





STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION Albany, New York / December 1, 1970

TO: Commissioner Diamond FROM: Mr. Metzler

SUBJECT: 1969 Annual Report of Environmental Radiation in New York State

SUMMARY

The Bureau of Nuclear Engineering routinely monitors the environment for radioactivity. Radioactive materials found in the environment originated from natural radioactivity, fallout from weapons testing, and the nuclear power industry. During the year of 1969, there were over 6,000 separate analyses made on samples. This report summarizes the routine analyses made in the State-wide surveillance program and includes results of special samples taken of air, algae, fish, deer, mud, and vegetation for the year 1969 which were not recorded in the quarterly Radioactivity Bulletins.

The concentration of radioactivity in fish, particularly strontium-90, from the creek systems below the discharge at the fuels reprocessing plant remain at levels that indicate that corrective action should be taken in order to hold liquid waste discharges to as low levels as practicable. The company has indicated that additional waste treatment facilities will be installed at the plant in 1971.

Trace amounts of radioactivity were detected in fish, mud, and aquatic vegetation resulting from discharges to the Lower Hudson River from Consolidated Edison's No. 1 nuclear power plant. The levels were well below the USAEC limits.

Fallout from weapons testing is still the major source of man-made radioactivity in the general environment throughout the remainder of the State.



The evaluation of data obtained for the year 1969 indicates that the levels of radioactivity in the samples taken around major nuclear facilities in the State were below the limits established by the USAEC. The levels of radioactivity in milk were well below the upper limit of Range II of the Federal Radiation Council Guidelines.

Radioactive particles in air are sampled by drawing approximately 1 cfm through a two inch diameter glass fiber filter. The filter is changed wackly, allowed to decay for four days, and counted on a low level beta counter.

In all cases, the particulate air samples were less than 1.0 pCi/M^3 with the average at any single air sampling station being 0.25 pCi/M^3 or less. These levels may be compared to the year 1963 where the average level for all stations in the State was 5.3 pCi/M^3 . The residual radioactivity in the atmosphere from the testing of atomic weapons caused a slight increase in air samples from May through August of 1969. Samples of particulates in air taken around the fuels reprocessing plant were not significantly different from other areas of the State. The radioactive particulates detected in all samples are attributed to atmospheric weapons testing debris and to a smaller extent from natural radioactive materials.

FALLOUT'

AIR

Only two fallout stations are now in operation; one at Albany and one in Cattaraugus County. Fallout is the term used to denote radioactive materials originating from the atmosphere and settling or being washed into a bucket. The results for the year of 1969 continue to show low to non-detectable values.

MILK

Milk is considered a sensitive indicator of radioactivity deposition on land ar is. Also, it is an important source of food for one of the most susceptible portions of the population to ionizing radiation, that is, the small child.

Trace amounts of iodine-131 were found in some milk samples, the source most likely being fallout from Chinese weapons testing. The presence of other gamma emitters such as cesium-137 in milk was sporadic depending upon the residual effects from previous weapons testing and any recent testing. Strontium-90 detected in milk also reflected the residual effect of weapons testing that occurred in previous years plus any recent tests. In general the presence of I-131, Sr-90 and Cs-137 are explainable as fallout from nuclear weapons testing.

The Federal Radiation Council provides guidance on the intake of the specific radioisotopes strontium-90 and iodine-131. If the upper

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limit of Range II is exceeded, the Federal Radiation Council recommends that countermeasures be taken to bring levels below this limit. The upper limit of Range II averaged over one year for strontium-90 is 200 pCi/day and for iodine-131 the limit is 100 pCi/day. All values for strontium-90 and iodine-131 in milk are well below these limits.

Tritium levels in milk should reflect the presence of tritium in rainwater and tritium in water v por during the period when cows are out to pasture. All of the milk samples analyzed showed very low to undetectable amounts of tritium. Most of the tritium comes from testing of nuclear weapons. The dairy herds in the vicinity of the fuels reprocessing plant for the period January 1967 to June 1969 showed the same general levels of tritium as for the remainder of the State. This is an indication that tritium water vapor that originated from the fuels reprocessing plant did not have a significant effect on the surrounding pasture lands.

WATER

During 1969, most of the water samples showed concentrations near or below the detectable limits of the instrumentation. In no case did any sample exceed the allowable concentrations established by the USAEC. The effects of salt water intrusion up the lower Hudson River and the discharges from the NFS plant on the systems below were evident.

In the lower Hudson River, salt water may intrude up the river as far as Poughkeepsie under certain weather conditions combined with lowflow of fresh water in the river. The naturally occurring potassium-40 will contribute to the gross beta test. The concentrations of gross beta in the Hudson River were similar to those which have occurred previously. Isotopic gamma scans made on water samples indicated no detectable gamma emitting fission products or corrosion products in the Hudson River below the Consolidated Edison Reactor No. 1. Samples of lower Hudson River above and below the Consolidated Edison discharge were also analyzed for strontium-90 and concentrations were below the level of detection.

The effects of the discharges from NFS are evident at the Buttermilk and Cattaraugus Creek sampling stations. The concentration of Sr-90 showed a significant rise during the last three months of 1969. Starting in June of 1969, a significant rise in the levels of rutheniumrhodium-106 was noted indicative of the processing of fuels that had shorter storage periods than in previous years. The USAEC has not established limits for the section of Buttermilk Creek which receives the wastes because this section is within the NFS site boundary and under the control of NFS. The concentration limits are applied to Cattaraugus Creek after the confluence of Buttermilk Creek. The limits for gross beta are considered to be 300 and 600 pCi/l for the yearly average and maximum values respectively if an isotopic analysis is not made.

The allowable concentration in pCi/l for each specific radionuclide averaged over a year's period if each were only present are as follows:

Sr-90 - 300; Cs-137 - 20,000; ZrNb-95 - 60,000; Ru-106 - 10,000; Sr-89 - 3,000; tritium - 3 million.

On a yearly basis, the average concentrations allowed by the USAEC.in Cattaraugus Creek v re not exceeded.

During 1969, four samples from Cattaraugus Creek showed gross beta concentrations greater than 600 pCi/l. Specific isotopic analyses were made on these samples and results reported in the quarterly Radioactivity Bulletins. The samples were within limits allowed by the USAEC.

KRYPTON-25 IN AIR - NFS AREA

Gaseous samples of air were taken in the area of the fuels reprocessing plant and at Albany and analyzed for krypton-85. Kr-85 is an inert radioactive gas with a half-life of 10.7 years which is an important fission product (fission yield 0.29%) because as presently practiced, all of it is released at fuels reprocessing plants. The allowable continuous concentration of Kr-85 for exposure to an individual in the environment has been established by the USAEC at 300,000 pCi/M^3 .

Some of the samples in the area of the fuels reprocessing plant were taken during periods when fuel was being dissolved. The results on page 20 can be compared to the Albany area where the average result was 21 pCi/M^3 . The limited sampling done in the area of the fuels reprocessing plant indicates detectable concentrations of krypton-85 but at levels far below the USAEC limits.

PLUTONIUM-239 IN AIR - NFS AREA

Plutonium-239 is produced in reactor fuels. Every effort is made within a fuels reprocessing plant to reclaim as much plutonium as possible since plutonium-239 can be used as a nuclear fuel. Trace amounts of plutonium are discharged out the stack and in the liquid wastes at the NFS reprocessing plant. Plutonium-239 is present in the atmosphere as a result of weapons testing.

In April and May of 1969, 12 samples of air were taken around the NFS site. The highest result was 0.0003 pCi/M³ of plutonium-239 and the average result was 0.00013 pCi/M³ which can be compared to the allowable concentration of 0.06 pCi/M³ established by the USAEC for continuous off-site concentration. The limited sampling around the NFS site indicates that environmental levels of plutonium-239 suspended in air have been well below allowable USAEC limits.

The Department plans to continue measurements of plutonium in air so that any trend towards the build-up of plutonium suspended in the air around the NFS site can be recognized well before maximum allowable concentrations are reached.

IODINE-129 IN MILK - NES AREA

Another radioactive material that has been found around the fuels reprocessing plant is the isotope iodine-129. It has a long half-life of 1.7x10⁷ years and a fission yield of approximately 1%. It could enter the environment by way of stack discharges or liquid wastes discharges. Cow's milk could be one of the most important pathways to man. In this instance, the most sensitive member of the public is the small child.

Thirteen milk samples were taken in March 1969 and all results were less than the detectable limit of 16 pCi/l. The Department in cooperation with the State Health Department, and the USPHS, has been investigating more sensitive sampling or analytical techniques to determine the presence of iodine-129 in milk because the limit of sensitivity of 16 pCi/l is not considered low enough.

