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ENVIRONMENTAL MONITORING

ANNUAL REPORT

1972

By

J. D. MOORE

Atomics International
North American Rockwell

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ABSTRACT

Environmental monitoring at Atomics International is performed by the Operational Safety and Waste Management Unit of the Health, Safety and Radiation Services Department. Soil, vegetation, water, and air are routinely sampled up to a distance of 10 miles from Atomics International sites. Site perimeters are monitored for radiation levels by means of thermoluminescent dosimeters. The environmental radioactivity reported herein is attributed to natural causes and to nuclear weapons testing, rather than to Atomics International operations.

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I. SUMMARY

Atomics International Division of Rockwell International Corporation has been engaged in atomic energy research and development since 1946. The Company designs, develops, and constructs nuclear reactors for central station and compact power plants, and for medical, industrial, and scientific applications.

The Company occupies modern facilities in Canoga Park, California, approximately 23 miles northwest of downtown Los Angeles (Figure 1). The 290-acre Nuclear Development Field Laboratory (Figure 2), equipped with both AEC and Rockwell International owned facilities for the support of advanced nuclear studies, is located in the Simi Hills of Ventura County, approximately 29 miles northwest of downtown Los Angeles. The location of the above sites in relation to nearby communities is shown in Figure 3.

Programs conducted during 1972 include the operation of reactors for neutron radiography and research, a critical facility, a hot cell, and a radioactive material disposal facility. In addition, fuel manufacturing involving normal and enriched uranium was conducted during the year.

The basic concept of radiological hazards control at Atomics International requires adequate containment of radioactive materials and, through rigid operational controls, minimizes effluent releases and external radiation levels. The environmental monitoring program provides a measure of the effectiveness of the Company's radiological safety procedures and of engineering safeguards incorporated into facility designs.

Environmental sampling stations located within the boundaries of Atomics International's sites are referred to as "on-site" stations. The remaining stations, located within a 10-mile radius of the sites, are referred to as "off-site" stations. The on-site environs of Atomics International's Headquarters and Nuclear Development Field Laboratory (NDFL) facilities are sampled monthly to determine the concentration of radioactivity in typical surface soil, vegetation, and water samples. The off-site environs are sampled quarterly. Continuous on-site environmental air sampling provides information concerning long-lived airborne particulate radioactivity. A site perimeter radiation

