NH_4OH, adding it slowly and with stirring. Use methyl orange as an indicator and approach the end point from the alkaline side. Adjust the pH to 2.5-3.0 using a pH meter with temperature compensation for final check.

Add 4 grams fo powdered ammonium oxalate, bring to a boil and simmer at 90°C. for one hour. Allow to stand overnight before filtering through Whatman #5 paper (240-mm. diameter). Wash the precipitate on the filter with 1% ammonium oxalate solution.

Dry in an oven. Transfer the filter with residue to a platinum dish. Char the paper by heating the dish gently over a Meker burner, taking care that the paper does not burst into flame. An infrared heater may be substituted for the oven and Meker burner.

Ignite in a muffle furnace at 600°-700°C. until the ash is pure white. One hour of heating is usually sufficient.

Transfer the ash to a weighed 2" stainless steel planchet and reweigh. Cover the planchet with Saran wrap* and count in a Baird-Atomic automatic gas flow proportional counter vs. a $K^{40}Cl$ standard of equal weight.

* Procedure - Saran wrap seal for planchets

1. Cut square of Saran wrap to size and place on a piece of cheesecloth.
2. Weigh sample and put it in planchet.
3. Paint a layer of glue around the outside of the planchet.
4. Put Saran wrap over planchet and pull tightly around the bottom with a spinning motion in order to provide a taut film over the open face of the planchet.
5. Holding twisted ends, rotate the planchet slowly in a gentle flow of steam for approximately 10 seconds.
6. Let Saran wrap dry and trim off excess with a razor blade.

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Saran wrap seal for planchets

When the Saran wrap is brought near the top of the planchet, the sample material in the planchet may have a tendency to "fly up" to meet the Saran wrap. To eliminate loss of sample, the Saran wrap is cut to size and then placed on a cloth to remove static electricity.

Because of the narrow rim on some planchets, and minor variations in size which make them fit tightly in the counter, use of glue is desirable when covering planchets with Saran wrap*. To make glue, mix 3 parts of benzene to 1 part of ethylene dichloride, and add poly-iso-butyl methacrylate polymer to bring to the consistency desired.

*Procedure:

1. Cut square of Saran wrap to size and place on a piece of cheesecloth.

2. Weigh sample and put it in planchet.

3. Paint a layer of glue around the outside of the planchet.

4. Put Saran wrap over planchet and pull tightly around the bottom with a spinning motion in order to provide a taut film over the open face of the planchet.

5. Holding twisted ends, rotate the planchet slowly in a gentle flow of steam for approximately 10 seconds.

6. Let Saran wrap dry and trim off excess with a razor blade.

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Radiological examination of air particulates

The samples to be analyzed have either been an 8 inch by 10 inch or a 2 inch diameter glass fibre filter. The filters are supplied by Mine Safety Appliance Company of Pittsburgh, Pa. and each package of 25 filters bears the catalogue number CT-5428. The 2 inch diameter filters are pressed out of the 8 inch by 10 inch sheets.

When in the filter holder the effective area of the 8" x 10" filter is reduced to 7 inches by 9 inches and the effective diameter of the 2 inch diameter filter becomes 1 3/4 inches. At least six hours are allowed to elapse between the time the sampling period ended and the time of examination.

The 8 inch by 10 inch filter (used on the Staplex High-Volume Sampler) is prepared for counting in the following manner.

1. Weigh a 2" stainless steel planchet.
2. Cut 4 - 1 3/4 inch diameter discs from the exposed portion of the filter spacing them evenly along a diagonal.
3. Stack these 4 discs in the planchet with exposed side up.
4. Weigh planchet and contents.
5. Cover planchet with saran wrap.

The 2 inch diameter filter (used in the Gast Sampler) is prepared for counting in the following manner.

1. Weigh the 2" stainless steel planchet.
2. Insert the 2" filter into the planchet with exposed side up.
3. Weigh planchet and contents.
4. Cover planchet with saran wrap.

The prepared samples are then counted under a Baird-Atomic automatic thin window proportional counter. The counts are standardized by comparison to KCl standards of the same weight. Background is determined by counting an empty 2" stainless steel planchet covered with saran wrap. Each sample is counted at least twice for 900 counts each time. If observation indicates short-lived isotopes are present, further study is required.

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Radiological examination of air particulates

The efficiency of the counting technique is found by calculating an efficiency factor for various weight standards. Since the geometry is constant, the efficiency for samples is assumed to be the same as that obtained for equal weight standards.

In order to calculate the activity in μμc per meter cubed the following factors must also be known:

1. Length of sampling period.

2. Average air flow.

3. Ratio of area of filter to area of sample.