The Department will continue to periodically measure iodine-129 and will try to develop a more sensitive technique to determine if there is a trend towards the build-up of this long-lived radioactive material in the environment.

RADIOACTIVITY IN FISH BELOW THE NFS DISCHARGE

Radioactivity levels in fish taken from the watershed below the NFS discharge are given on pages 21 and 22. In most cases the fish were analyzed whole; including bone, flesh, intestines and scales.

In comparison to previous years, the amount of strontium-90 in fish appears to be lower. This is partly explainable by examining the Sr-90 concentration in the water at Springville Dam. During May of 1969, when most of the fish samples were taken, the average Sr-90 concentration was 9 pCi/l which is one of the three lowest monthly averages since September 1966 when liquid waste discharges of Sr-90 started to increase. In a few samples of fish taken during October of 1969 when the concentration of Sr-90 at Springville Dam averaged 77 pCi/l, the concentration of Sr-90 was approximately five times higher in the fish than in the month of May.

Samples of fish taken at the mouth of Cattaraugus Creek show that the flesh of carp (fillets) tended to have much less Sr-90 than the carcass (bone, some flesh, and scales). The samples of Coho salmon that were taken indicate no unusual reconcentration of Sr-90 by Coho salmon. The trend towards reconcentration of Sr-90 appears to be greater in the scavenger fish such as carp and suckers. Also, it appears that more Sr-90 will be in the bone than in the flesh.

The USAEC has not established a table of allowable concentrations for each radionuclide in food, such as fish, as has been done for water. In order to determine if the intake of radioactivity could result in an individual exceeding allowable exposures established by the USAEC, one may use the allowable water concentration multiplied by an intake of 2.2 liters of water per day for 365 days to establish the allowable yearly intake at which the allowable exposures established by the USAEC for the individual might be exceeded. For example, the allowable concentration of Sr-90 in water of 300 pCi/1 would result in an individual allowable yearly intake of 300x2.2x365=240,000 pCi of Sr-90.

An average concentration of each specific radionuclide was found for fish taken from Buttermilk Creek and Cattaraugus Creek down to the Springville Dam below the NFS discharge for the years 1967, 1968, and 1969. A conservative assumption was made that the entire fish would be consumed. On this conservative basis, a person could consume 100 pounds of fish before the allowable exposures recommended by the USAEC might be exceeded. A creel survey conducted by the Department in the summer of 1969 indicated that the greatest fishing pressure on Cattaraugus Creek below the NFS discharge was near the mouth of the creek with Springville Dam area being second. No individual was found who might consume over 100 pounds of fish per year.

The company has made a decision to install equipment consisting of chemical precipitation and ion exchange to treat the liquid wastes. It is expected that this equipment should be in operation by the spring, or at the latest, the summer of 1971. This process should significantly reduce the concentrations of Sr-90, Cs-137, and Cs-134.

RADTOACTIVITY IN DEER ON THE NES SITE

Five deer were collected in March of 1969 and three in October of 1969 on the 3,300 acre NFS site. The highest result in meat for the year 1969 was found in a deer taken in October as compared to those taken in March. The concentration of gross beta radioactivity in Buttermilk Creek in October was approximately two times greater than in March indicating that the deer collected in October might have consumed water with the higher radioactivity concentrations. If an adult ware to consume deer meat with the highest concentration of Cs-137 and Cs-134 found in the year 1969, it would take approximately 2,700 pounds per year before exceeding the USAEC limits for an individual. The company's plans to install a waste treatment facility for the liquid waste discharge should reduce the concentration of cesium isotopes in deer taken on the site.

Samples of deer taken on the site in 1969 showed some radioactivity in the lungs of dear due to plutonium-238 and plutonium-239 as noted on pages 23 4 24. The highest amount of plutonium in the lungs is associated with deer with the greatest amount of Cs-134 and Cs-137. The concentration of plutonium in the lungs of the deer is below that found in humans in the Boston, Massachusetts area as reported by Magno, Kauffman,

and Groulx in the February 1969 issue of <u>Rediological Health Data and</u> <u>Reports</u>. They reported a human lung concentration ranging from 0.13 to 1.13 pCi/kg during a period August 1965 through February 1967. It should be noted that previous to that time (1965-1967) the plutonium levels in the atmosphere from weapons testing were higher than one would expect to find in the year 1969. The deer on the site may have inhaled some particulate plutonium that was discharged out the stack or by way of liquid wastes that later may have become airborne. The plutonium found in the lungs of deer indicates the need for environmental air particulate sampling for plutonium which has been discussed on page 4.

The presence of detectable iodine-129 in the thyroids of three of the five deer analyzed confirms that iodine-129 is being discharged to the environment. The deer may have received the iodine-129 from liquid waste discharges or from stack discharges. The Department, in cooperation with the USPHS, has expanded the environmental surveillance program to determine the presence of iodine-129 off site.

CONCENTRATIONS IN VEGETABLES AND SOIL BELOW NES DISCHARGE

In August of 1969, samples of vegetation and soil were taken from fields that were believed to have been irrigated with Cattaraugus Creek water. The presence of Cs-137 and Cs-134 in the ratio of approximately three or four to one in the soil indicates that the fields had been irrigated with Cattaraugus Creek water. The presence of Sr-90 in much higher concentrations in the beans and beets as compared to the tomatoes was noted and would be expected since this type of vegetation is normally higher in calcium content than tomatoes. A person would have to eat approximately five pounds of beans or four pounds of beets per day every day in the year before exceeding the limits established by the USAEC for exposure to an individual.

As might be expected, the cesium appears to be held in the soil and does not appear in the vegetation in significant concentrations.

The results on vegetation indicate the need for further evaluation of the use of Cattaraugus Creek for irrigation of crop land.

SILT SAMPLES BELOW NFS DISCHARGE

Silt or mud samples below the NFS discharge have been analyzed to ascertain if there is a significant buildup of radioactivity in stream beds. Such a buildup, if it did occur, could result in external radiation exposure to persons using the stream for fishing or other recreational purposes. Also, the radioactivity in the silts could be an important factor in the fish to man's food chain.

Two samples of silt behind the Springville Dam were taken in September 1969 when the pond b hind the dam was drained for the annual cleaning operation. Samples of silts from the bottoms of the creeks below the NFS discharge have been taken in the years 1966 and 1967. The analyses of silt samples are reported on pages 26 and 27.

The concentrations of cesium vs. strontium in the silts confirms the observation that cesium tends to be removed more readily from solution by the silts and clays than does strontium. The ratio of Cs-137 to Cs-134 for the Springville Dam silt samples for the year 1967 was approximately 6 to 1; and for the year 1969, the ratio was approximately 3 to 1. This indicates that the fuel processed in 1967 had been stored longer before processing than in 1969. The much higher concentrations of ruthenium-106 in the 1969 samples confirms the trend towards processing of fuel with shorter storage periods. Radioactivity Bulletin 69-3 which covered the period July-September 1969 pointed out the increase of ruthenium-106 in water samples from Cattaraugus Creek.

PLUTONIUM, URANIUM, IODINE-129 IN WATER BELOW NFS DISCHARGE

The concentrations of uranium and plutonium isotopes and iodine-129 in water samples below the NFS discharge are shown on page 28. The results are well below the allowable yearly average concentrations as given at the bottom of the page.

DISSOLVED AND SUSPENDED RADIOACTIVITY IN WATER

The dissolved and suspended radioactive materials for the years 1968 and 1969 in Buttermilk and Cattaraugus Creeks have been compared in pages 29 and 30. The results show that Cs-137 is readily taken up by silts and clays where as Sr-90 is more slowly removed. The removal of some Sr-90 by sedimentation behind the Springville Dam is also evident.

SAMPLES FROM LOWER HUDSON RIVER

Gamma isotopic analyses of aquatic vegetation, fish, and bottom muds and Sr-90 analyses on fish are shown on pages 31 and 32. Manganese-54 was found in aquatic vegetation but in lower concentrations than found in the year 1968. Most of the Mn-54 found probably originated from the discharges from Consolidated Edison plant although Mn-54 may be found in fallout from recent atmospheric testing by Red China.

The detection of low levels of Cs-134 in fish and mud indicates discharges from the Consolidated Edison plant. Cs-134 is an induced radioactive material that builds up with time in nuclear fuel as the fuel is consumed. Cs-134 is not a fission product and has not been found in significant quantities in fallout from weapons testing. The levels of radioactivity detected in mud, fish, and aquitic vegetation samples from the lower Hudson River indicate a slight increase resulting from discharges from the Consolidated Edison plant and reconcentration of certain radionuclides. The slight increase of Cs-134 in fish is not considered a significant source of possible human exposure. A person would have to consume approximately 60,000 pounds of fish per year before the limits established by the USAEC might be exceeded.