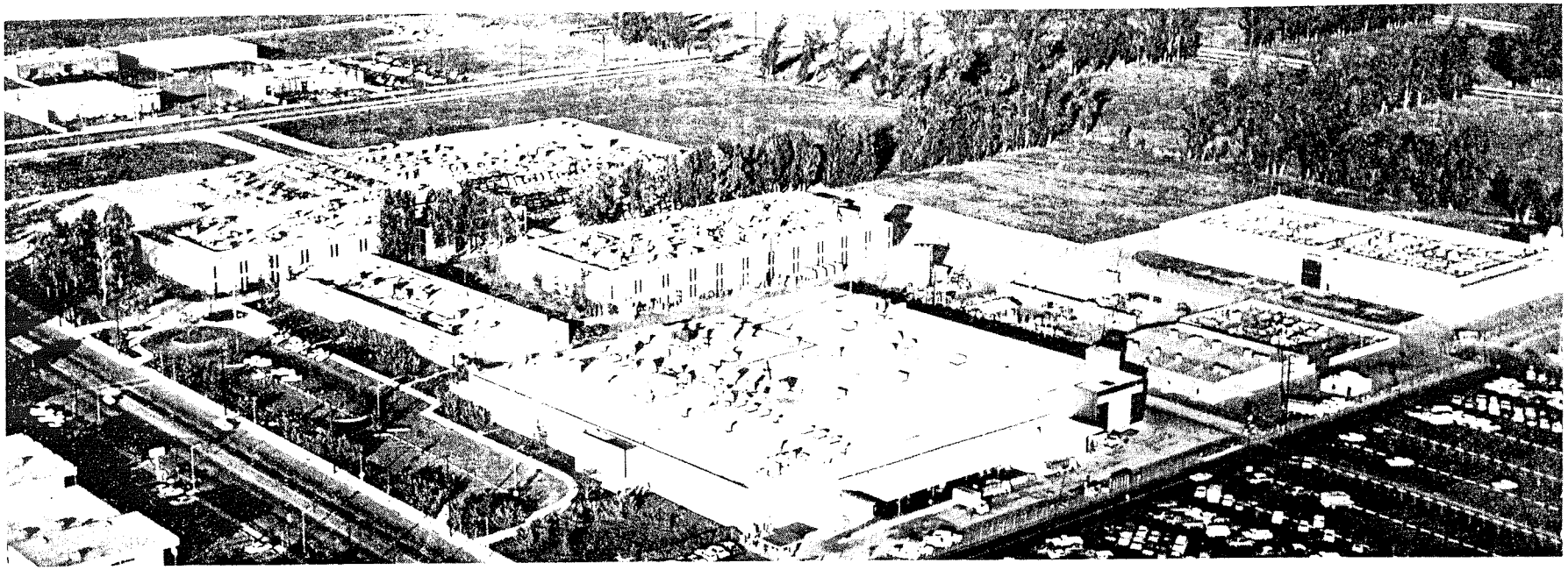

Figure 1. Atomics International Headquarters