RADIOACTIVITY IN FISH FROM LAKE ERIE, LAKE ONTARIO AND CAYUGA LAKE

Fish samples were analyzed from waters of the State other than those below NFS and in the lower Hudson River. Results are given on pages 33 to 35. In all cases, the whole fish was analyzed. The unexpected high concentrations of Sr-90 in bullheads taken from Lake Ontario in 1968 can not be fully explained. The levels in 1969 were closer to those expected. The major source of radioactivity found in fish from sampling of the lakes is believed to be from fallout from nuclear weapons testing.

The Niagara Mohawk Nine Mile Point nuclear power plant and the Romester Gas and Electric plant, both on Lake Onterio started operation during the fall of 1969 after collection of the fish samples in the years 1968 and 1969.

BACKGROUND GAMMA RADIATION LEVELS (PIC)

The New York State Department of Health, Bureau of Radiological Health started to measure external gamma background radiation around operating or proposed major nuclear facilities in 1964, and continued the survey annually at most of the same sampling locations in order to detect any changes of gamma radiation due to the operation of nuclear facilities. A Reuter-Stokes RSG-9 Pressurized Ionization Chamber (PIC) was used in the survey. This instrument can detect gamma radiation in the range of 1-200 microroentgens per hours ($\mu r/hr$).

Any increase in gamma radiation would be caused by deposition of particulate radiation on the ground or submersion of the instrument in a cloud of radioactive gas or an increase in natural cosmic radiation. The readings obtained are only a measure of the external gamma radiation at the time of measurement and not of total accumulative exposure.

Levels of gamma radiation were found in the range from 8.5 to 12.0 microroentgens per hour for the years 1964 through 1968, see page 36 In 1969, the levels of gamma radiation found ranged from 7.5 to 11.4 microroentgens per hour. No significant increase of gamma radiation background due to the operation of nuclear facilities has been found except in one case.

During 1969, the Bureau conducted a special PIC survey along the bank of Cattaraugus Creek. The results found were higher than normal background for the area. The levels shown ranged from 9.0 to 20.5 microroentgens per hour. The higher results are due to the liquid wastes discharged from the fuels reprocessing plant. The increased exposure along the bank of Cattaraugus Creek is believed to be caused from deposition of radioactivity in silts and clays and from radioactivity dissolved or suspended in the water.

KEY-

Curie (Ci): The quantity of any radionuclide in which the number of disintegrations per second is 37 billion. Millicurie (mCi): One thousandth of one curie. Picocurie (pCi): One millionth of a millionth of a curie. Cubic Meter (M³): Approximately 35.3 cubic feet. Milliliter (ml): One thousandth of liter (approximately 0.0011 quarts). Liter (1): One liter (approximately 1.06 quarts). Kilogram (kg): One thousand grams or 2.2 pounds. N.D.: Non-detectable. -: In report tables indicates that analysis was not made. If there is only one sample in the report period, it is in the average column. NFS: Nuclear Fuel Services USAEC: United States Atomic Energy Commission USPHS: United States Public Health Service FRC: Federal Radiation Council PIC Pressurized Ionization Chamber

1969 Summary of Gross Beta, Particulate,

Radioactivity Levels in Air

Results in pCi/M³

		Gross			Gross
Station-Recation		пета	Station-Location	1	Beta
<u>Albany County</u> Albany Site A010101	Samples 145 Avg. Max. Min.	0.07 0.48 N.D.	Orange County Tuxedo Site A356501	Samples 23 Avg. Max. Min.	0.17 0.44 0.03
<u>Cattaraucus County</u> Ashford Site A045143	Samples 45 Avg. Max. Min.	0.13 0.40 0.03	Oswego County Scriba Site A376101	Samples 14 Avg. Max. Min.	0.11 0.23 0.64
Site A045114	Samples 46 Avg. Max. Min.	0.24 0.95 0.03	Tompkins County Ithaca Site A540101	Samples 41 Avg. Max. Min.	0.14 0.40 0.03
Site A045145	Samples 53 Avg. Max. Min.	0.16° 0.37 0.03	<u>Wayne County</u> Ontario Site A585701	Samples 13 Avg. Max. Min.	0.12 0.42 0.06
Site A045104	Samples 50 Avg. Max. Min.	0.14 0.44 0.02	Westchester County Cortland Site A595101	Samples 48 Avg. Max. Min.	0.11 0.33 N.D.
Site A045144	Samples 51 Avg. Max. Min.	0.25 0.68 0.08	Peekskill Site A590101	Samples 50 Avg. Max. Min.	0.20 0.56 0.02
Dútchess County Pawling Site A132201	Samples 13 Avg. Max. Min.	0.20 0.39 0.05			

1969 Summary of

Radioactivity Levels in Fallout

Result in pCi/ft2/day

Station-Location			I-131		Cs-137	·	Sr-89	· · · · · · · · · · · · · · · · · · ·	
Libery County	Samples	77	· · · · ·	27		20		20	
Albany	Avg.	21	N.D.	<i>2</i> (N.D.	~7	N.D.	27	N.D.
Site B010101	Max.		N.D.		N.D.		8		N.D.
	Min.		N.D.		N.D.		N.D.	•• • •	N.D.
Cattaraugus County	Samples	51	• •	51		51		51	· .
Ashford	Avg.		N.D.		N.D.	·	12	· ·	N.D.
Site B045145	Max.	1.1	N.D.		N.D.		93		32
	Min.		N.D.	a the second	N.D.		N.D.	•	N.D.

1969 Summary of

Radioactivity Levels in Milk

Result in pCi/l

Station-Location		I-131		<u>Cs-137</u>		Sr-89	Sr-90		H-3
<u>Albany County</u> Albany Site M010101	Samples 53 Avg. Max. Min.	N.D. 6 N.D.	52	N.D. 29 N.D.	53	N.D. 27 N.D.	53 6 14 N.D.	52	N.D. 2,980 N.D.
<u>Cetterauous County</u> Ashford Site M045168	Samples 19 Avg. Max. Min.	N.D. N.D. N.D.	19	N.D. 30 N.D.	14	3 17 N.D.	14 10 17 N.D.	10	N.D. 1,390 N.D.
Site M045114	Samples 19 Avg. Max. Min.	N.D. N.D. N.D.	19	30 96 N.D.	13	3 18 N.D.	13 11 19 N.D.	10	N.D. 2,170 N.D.
Site M045146	Samples 20 Avg. Max. Min.	N.D. N.D. N.D.	20	N.D. 40 N.D.	12	4 22 N.D.	12 12 25 7	10	N.D. 1.050 N.D.
Site M045143	Samples 19 Avg. Max.	N.D. N.D.	19	N.D. 23	13	8 40	13 16 21	10	N.D. 1,520

Radioactivity Levels in Milk (cont.)

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RESHLT	1.11	$D \cup I / I$
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Ctation-Lacition 1		T-1-21		Cs-137		Sr-89		Sr-40		
STRIGON-LOCATION	<u></u>	<u> </u>		03-101				<u> </u>		
Site M045131	Samples 20		20		13	•	13		10	
	Ava.	N.D.		N.D.		3		10	• .	N.D.
	Max.	N.D.		27		19		17		1,330
	Min.	N.D.	н н. Н	N.D.		N.D.		É		N.D.
							:	÷.		
Site M045170	Samples 19		19	4	11		11		10	
	Avg.	N.D.	•	N.D.		N.D.	•	15		N.D.
	Max.	5		26		18		24		1,640
	Min.	N.D.		N.D.		N.D.		9		N.D.
							· · · ·	• .		en e
East Otto	Samples 19		. 19		13		13		.9	<b></b>
Site M045602	Avg.	N.D.		N.D.		4		5		N.J.
	Max.	5		N.D.		17		13	•	<b>,</b> 47C
	Min.	N.D.		N.D.		N.D.	n de la composición de la comp	N.D.		
		e di second		•	10		10		• •	
Machias	Samples 19	NT TO 1	19	AT ~~	12	· · · · ·	14	10	1U	<u>ب از،</u>
Site M046947	Avg.	N.D.		N.D.		0		- 13		1 / 10
	Max.	5	•	27		25		13		1,460
	Min.	N•D•		N•D•	. •	N•D•		. 1		N• J•
Vonkohing	Samples 19		10	· .	Q		R		D.	
IOLKSHILG	Ave	N T	1.7	ND		NID	J	G	,	N.D
STLE MU40213	May			00 00			· ·	12		1.150
	Max.	N D	. c		· · · ·					N.D.
	1VILII0	14 • L ⁰ •		14 • 17 •		1 <b>N • 17 •</b>		U		
Erie County	Samples 10	•	10		10	4	10		-	• .
Buffalo	Ava.	N.D.		N.D.		3		N.D.		·
Site M140101	Max.	N.D.		N.D.		16		9		-
	Min.	N.D.	•	N.D.		N.D.	· .	N.D.		<u> </u>
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		· · · ·		,	· •					
Concord	Samples 19		19		. 10		- 10	•	10-	
Site M145951	Avg.	N.D.		N.D.		6	· -,	15		N.D.
	Max.	N.D.		26		25	ны. На	21		1,840
	Min.	N.D.		N.D.		N.D.	•	11-		N.D.
		•.	,		•		~			
East Concord	Samples 6	NT TO	6	NT 10	3	NT P	3	N7	•••	•
Site M145971	AVG.	N.D.		N.D.	•	N.D.		·V•·./•		-
	Max.	N.D.		• 24		N.D.		/ N 7	. '	-
· · · · · ·	Min.	N•D•		N•D•	•	N.D.		N.• D.•		-
Sita M1/50/0	Samples 19		١٩		<b>Q</b> .	•	Ġ		10	
UILE MINUVAU	Ava_	N.D.	÷,	N.D.		N.D.		.7		N.D.
۰.	Max.	N. D.		N.D.		5		15		1,220
	Min.	N.D.		N.D.		N.D.	•	N.D.		N.D.

### Radioactivity Levels in Milk (cont.)

Result in pCi/l

Station-Location		I-131	Cs-137		Sr-89	Sr-90	E-3 1
C:+- V145CEO						······································	
51te M145950	Somples 20	20		12	12		10
	AVO.	N•D•	N.D.		N.D.	9	N.D.
	Min.	N•D•	30		7	14	N.D.
• •		N•D•	N•D•		N•D•	6	N.D.
Sardinia	Samples 11	11	· · ·	7	7	,	10
Site M147148	Avg.	N.D.	N.D.		۲.	3	
	Max.	N.D.	20		15	9	2 000
	Min.	N.D.	N.D.		N.D.	N.D.	N-D.
• .							
Nassau County	Samples 11	11		-	- · ·		
Oyster Bay	Avg.	.N.D.	N.D.			-	_
Site M297101	Max.	N.D.	27		- · · · ·	<b></b>	-
	Min.	N.D.	N.D.		-	· •	-
New York City	Complete 47	A 177				* . • • •	
Ster W709203	Samples 47	N D	ND	47	47		-
5100 M/09501	May.	N D	N•D• 30	· . ·	N•D•	0	
	Min.	N.D.	N D		18 N D	20	- (
			N•D•		N•12•	N•D•	-
Onondaga County	Samples 23	23		23	23	·	_
Geddes	Avg.	N.D.	N.D.		N.D.	é	_
Site M335601	Max.	22	N.D.	÷.,	15	20	
	Min.	N.D.	N.D.	•• . • .	N.D.	N.D.	-
			·				
Urange County	Samples 27	27		27	27	· · ·	°-
Newburgh	Avg.	N.D.	N.D.	•	N.D.	9	- 1
5110 M350201	Max.	6	N.D.	· ·	10	22	-
	/¥1⊥I1.●	N•D•	N•D•		N.D.	N.D.	- 1
Oswego County	Samples 12	12	1		11		10 .
New Haven	Avo.	N.D.	N.D.	. <b>.</b>	N.D.	7	
Site M375801	Max.	N.D.	23		18	16	2.000
	Min.	N.D.	N.D.		N.D.	N.D.	N.D.
					•		
Scriba	Samples 12	. 12	נ	12	12		12
Site M376701	Avg.	N.D.	24	· .	4	-13	N.D.
	Max.	13	31		17	23	2.190
	Min.	N.D.	N.D.		N•D•	N.D.	N.D.
Site M376703	Sampler 12	10		1 <b>0</b>	10		
	Avo.	N.D.	וכ	. 2	12	10	14 1
	Max.	19	 		4 · · · ·	⊥,∠ · . 37	2 200
	Min.	'N.D.	24		N.D.	N.D.	N.D.

Radioactivity	Levels	in	Milk	(contr)
				A

Result in pCi/l

Station-Location	1	I-131	Cs-137		Sr-29	5-00	
					<u> </u>	090	
Site M376702	Samples 12	12	2	12	12	<u>)</u> .	12
	Avg.	N.D.	23	· ·	4	15 -	1.063
	Max.	N.D.	34		18	36	2.870
	Min.	N.D.	N.D.	the sector as	N.D.	N.D.	
St. Lawrence County	Samples 24	24	4	24	.24		-
Massena	Avg.	N.D.	N.D.		3	3,	_
Site M440201	Max.	19	32	· · · · · · · ·	30	17	-
	Min.	N.D.	N.D.		N.D.	N.D.	_
Suffalle Countie	Samalas 10					•	
Brookbastan:	Samples 12	12	2	-			-
Sito MEIEIO2	AVG.	N.D.	N.D.	· ·	-	<del>-</del> . 1	-
DIFE WOIDIO2	Max.	N•D•	33		-	. ·	-
	W.Lile	N•D•	N.D.		-		
Brookhave	Samples 12		<b>)</b> ,	_ · ·	4 . ¹		
Site M515101	Avc.	N.D.	ND			· .	-
	Max	7	30			-	-
	Min.	N-D-	ND			• • •	
			M•2.		-	2	-
Yaphank	Samples 12	12	2	12	. 12		
Site M515102	Avg.	N.D.	N.D.		N.C.	6	
	Max.	N.D.	21	te i sere e	28	11	
	Min.	N.D.	N.D.		N.D.	N.D.	_
					line in the		
Wayne County	Samples 4	6	)	6	6	· · · · ·	-
Untario	Avg.	N.D.	N.D.		3	3	_
Site M586301	Max.	15	26		16	.÷ 8	
	Min.	N.D.	N.D.		N.D.	N.D.	-
C:+- NE (15 7 0)	<b>C N D</b>	· · · · · · · · · · · · · · · · · · ·				• 	
Site MSH5701	Samples 7	7	· · · · · ·	7	7		-
×	Avg.	N.D.	N.D.		N.D.	3	-
	Max.	N.D.	N.D.		7	81	-
	Min.	N.D.	N•D•		N.D.	N.D.	-
Site M585702	Samples 1	1		1			
	Ava.	N.D.	N.D.	<b>A</b>	N D	5	-
	Max.	N.D.	N.D.		N D	. J	-
	Min.	N.D.	N.D.		N. D.	-	-
				4.5 		-	-
Site M585703	Samples 3	3	:	3	3		
	Avg.	N.D.	N.D.		N.D.	N.D.	_
	Max.	N.D.	N.D.		N.D.	N.D.	· · · · ·
	Min.	N.D.	N.D.		N.D.	N.	-

Radioactivity Levels in Milk (cont.)

	•		· ·		· ·		· · · · ·
Instion-Location		7-131	<u>Ch-137</u>		Sr-89	Sr-90	:-3
Mestchesten County Mt. Pleasant Site M595701	Somples 10 Avg. Max. Min.	10 N.D. N.D. N.D.	N.D. N.D. N.D.	-	- -	-	
Yorktown Site M596802	Sumples 12 Avg. Max. Min.	12 N.D. 12 N.D.	N.D. 22 N.D.	-	-	-	

Result in pCi/l

<u>1969 Summary of</u> Racioactivity Levels in Water

Result in pCi/l

Station-Location		Cs-137	7	Ru-106		Sr-90.	Gro	oss Beta		H-3
		•								······································
Albany County	Samples -		-				12		12	
Albany	Avg.	-		-		<b>-</b> '		2		N.D.
State Realth	Max.	-		-		. –	•	3 .		2,690
Dept. Lab.	Min.	-	• •	<b>.</b>	•	-		2		N.D.
Charlent	C-males	••	· .				00		00	
Crease Dem	Sompres -		-		<b>.</b>		23		23	
orescent Dam	AVG.	-			•	-		- 4		N•D•
	wax.			· ••		-		5		2,830
· · · ·	Min•	-		-		<b>-</b> .		2	:: :	N.D.
Glermont	Samples -		_				16			
Hudson Biver	Avo	_	_	· _	-		40	2	-	
ndoson nivei	May.	_		_	•	-		10		
;	Max. Min	_		-			•			-
		-	• •	-		-		N•U•		. –
Cohoes	Samples -		-		_	÷.,	24		24	
Cohoes	Avg.	-		-	• *	-		. 4		N.D.
Filtration	Max.			-		-		13.	•	2.100
Plant	Min.	-		-	• •	-		N.D.		N.D.
				· · ·	· .					
Catteraugus County	Samples 12		12		12	•	12	· · ·	12	
Ashford	Avg.	N.D.		N.D.		N.D.		4		N.D.
Cattaraugus	Max.	N.D.		N.D.		N.D.		11		1.800
Greek at	Min.	N.D.		N.D.		N.D.		N.D.		N.D.
Bigelow Bridge						· ·				
Site CO7					i					
						•				
Buttermilk Creek	Samples 12		12		12		12		11	
At Fox Valley Rd.	Avg.	N.D.		N.D.		N.D.		· 5	· .	N.D.
Site 004	Max.	N.D.		N.D.		N.D.		9		N.D.
	Min. 🕤	N.D.		N.D.		N.D.		N.D.		N.D.