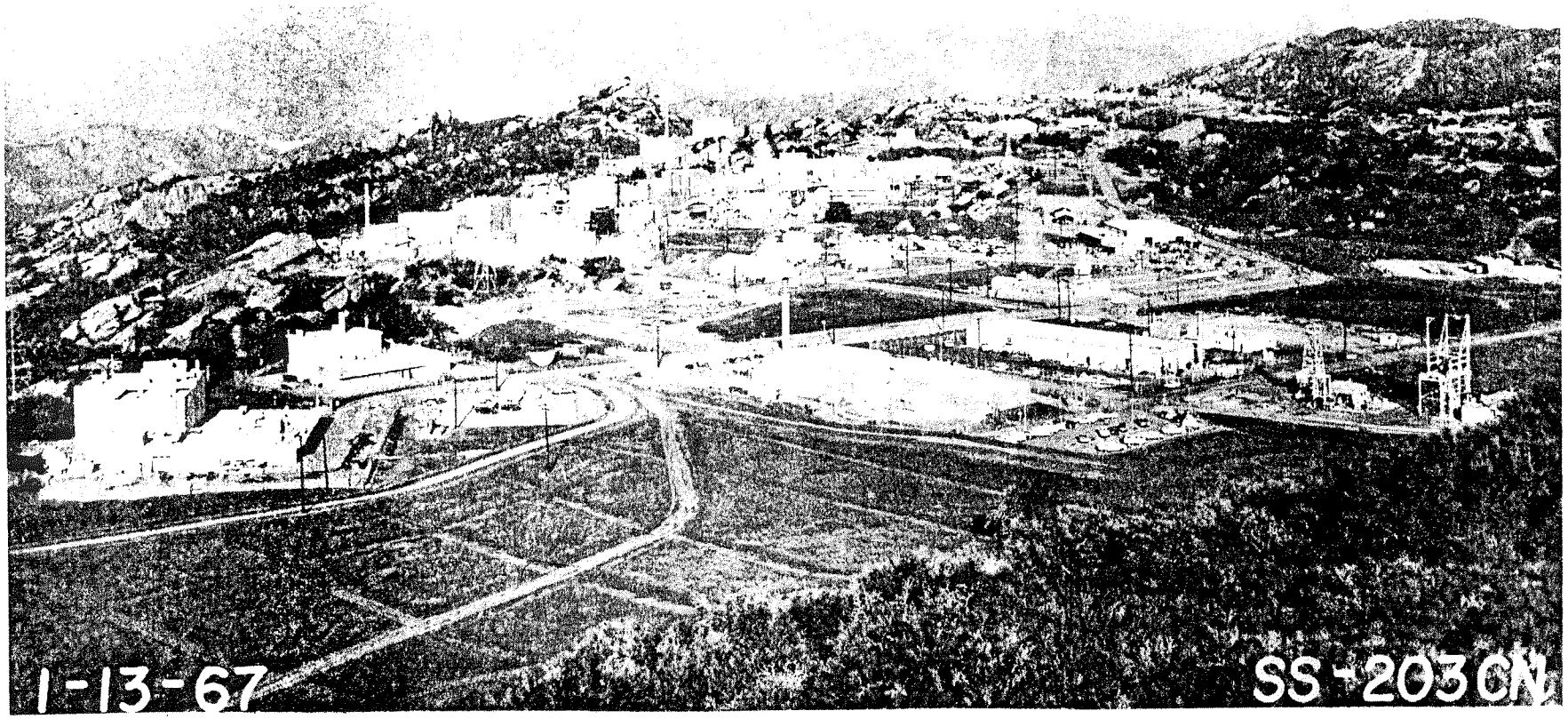

Figure 2. Atomics International Nuclear Development Field Laboratory.