# Radioactivity Levels in Water (cont.)

Result in pCi/l

Station-Location	· 	$C_{S} = 1.37$				57-90	Grace Hors	
					······	01 /0	0.035 1200	
Buttermilk Creek	Samples 53	<i>t</i>	53		52		55	55
At Thomas	Ava.	150	÷	1.456		407	1.754	115.099
Corners Rd.	Max.	1,161		5,816		1.658	5.440	421 0.0
Site 035	Min.	N.D.		N.D.		28	72	
				N•2•		20	10	1,000
Cattarauxus	Samples 3		3		3		לו	.17
Creek near	Avg	N.D.	•	523	Ŭ	127	327.	8 771
Felton Bridge	Max.	N.D.		891		194	915	30,110
Site 032(daily)	Min.	N.D.		200		72	132	9.950
				200	· · ·		102.	0,700
Dutchess County	Samples 2	· · ·	·		-		15	
Pawling	Avo.	N.D.			· . ·	_	- ¹ 2	_
Pond at United	Max.	N.D.		-		_	ы. Б	_
Nuclear Corp.	Min.	N-D-		<b></b> .	•	_	2	
Nuclear ourp.		N•D•		· .			۷.	-
Erie Cousty	Samples 35		34		34		44	LL
Brant	AVG	N.D.	U,	N-D-		22	112	8 530
Cattarauous Creek	Max	273		272		62	423	29,000
At Trying	Min.	N. D.		N.D.		ND	16	N
Site 065								
						· .		
Collins	Samples 36		35	1 A A	36		51	51
Cattaraucus Creek	Ava.	N.D.		N.D.	.00	23	134	11/217
At Gowanda	Max.	113		487	•	75	219	44 520
Site 060	Min	N.D.		N.D.		N.D.	16	N.D.
							10	
Concord	Samplès 16		16		12		202	202
Cattaraugus Creek	Avg.	86		210	· ·	72	225	LUL IALGRE
At Springville	Max.	284		421	• .	224	926	94.100
Dam	Min	N.D.		N-D-		7	N.D.	
Site 042(dailv)								
	• •							
Springville Dam	Samples 43		43		42		51	50
Site 042	Avá.	N.D.		151		47	214	17,619
(weekly	Max.	81		414		208	535	69,810
composite)	Min.	N.D.		N.D.		N.D.	• 26	N.D.
							- 20	
Niagara County'	Samples -				· _		13	- 
Niagara Falls	Ava.	<b></b> ·				-	4	 <del></del>
West Branch of	Max.	-		° _		-	- Fi	· · · ·
Niagara River	Min.			_		-	3	_
Contario County	Samples -		·	· · ·			11	<b></b>
Ceneva	Avg.	· 📕		-		_		. <del></del>
Seneca Lake	Max.	-		-		 _	с. с	
	Min.			-		<u> </u>	· ,	-

# Radioactivity Levels in Water (cont.)

unetion-Location		Cs=137	Ru-106	Sr-90	Gross Bota	1:-3
Grande Courter	Salandan	· ·				
Three of the second	5/10105		-	· · ·	12	-
Indian Kill	May	•		-	6	-
Cartfall S	Min	-	-	-	11	
					3	
Sawego County	Samples	· _ · · · · _				. •
Cswedo	Avg.	· · · · · · · · · · · · · · · · · · ·	· · · · · ·		11	-
City Hall Tap	Max.			7	4	-
	Min.	_	_		5	· · · ·
		•	-	· ••••	3	· •
New Haven	Samples		· · · · ·		•	· · · ·
Lake Ontario	Ava.	· · · ·	_		9	-
	Max.	-		<b>.</b>		• • • • • • • • • • • • • • • • • • •
•	Min.		-		D D	
				-	3	1997 - Angel State (1997) 1997 - Angel State (1997) 1997 - Angel State (1997)
Tompkins County	Samples		_			
Lansing	Avg.	-			1 N D	1
Kaha's Well	Max.		_		N• <i>D</i> •	N.D.
	Min.		· <u>-</u> .	_		-
· · · ·				_	-	-
LaBarr Dug Well	Samples				1	
	Avg.				L N D	1
	Max.	-	-		N•D•	N•Q•
	Min.	- -	· · · ·		-	-
· · ·		• •			· •	-
Tompkins County	Samples		_ ·		1	,
Airport	Avg.	-	-	· <b>_</b>	N D	1 N D
	<u>Max.</u>	<b>-</b> °	_	· _ ·		iV• D•
	Min.	-	<b>-</b> .		· · · · · · · · · · · ·	_
	_				·	
iracey Tobey	Samples		-	· · · ·	1 .	
weil	Avg.	-	<b>-</b>	-	. N. D.	Х. Э.
	Max.	-	<b>-</b> .	-	-	-
	Min.	-	-	- j	-	_
B. K. Shively's	C	* 	•			
Well	Samples		-		1	1
Nerr I	Avg.	-	<b></b>	<b></b>	N.D.	N.D.
	Max.	-	-	-	-	_
	WITU •	-	. –	-	<b>-</b> .	
Navne County	Gamelan			•		
Octario Filtor	oumpites -		-		5	-
Plant	NVG•	-	· -	-	· · · · · · · · · · · · · · · · · · ·	-
	- 669 A.# - 555 A.	°	<b></b> .	-	6	· - ·
	م المشادد	-		-	3	- ,
Williamson Water	Samalas					
Plant	omepies Ave		-		1	- i
-	ovy. Mav	-	-	-	5	
	Mark.	-	-		-	-

# Result in pCi/1

Radiosctivity	Levels	in Water	(cont.)
والمراجع والمراجع والمراجع والمراجل والمحمد والمتحدين والمراجع و	the second s	and the second distance of the second distanc	

		,
D	·	n: /1
ROSULT	1 n	DU 1/1
	× * * *	por/ L

	·					
Station-Location	<u> </u>	C-137	Ru-106	<u>Sr-90</u>	<u>Grose Reta</u>	- H-3 - 1
<u>Westchester County</u> Peekskill Camp Field Filter Plant	Samples Avg. Max. Min.			- - -	12 3 15 N.D.	
Hudson River At Standard Brands	Samples Avg. Max. Min.	13 N.D. N.D. N.D.	3 27 N.D. N.D. N.D.	N.D. N.D. N.D.	50 9 32 N.D.	
Ossining Indian Brook Reservoir	Samples Avg. Max. Min.			-	12 4 7 N.D.	
Hudson River At Sing Sing	Samples Avg. Max. Min.	51 N.D. N.D. N.D.	9 27 N.D. N.D. N.D.	N.D.  N.D.	51 23 71 N.D.	
Yorktown Croton Reservoir	Samples Avg. Max. Min.			: 	12 4 6 N.D.	-
<u>Jefferson County</u> Watertown Black River	Samples Avg. Max. Min.	- - - -		- - - -	13 3 5 2	
<u>New York City</u> Public Water Supply	Samples Avg. Max. Min.	-			18 2 4 N.D.	

. 19

		~ ~	~ *	•	
				<b>1</b>	~ ~ ~
12 24 2 2 2 2	F (1) -			1 1	- AL 2 - T
N F V D				3.11	<b>n</b> 2 1

Station	Date of Collection	Results (pCi/M ³ )
Cattoraugus County Ashford Site A045145	3/28/69 4/22/69 7/10/69 9/5/69	7,860 22 63 18
Site A045144	5/2/69 5/16/69 6/2/69 6/30/69 7/30/69 8/13/69	19 170 36 148 160 31
Site A045114	4/14/69 12/18/69	2,640 38
Site A045104	3/10/69	209
	7/17/69 11/26/69	50 26

Station	Results pCi/M ³
Albany N.Y.S.D.H., Div. of Lab. & Research 30 Russell Road	Average 21 (22 samples) Maximum 83 Minimum 14

- 1) Grab samples analyzed by Division of Laboratories and Research, N.Y.S. Department of Health.
- 2) The A.E.C. 10CFR20 allowable yearly average concentration for Kr-85 is 300,000  $pC1/M^3$ .

					•	
Radioactivity	i.n	Fish	Below	NFS	Dischar	<u>20</u> -

		Cs-137	Co-60	- RuRh-106	Zr\86-95	Cs-134	Sr-90
Station & Type of Fish	Date			Results (I	oCi/kg)		
Cattaraugus County Cattaraugus Creek just							
above Springville Dam (bullhead) (small sucker) 1 Suttormilk Greek at	5/27/69 0/23/69	2,014 4,896	1,051 38	2,171 3,789	N.D.	N.D. 1,013	415 1,476
Thomas Corners Road (brown trout)	5/26/69	2,219	2,078	<b>3,08</b> 6	95	39	289
(sucker-whole)	5/26/69 0/24/69	7,505 7,537	33 123	1,408 15,721		1,240 1,467	1,373 6,677
Cattaraugus Creek at Zoar Valley Park (sucker-whole)	5/27/69	872	77	119		161	306
Rt. 16 Bridge (trout)	5/26/69	117	870	668	33	N.D.	12.3
(sucker-whole)	5/26/69	11					N.D.
At mouth of Cattaraugus Creek (carp-fillets)	5/2/69	147	353	977	10	N.D.	157
(carp-carcass)	5/27/69			· · · ·	· ·		1,994
(carp-fillets)	5/27/69	91	139	465	N.D.	N.D.	125
(carp-carcass)	5/27/69					· .	1,366
(carp-fillets)	5/27/69	63	185	667	N.D.	N.D.	62.9
(carp-carcass)	5/27/69						3,182
(sucker-fillet)	5/28/69	101	N.D.	N.D.		N.D.	17
(yellow perch-whole)	5/28/69	142	N.D.	N.D.		N.D.	38
(sucker-flesh)	5/28/69	85	N.D.	N.D.	· · · · · · · · · · · · · · · · · · ·	N.D.	N.D.

Radioactivity in Fish Below NFS Discharge (cont.)

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	Date	Cs-137	Co-60	RuRh-106	ZrN5-95	Cs-134	Sr-90		
Station & Type of Fish			Results (pCi/kg)						
At mouth of Cattaraugus Creek (cont.)						• • •			
(coho-salmon)	10/3/69	138	N.D.	N.D.		N.D.	42		
(cono-salmon)	10/24/69	152	N.D.	N.D.		N.D.	25		
(rainbow trout)	10/24/69	106	N.D.	N.D.		N.D.	26		
(sucker-bone)	5/28/69						N.D.		
(sheephead-whole)	6/3/69	150	N.D.	N.D.		N.D.	28		
(sucker-flesh)	6/3/69	94	N.D.	N.D.		N.D.	35		
(sucker-bone)	6/3/69						686		
(small mouth bass)	5/27/69	323	1,002	1,269	8.0	N.D.	203		
(bullhead)	5/28/69	244	640	1,338	N.D.	N.D.	269		
(sheephead)	5/28/69	138	135	504	N.D.	N.D.	431		
(shad)	5/27/69	148	81	431	N.D.	N.D.	68.4		
(smelt)	5/27/69	367	498	1,779	N.D.	N.D.	86.9		
(bullhead)	5/28/69	87	284	473	N.D.	N.D.	100		
(rock bass)	5/28/69	148	162	774	N.D.	N.D.	863		
(carp-fillet)	5/27/69	90	272	452	N.D.	N.D.	55.5		
(carp-carcass)	5/27/69						1,754		
Yorkshire (mixed suckers)	10/23/69	N.D.	N.D.	N.D.		N.D.	47		

Radioactivity In Deer-NFS Site*

						·	• •	0	. ·	
Station	Portion of Deer	Date	Cs-137	Co-60	RuRh-106	Cs-134	Sr-90	Pu-238	Pu-239	I-129
Station	UL DUCL				Results j	pCi/kg				pCi/gm
Cattaraugus County Ashford County Rd. Deer P	Hind- quarter 32	3/6/69	103	N.D.	N.D.	N.D.				
Deer O	Hindquarter	3/18/69	203	ND	108	מא				
<b>`</b>		0,10,00	203	M.D.	100	R.D.		· .		
	Liver	•	141	N.D.	200	N.D.			•	· .
	Lungs		101	•		7	· . :	N.D.	N.D.	к
	Forequarter			· · ·	,		4.5			
	Thyroid									<81
Deer R	Hindquarter	3/18/69	2,765	N.D.	N.D.	397		•		
	Forequarter					· · ·	15.5	· · · ·		
	Lungs		746	•		92		0.14	0.22	
	Thyroid			т. У					. <u>.</u>	180
Deer S	Liver	3/18/69	852	N.D.	N.D.	134				·
	Forequarter		2,250	N.D.	N.D.	314				· · ·
	Lungs		666			80		N.D.	0.11	
	Thyroid						~	•		210
Deer T	Hindquarter	3/18/69	268	N.D.	N.D.	28				
	Liver (adult doe)		92	N.D.	N.D.	N.D.		i -	- - -	· ·
	Forequarter	· · · · · ·					95.0			
·			I			·				

Radioactivity In Deer-NFS Site (cont.)

	Portion	Date	Cs-137	Co-60	RuRh-106	Cs-134	Sr-90	Pu-238	Pu-239	7-125
liation	of Deer	Collected			Result pC	i/kg		<del></del>	·····	pCi/gm
eer T (cont.)	Lungs Thyroid		90			6		N.D.	N.D.	N. D.
Jeer U	Hindquarte	er 3/18/69	222	N.D.	N.D.	19				
	Liver		58	N.D.	N.D.	N.D.				
	Forequarte	er		·			19.0			
•	Lungs		97			N.D.		N.D.	N.D.	
	Thyroid			• •						" N.D.
Deer V	Liver (do	e) 3/18/69	1,154	N.D.	N.D.	169		· · · · · ·		
	Himlquart	er	2,937	N.D.	N.D.	402				
· · · · · · · · · · · · · · · · · · ·	Forequart	cr			•		19.2			
	Lungs	· · ·	727		· · · · · · · · · · · · · · · · · · ·	92		0.10	0.25	· .
Deer W	Muscle Ti	ssue 10/7/69	8,587	N.D.	624	2,046	N.D.	· · · ·		1,200
Deer X	Muscle Ti	ssue 10/8/69	139	N.D.	N.D.	N.D.				N.D.
Deer Y	Muscle Ti	ssue 10/10/69	996	N.D.	N.D.	139	28		. · ·	

*Deer collected outside 90 acre exclusion area but within 3,300 acre site except for Deer P.

·	Date of		······						
Station	Collection	Cs-134	_Cs-137	Co-60	RuRh-106	ZrNb-95	Sr-	Sr-90	Romarico
Lattaraugus Co. Town of Gowanda Site V042701	8/22/69 8/22/69 8/22/69	N.D. N.D. N.D.	N.D. N.D. N.D.	N.D. N.D. N.D.	N.D. N.D. N.D.	N.D. 50 N.D.	22 N.J. N.D.	15 284 N.D.	Tomstous Beans Beans
Sita V042702	8/22/69	N.D.	N.D.	N.D.	519	219	N.D.	363	Ecets

Radioidtivity in Vegetables-NFS Area

Radioactivity in Soil Used to Grow Vegetables

Detteraugue Co.	8/22/69	127 346	N.D. 634		Tomatoes-
Sité S042701	8/22/69	106 353	N.D. N.D.	an a	Soil Beans-
	8/22/69	137 545	N.D. 571		Soil Bears- Sort
Site \$042702	8/22/69	116 409	N.D. 656		Seets-
					0011

Radioac	tivity_	in Si	<u>lts Be</u>	low NFS	Discharge	

	Date of	1	Conc	entration r	Cila dry wa	icht	
Station	Collection	Sr-90	Cs-137	Ru-106	Cs-134	ZrNb-95	Co-(0
Buttermilk Creek downstream Site 035	8/29/66 11/30/66 2/27/67 3/6/67 3/20/67 3/27/67	81 3.9 4.8 0.4 1.4	74 179	47 589		88 222	6.3 9.2
Buttermilk Creek upstream Site 004	11/30/66 2/27/67 3/6/67 3/13/67 3/20/67 3/27/67	0.3 0.1 0.1 0.2 N.D. N.D.	0.2	1.7		0.2	0.1
Cattaraugus Creek downstream Springville Dam Site 042	11/30/66 1/27/67 2/28/67 3/7/67 3/14/67	3.8 1.2 9.9 0.9	9 4.3	32 4.5	1.5	10.7 0.8	C.4 0.3
Location A ^a C ^a D ^a E ^a F ^a G ^a H ^a	6/5/67b 6/5/67b 6/5/67b 6/5/67b 6/5/67b 6/5/67b 6/5/67b 9/22/69 9/22/69	0.3 0.6 1.9 2.5 1.8 1.2	8.1 4.5 37.3 44.4 43.3 19.4 31.8 33.5	1.9 1.3 2.6 2.8 3.4 3.5 166.4 178.6	1.4 0.8 7.1 5.2 7.6 3.5 9.9 11.0	•	0.2 0.4 0.4 0.5 0.4 1.3 2.0