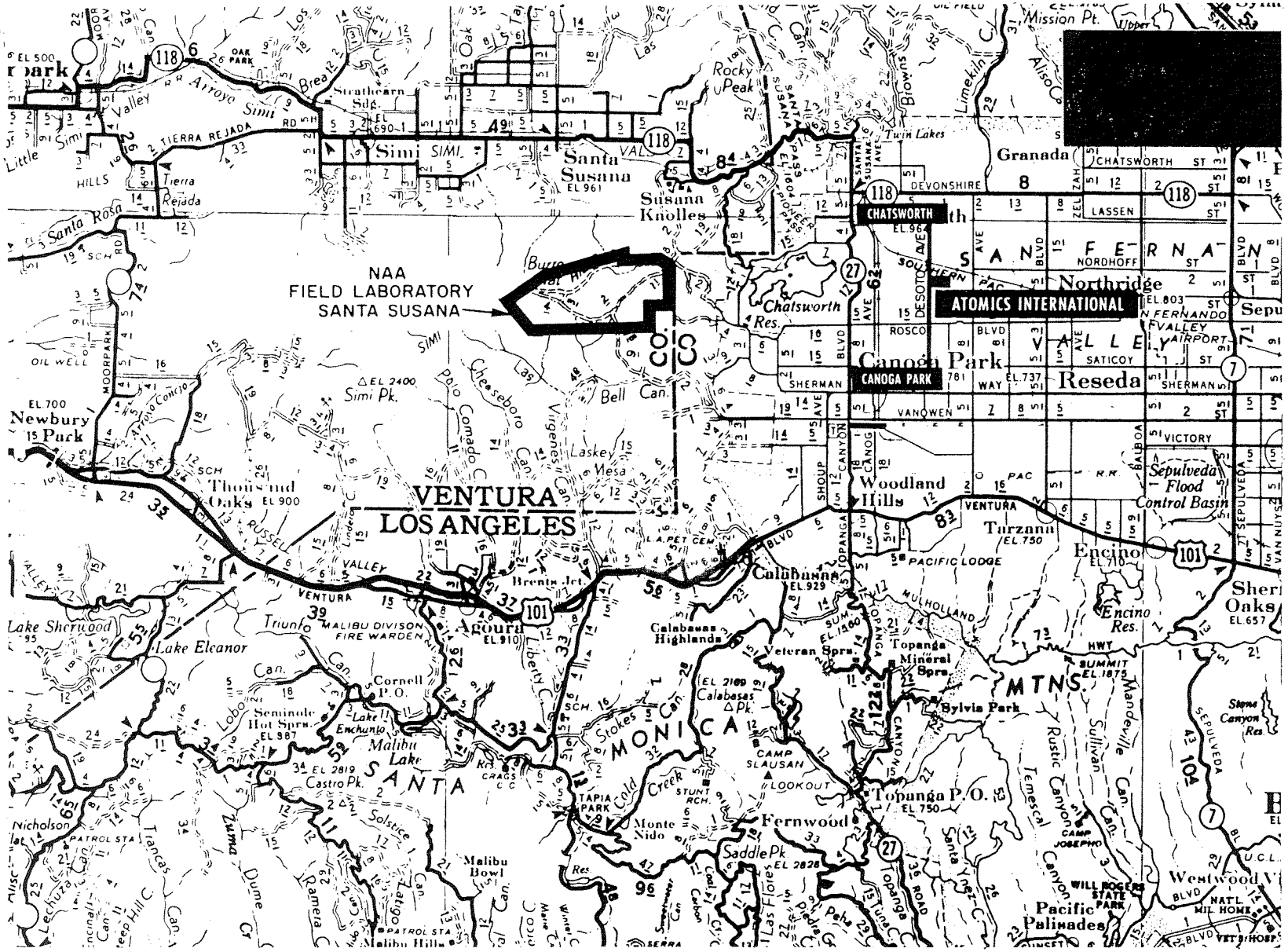

Figure 3. Map of Headquarters and Nuclear Development Field Laboratory Environs.

monitoring program utilizing thermoluminescent dosimetry (TLD), was begun in 1971. This report summarizes environmental monitoring results for 1972. A comparison of 1972 results with previous years is presented in the Appendix.

A. ENVIRONMENTAL RADIOACTIVITY DATA – 1972

The average radioactivity concentrations in soil and vegetation samples are presented in Tables I and II.

TABLE I

SOIL RADIOACTIVITY DATA – 1972

Area	Activity	No. Samples	Gross Radioactivity (μCi/gram)		
			Average Value	Confidence Limit	Maximum Observed Value
On Site	α	144	5.6×10^{-7}	±1.7	9.5×10^{-7}
	β-γ	144	2.5×10^{-5}	±0.088	3.9×10^{-5}
Off Site	α	48	5.7×10^{-7}	±1.7	9.3×10^{-7}
	β-γ	48	2.4×10^{-5}	±0.084	2.9×10^{-5}

TABLE II

VEGETATION RADIOACTIVITY DATA – 1972

Area	Activity	No. Samples	Gross Radioactivity (μCi/gram)			
			* Dry Weight Average Value	ASH Average Value	ASH Confidence Limit	ASH Maximum Observed Value
On Site	α	144	3.4×10^{-8}	2.1×10^{-7} to 2.5×10^{-7}	±2.9	1.2×10^{-6}
	β-γ	144	2.16 x 10-5	1.45×10^{-4}	±0.013	3.49×10^{-4}
Off Site	α	48	7.3×10^{-8}	3.5×10^{-7} to 3.7×10^{-7}	±4.6	3.0×10^{-6}
	β-γ	48	2.53×10^{-5}	1.25×10^{-4}	±0.011	2.34×10^{-4}

*Last six months of 1972 only

Process water used at the NDFL is obtained from Ventura County Water District No. 10 and distributed on-site by the same piping system previously used when process water was supplied by on-site wells. Pressure is provided by elevated storage tanks, one 50,000-gallon and one 500,000-gallon tank on-site. While clinically potable, the water is not used for drinking. Bottled potable water is delivered by a vendor and is not analyzed. Water from the pipe system is sampled monthly at two locations. The average process water radioactivity concentration is presented in Table III.