·							
	Date of	·	Con	centration	oCila dov w	eicrt '	
Station	Collection	Sr-90	Cs-137	Ru-106	Cs-134	ZrXo-98	Co - 60
Cattaraugus Creek downstream Felton Bridge Site 032	9/28/66 11/30/66 3/7/67 3/14/67	4.6 0.1 0.6	6.5 8.3	22 28.3		6.7 9.5	0.0 0.5
Cattaraugus Creek upstream Bigelow Bridge Site 007	9/28/66 11/30/66 3/7/67 3/14/67 3/21/67 6/13/67 ⁹	1.6 0.6 0.1 N.D.	0.3 N.D.	1.9 N.D.		0.2 0.1	C.1 N.D.
5-Mile Creek, South (Cattaraugus Co. background)	1/27/67		0.4	2.5		0.4	
Buttermilk Creek upstream Pfeffer's Pond (background)	8/29/66		0.7	7		0.9	0.6

### Radioactivity in Silts Below NFS Discharge (cont.)

Alocations A-E were taken through the center of the pond perpendicular to the dam: A, was located at the upper end of the pond approximately 2,500 feet from the face of the dam; B. upproximately 2,000 feet from the face of the dam; C, approximately 1,500 feet; D, approximately 1,000 feet; and E, approximately 500 feet. Location F was near the entrance to the penstock about 60 feet from the face of the dam and five feet from the north shore, G was approximately 275 feet, and H approximately 40 feet from the dam.

^bData on gamma-ray emitters from the U.S. Public Health Service.

	Uranium	<u>, Plúťoni</u>	um, Iodin	c-129 in	Water		
	Below NFS	Discharge	Collecte	d 12/2/68	-6/16/69	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 19	
•		Resul	lt in pCi	$\underline{/1}$			
						· · ·	
Station		U-234	<b>U-2</b> 35	<b>U-238</b>	Pu-238	Pu-239	I-129
<u>Cattorougus County</u> Buttermilk Creek at Thomas Corners Road Site 035 (Grab Samples)	Samples Avg. Max. Min.	28 2.0 20.9 N.D.	28 0.23 2.18 N.D.	28 0.12 0.90 N.D.	28 0.21 0.63 N.D.	28 0.11 0.60 N.D.	15 N.D. N.D. N.D.
Erie County Cattaraugus Creek at Springville Dam Site C42 (Continuous Daily Samples)	Samples Avg. Max. Min.	12 0.29 1.38 N.D.	12 0.09 0.49 N.D.	12 0.09 0.36 N.D.	12 0.26 0.64 N.D.	12 0.37 1.36 N.D.	3 N.D. N.D. N.D.

The USAEC has established the following average yearly concentrations for each of the above isotopes if each were present by itself:

U-234,	V-235	:30,000	pCi/l	U-238:40,000	pCi/l
Pu-238,	Pu-239	9: 5,000	pCi/l	I-129: 60	pCi/l

	······································		Dissolved	}	Suspende	d	Dis. to Sus	
Station-Location	Isotópe	Avg.	No. of Samples	Max.	No. of Avg. Samples	s Mex.	_Ratio for Average	
Cattaraugus County Ashford Buttermilk Creek At Thomas Corners Road Site 035	Cs-137 Ru-106 Sr-90 Cs-134	51 761 315 6	(43) (48) (44) (7)	219 2,879 1,011 25	76 (43) 121 (48) 3 (43) 26 (42)	594 835 19 163	.671 6.29 105 .23	
Cattaraugus Creek Near Felton Bridge Site 032	Cs-137 Ru-106 Sr-90 Cs-134	3 19 227 0	( T) ( 1) ( 1) ( 0)	3 19 227 -	$\begin{array}{cccc} 355 & (1) \\ 38 & (1) \\ 4 & (1) \\ 84 & (1) \end{array}$	355 38 4 84	.01 .05 56.75	
Erie County Concord Cattaraugus Creek At Springville D m Site 042	Cs-137 Ru-106 Sr-90 Cs-134	N.D. 54 33 -	(5) (4) (4) (-)	N.D. 61 60	28 (4) 87 (3) 5 (4) 11 (4)	55 151 15 20	.62 6.6	

		<u>1968 – </u>			
Summary C	of Wator	Samoles	Disa	olved	<u></u>
Suspended	Résults-	Nuclear	Fuel	Serv	ices
	Result	t in pCi	/1	•	

·	• • • • • • • • • • • • • • • • • • •				·			· .
		]	Dissolved			Sugnerided		Dis. to Sus.
Chaling Transform	÷		No. of			No. of		Ratio for
Station-Location	1sotope	Ava.	Samples	Max.	Avg.	<u>Samples</u>	Max.	Averane
Cattaraugus County	Cc-137	16	(45)	200	107			
Ashford	$B_{11} = 106$	1 544	(45)	5 744	127	(45)	875	•36
Buttermilk Creek	ST-90	457	(43)	1 450	107	(45)	384	14.43
At Toomas Corners	Cs-134	66	(-1)	1,000 44	2	(40)	21	228.5
Road	<b>00</b> 10 (	0.0	( 1)	00		(42)	265	1.78
Site 035			•					
				· · ·	· ·			
Cattaraugus Creek	Cs-137	N.D.	(2)			( )		
Near Felton Bridge	Ru-106	277	(-2)	354	N.D	(2)	<b>-</b> .	-
Site 032	Sr-90	85	$\left(\begin{array}{c} 2 \end{array}\right)^{-1}$	004	N.D.	$\left(\begin{array}{c} 2 \end{array}\right)$		-
	Cs-134	0	(0)	-	N.D.	$\begin{pmatrix} 2 \\ 2 \end{pmatrix}$		- · · ·
						<u>\</u> 2}	-	-
Erie County	Cs-137	3	(21)	15	39	(21)	161	0.0
Concord	Ru-106	170	(21)	397	41	(21)	174	.05
Cottaraugus Creek	Sr-90	68	(21)	208	.62	(21)		100
At Springville Dam	Cs-134	<u> </u>	( 0)	÷	10	$(2^{2})$	39	105
Site 042								
- · · · ·			•			· · · ·		
Collins	Cs-137	N.D.	(2)	<del>.</del>	50	(2)	100	_
Cattarougus Creek	Ru-106	230	(2)	460	.40	(2)	52	5.75
At Gowanda	Sr-90	11	(2)	11	· 1	(2)	2.	11
Site UpU	Cs-134	N.D.	(1)	-	12	(2)	24 .	
Brant	Co. 107	N D	(					
Cattaranone Creak	CS-137	N.D.	$\begin{pmatrix} 1 \end{pmatrix}$	N.D.	262	(1)	262	-
At Trying	RU-100	N•D•	(1)	N.D.	40	(1.)	40	-
Site 065	51-90	57	(1)	57	_3	(1)	3	19
	05-134	U	( 0)	-	57	(1)	57	-
						· .		

Summary of Water Samples Dissolved and Suppended Results-NFS Results in pCi/1

Radio	activi	.ty 1.	$\phi \chi c$	<u>15</u>	<u>in</u>	F	1	<u>;h</u>	•
	lower	Huds	on	Riv	/er				
	Result	is in	- pC	$\frac{1}{1}$	(g		• •		

Station	Date of Collection	<u>Cs-137</u>	Co-60	Ru-106	Cs-134	Sr-90	Romarks
Green's Cove	6/23/69 6/23/69 6/23/69 10/16/69	96 N.D. 189 107	N.D. N.D. N.D. N.D.	N.D. N.D. N.D. N.D.	N.D. N.D. 181 131	- - N.D.	Carp (flesh) Carp (bone) Mixed sml. flsh Mixed sml. flsh
Nyack-Tappan Zee Bridge West	6/23/69 10/16/69	74 67	N.D. N.D.	N.D. N.D.	N.D. N.D.	- 40	Mixed sml. fish Mixed sml. fish
Iona Island	6/23/69 10/16/69	65 37	N.D. N.D.	N.D. N.D.	N.D. N.D.	- 96	Mixed sml. fish Mixed sml. fish
Peekskill Bay	6/23/69 10/16/69	157 N.D.	N.D. N.D.	N.D. N.D.	128 N.D.	217	Mixed sml. fish Mixed sml. fish

Radioactiv	<u>vity</u>	Levels	in N	<u>lud</u>
_		N		

Lower Hudson River Results in pCi/kg

					· · ·			
Green's Cove	6/23/69 10/16/69	734 500	454 253	333 526	508 535	-	•	
Nyack-Tappan Zee Bridge West	6/23/69 10/16/69	810 862	165 127	362 790	66 522	- 		
Iona Island	6/23/69 10/16/69	669 529	141 133	415 336	71 245	-		
Peckskill Bay	6/23/69 10/16/69	216 N.D.	60 N.D.	444 313	229 99	· - ·		

No. 32 a. a. a. 4 d. a. 2 d. a. a.	T	2 A	Maa ad ad a a
RECTORCENTS	$\Box G M G + C$	in Aguatic	VECETATION
11002000012207			

Lower	Hudso	n River
Result	ts in	nCi/kg

Station	Date of Collection	<u>Cs-137</u>	Co-60	Ru-106	Sr-90	ZrNb-95	Co-58	Mn-54
Green's Cove	5/ 8/69 6/23/69 10/16/69	2,043 167 96	579 61 459	408 541	- 17	567 474 384	1,508 410 -	N.D. 3,861
Nyack-Tappan Zee Bridge West	6/23/69 10/16/69	N.D. 43	1.48 227	- 473		368 427	533	674 1,457
Iona Island	5/ 8/69 6/23/69 10/16/69	152 286 92	162 67 125	757 - 338	- - 26	675 330 199	600 587 -	N.D. 745
Peckskill Bay	10/16/69	70	210	540	N.D.		-	1,243

			· · · · · · · · · · · · · · · · · · ·		-			
Station	Date Collected	Type of Fish	Cs-137	Co-60	Ru-106	Cs-134	Set-90	Sr-89
swego County	7/27/68	Suclier	278	5/	(. ) <b>7</b>			
Nine Milk Pt.	7/27/68	Small Bass	728	1/	222	N.D.	152 ×	-
(Lake Ontario)	7/27/68	Sunfish	309	96	505	N.D.	/4 *	-
	7/27/68	Silver Bass	591	55	260	N.D.	302 *	-
	7/27/68	Bullhead	218	<u>ر</u> .	500 -	N.D.	137 *	-
	7/27/68	White Perch	460		240 270	N.D.	3,300 ×	-
	7/27/68	Bluegill	530	82	500	N.D.	127 * -	
	7/27/68	Small Bass	441	ND	610	N.D.	220 **	-
	7/27/68	Sunfish	500	N.D.	745	N.D.	310 **	-
	7/27/68	Sucker	209	. U. N	765	N.D.	19() ::::	-
	7/27/68	Silver Bass	346	<u> </u>	نان ،∶د. رسر∸ع	- A.D.	90 **	· -
	7/27/68	Bullhead	2/3	N.D.	2/7	N.D.	111 **	-
	7/27/68	White Perch	378	N.D.	308	N.D.	582 **	-
	7/27/68	Yellow Perch	410	9 N D	222	N.D.	211 ***	-
	7/27/68	Sucker	214	N.D.	419	X.D.	83 **	-
	7/27/68	Pullhesd	214		445	N.D.	50	-
•	7/27/68	Small Bace	514	N.D.	560.	N.D.	243 ***	-
	7/27/68	White Perch	523	14	59	N.D.	59 ****	
	7/27/68	Sunfièh	223	04	582	N.D.	178 ***	-
		JUILTON	Z41	27	682	N.D.	262 ***	· - ]

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1968
Radioactivity in Fish
Lake Ontario
Results in pCi/kg

* E. Nine Mile Point
** W. Nine Mile Point
*** Mexico Bay

Station	Date Collected	Type of Fish	Cs-137	Co-60	Ru-106	Cs-134	Sr-90	Sr-89
Cayuga Co.	8/5/69		79	N.D.	N.D.	N.D.	G. N	_
Cayuga Lake	8/5/69	Smelt	N.D.	N.D.	N.D.	N.D.	21	· _
	3/5/69	Brown Trout	N.D.	N.D.	N.D.	N.D.	7	
	8/5/69	Yellow Perch	83	N.D.	N.D.	N.D.	17	
	8/5/69	Cisco	54	N.D.	N.D.	N.D.	N.D.	
	8/5/69	Rainbow Trout	68	N.D.	N.D.	N.D.	N.D.	-
	8/5/69	Lake Trout	55	N.D.	N.D.	N.D.	6 ^s	_
	8/5/69	Suckers	21	N.D.	N.D.	N.D.	N.D.	-
	8/5/69	Trout	75	N.D.	N.D.	N.D.	11	6
	8/5/69	Rock Bass	89	N.D.	N.D.	N.D.	33	
	8/5/69	Samll Mouth Bass	s 96	N.D.	N.D.	N.D.	N.D.	_
t	8/5/69	Bullhead	82	N.D.	N.D.	N.D.	21	
				• •				
Erie County	5/28/69	Sheephead	85	N.D.	N.D.	N.D.	15	. <b></b>
Angola	5/28/69	Suckers	69	N.D.	N.D.	N.D.	N.D.	_
(Lake Erie)	5/28/69	Walleye	205	N.D	N.D.	N.D.	21	
	5/28/69	Coho Salmon	280	N.D.	-	-	N.D.	
	5/28/69	Coho Salmon	258	77	N.D.	<del></del>	N.D.	-
	5/28/69	Carp	123	150	425	N.D.	683	-

<u>1969</u> <u>Radioactivity in Fish</u> <u>Cayuga Lake, Lake Eric</u> <u>Result'in pCi/kg</u>

	•				•			
	Date							
Station	Collected	Type of Fish	Cs-137	Co-60	Ru-106	Cs-134	Sr-90	Sr-89
· · · · · · · · · · · · · · · · · · ·	- 10 1 ( 0						<b>C</b> D	
Layne County	9/3/69	Walleye Pike	256	N.D.	<u>N.D.</u>	N.D.	93	
Laké Ontario	9/3/69	Rock Eass	25.7	N.D.	N.D	N.D.	X.D.	
	9/3/69	White Perch	253	N.D.	N.D.	N.D.	N.D.	
	9/3/69	Silver Bass	455	N.D.	N.D.	N.D.	N.D.	
•	9/3/69	Eullhead	88	N.D.	N.D.	N.D.	29	
	9/3/69	Large Mouth Bass	145	N.D.	N.D.	N.D.	59	
	9/3/69.	Eel	262	N.D.	N.D.	N.D.	N.D.	
	9/3/69	Black Croppie	168	N.D.	N.D.	N.D.	105	
	9/3/69	Small Mouth Bass	140	N.D.	N.D.	N.D.	N.D.	221
·	9/3/69	Yellow Perch	1,690	N.D.	N.D.	N.D.	1,302	
	9/3/69	Sunfish	84	N.D.	N.D.	N.D.	132	
• • •	9/3/69	Bluegill	N.D.	N.D.	N.D.	N.D.	-*	
	. i							- -
Oswego County			•					
Scriba	÷							
(Lake Ontario)	s/13/69	•	60	N.D.	N.D.	N.D.	25	
*	8/13/69		118	N.D.	N.D.	N.D.	55	
	8/13/69		295	N.D.	N.D.	N.D.	Lab.	Acc.
	8/13/69		330	N.D.	N.D.	N.D.	52	
	8/13/69		273	N.D.	N.D.	N.D.	Lab.	Scc.
	8/13/69		123	N.D.	N.D.	N.D.	Lab.	Acc.

<u>1969</u> <u>Radioactivity in Fish</u> <u>Lake Ontario</u> Result in pCi/kg

* Insufficient sample for analysis

			1 A 1				
	Number	Number Vear of Survey, Average Results in ur/br					
Nuclear Facilities	of Sites	1964	1965	1966	1967	1968	1969
Nuclear Fuel Services-1966* Brookhaven National Laboratory-1954* Consolidated Edison Unit #1-1962* Nine Mile Point-1969* Rochester Gas & Electric - 1969*	17 22 18 22 20	11.1 9.2 11.3 -	11.1 8.7 10.0 12.0	10.1 10.5 - -	11.2 9.0 9.4	9.5 9.8 9.4 9.0 8.5	11.4 - 9.5 8.1 7.5

State-Wide Pressurized Ionization Chamber (PIC) Study of External Gamma Radiation

*Year in which facility started operation.

PIC Study Along Cattaraugus Creek-1969

	Results in ur/hr					
Location	9/16	9/23	10/6			
Irving Zoar Bridge Frye Bridge Springville Dam Felton Bridge Bigelow Bridge	12.6 15.5 13.0 18.5 20.5 9.2	9.0 13.5 12.8 14.1 11.9	11.3 15.5 11.9 11.3 14.8			

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