TABLE III

NDFL PROCESS WATER RADIOACTIVITY DATA – 1972

Area	Activity	No. Samples	Gross Radioactivity (μCi/mℓ)			
			Average Value	Confidence Limit	Maximum Observed Value	% of Guide*
NDFL	α	24	8.8×10^{-11} to 2.2×10^{-10}	±1.8	4.0×10^{-10}	0.22
	β-γ	24	3.7×10^{-9}	±0.662	5.1×10^{-9}	3.7

*Guide = 1×10^{-7} μCi/mℓ

Surface discharged waters from NDFL facilities drain Southward into holding reservoirs on Rocketdyne Division SSFL property. When full, the main reservoir may be drained into Bell Creek, a tributary of the Los Angeles River in the San Fernando Valley, Los Angeles County. Pursuant to the requirements of Los Angeles Regional Water Quality Control Board Resolution 66-49 of September 21, 1966, an environmental sampling station was established in Bell Creek Canyon approximately 2.5 miles downstream from the south Rockwell International Corporation boundary. Samples, obtained and analyzed monthly, include stream bed mud, vegetation, and water. Average radioactivity concentrations in Rocketdyne Reservoir and Bell Creek samples are presented in Table IV.

TABLE IV

BELL CREEK AND ROCKETDYNE SSFL RESERVOIR RADIOACTIVITY DATA – 1972

Area	Activity	No. Samples	Gross Radioactivity			
			Average Value	Confidence Limit	Maximum Observed Value	% of Guide*
Bell Creek MUD No. 54 (μCi/gram)	α	12	3.2×10^{-7}	±1.0	4.6×10^{-5}	-
	$\beta\gamma$	12	2.2×10^{-5}	±0.077	2.3×10^{-5}	-
Bell Creek Vegetation No. 54 (μCi/gram-ASH)	α	12	2.9×10^{-8} to 1.2×10^{-7}	±9.4	3.5×10^{-7}	-
	$\beta\gamma$	12	1.39×10^{-4}	±0.013	1.86×10^{-4}	-
Bell Creek(1) Vegetation No. 54 (μCi/gram dry wt)	α	6	2.3×10^{-8}	±1.7	6.3×10^{-8}	-
	$\beta\gamma$	6	2.52×10^{-5}	±0.023	3.48×10^{-5}	-
Bell Creek Water No. 16	α	12	0 to 2×10^{-10}	±2.4	2.0×10^{-10}	-
(μCi/ml)	$\beta\gamma$	12	2.5×10^{-9}	±0.44	3.5×10^{-9}	2.5
SSFL Reservoir Water No. 6	α	12	5.3×10^{-11} to 2.2×10^{-10}	±2.6	3.5×10^{-10}	-
	$\beta\gamma$	12	5.3×10^{-9}	±0.94	6.4×10^{-9}	5.3
SSFL Reservoir Water No. 12	α	12	9.1×10^{-11} to 2.2×10^{-10}	±2.6	3.4×10^{-10}	-
	$\beta\gamma$	12	5.5×10^{-9}	±0.98	6.4×10^{-9}	5.5

*Guide 1×10^{-7} μCi/ml

(1)Last six months of 1972 only

Environmental air sampling for long-lived particulate alpha and beta-gamma radioactivity is performed continuously with automatic sequential samplers at both the Headquarters and NDFL sites. Air is drawn through an HV-70 filter which is analyzed, after a minimum 72-hour decay period, for long-lived radioactivity. The average concentration of long-lived alpha and beta-gamma radioactivity is presented in Table V.

TABLE V

AIRBORNE RADIOACTIVITY DATA – 1972

Area	Activity	No. Samples	Average Value	Confidence Limit	Maximum Observed Value	% of Guide*
Headquarters	α	708	8.5×10^{-15}	±10.4	1.7×10^{-14}	85.
	$\beta\gamma$	708	1.4×10^{-13}	±0.19	1.4×10^{-11}	14.
NDFL	α	2430	8.6×10^{-15}	±10.4	2.0×10^{-14}	100.
	$\beta\gamma$	2430	1.4×10^{-13}	±0.19	7.2×10^{-12}	14.

*Guide 2×10^{-14} μCi/cc α

1×10^{-12} μCi/cc $\beta\gamma$

TABLE VI

SITE PERIMETER RADIATION DOSIMETRY DATA – 1972

Location	Dose (rem)	Average Dose Rate (mrem/hour)	% of Guide*
TLD-1	0.84	0.096	168.
TLD-2	0.19	0.043	38.
TLD-3	No Data	-	-
TLD-4	0.25	0.029	50.
TLD-5	0.25	0.028	50.
TLD-6	0.11	0.016	22.
TLD-7	0.23	0.026	46.
TLD-8	0.05	0.023	10.
TLD-9	0.21	0.024	42.
TLD-10	0.33	0.038	66.

*Radiation Protection Standard – 0.5 rem/year

Site perimeter radiation monitoring is performed with Calcium Fluoride thermoluminescent dosimeters (TLD) placed at selected locations on or near the perimeters of the Headquarters and NDFL sites. Each dosimeter, sealed in a light-proof plastic holder, is installed in a polyethylene vial which is permanently mounted at each monitoring location. The dosimeters are exchanged and analyzed quarterly for the first half of 1972 and Semi-Annually for the last half of 1972. The radiation dose monitored at each dosimeter location is presented in Table VI.

Some of the data in the tables are presented as a range within which lies the true average. This is necessary when one or more of the samples contains an "undetectable" amount of radioactivity. In these instances, two values are determined. The lowest value assumes that the "undetectable" samples contain no radioactivity; the highest value assumes that these samples contain radioactivity equal to the appropriate minimum detection limit specified in Table VIII. Errors shown in the tables are the approximate 95% Confidence Limit errors.

Radioactivity concentrations in most sample types are generally commensurate with the concentrations observed in prior years, with the general trend in radioactivity concentration levels to be downward. The environmental sample radioactivity concentrations reported and discussed herein are not attributed to Atomics International's operations; rather it is felt to have been produced after September 1, 1961, by several world-wide nuclear detonations and also due to natural causes.

II. ENVIRONMENTAL MONITORING PROGRAM

A. GENERAL DESCRIPTION

Soil and vegetation sample collection and analysis for radioactivity was initiated in 1952 in the Downey, California, area where the Company was initially located. Environmental sampling was subsequently extended to the proposed Sodium Reactor Experiment (SRE) site in the Simi Hills in May of 1954. In addition, sampling was conducted in the Burro Flat area, southwest of SRE, where many nuclear installations are currently in operation. The Downey area survey was terminated when the Company relocated to Canoga Park. The primary purpose of the environmental monitoring program is to survey environmental radioactivity adequately to ensure that Atomics

International operations do not contribute significantly to environmental radioactivity. The locations of sampling stations are shown in Figures 4, 5, and 6, and in Table VII.

TABLE VII

SAMPLE STATION LOCATIONS

Station	Location
SV-1	SRE Reactor, NDFL
SV-2	SRE Perimeter Drainage Ditch, NDFL
SV-3	Bldg. 064 Parking Lot, NDFL
SV-4	Bldg. 020, NDFL
SV-5	Bldg. 363, NDFL
SV-6	Rocketdyne Reservoir, SSFL
SV-10	Santa Susana Site Access Road
SV-12	L-85 Reactor, NDFL
SV-13	Sodium Cleaning Pad, NDFL
SV-14	Canyon Below Bldg. 022, NDFL
SV-19	Santa Susana Site Entrance, Woolsey Canyon
SV-24	Atomics International Headquarters
SV-25	DeSoto Avenue and Plummer Street
SV-26	Mason Avenue and Nordhoff Street
SV-27	DeSoto Avenue and Parthenia Street
SV-28	Canoga Avenue and Nordhoff Street
SV-31	Simi Valley, Alamo Avenue and Sycamore Rd.
SV-40	Agoura - Kanan Road and Ventura Freeway
SV-41	Calabasas - Parkway Calabasas and Ventura Freeway
SV-42	Non-Radioactive Materials Disposal Area, NDFL
SV-47	Chatsworth Reservoir North Boundary
SV-51	Bldg. 029, NDFL
SV-52	Burro Flat Drainage Control Pond, G. Street and 17th Street, NDFL
SV-53	Top of Bell Canyon Below Rocketdyne Delta Pond Spillway, SSFL

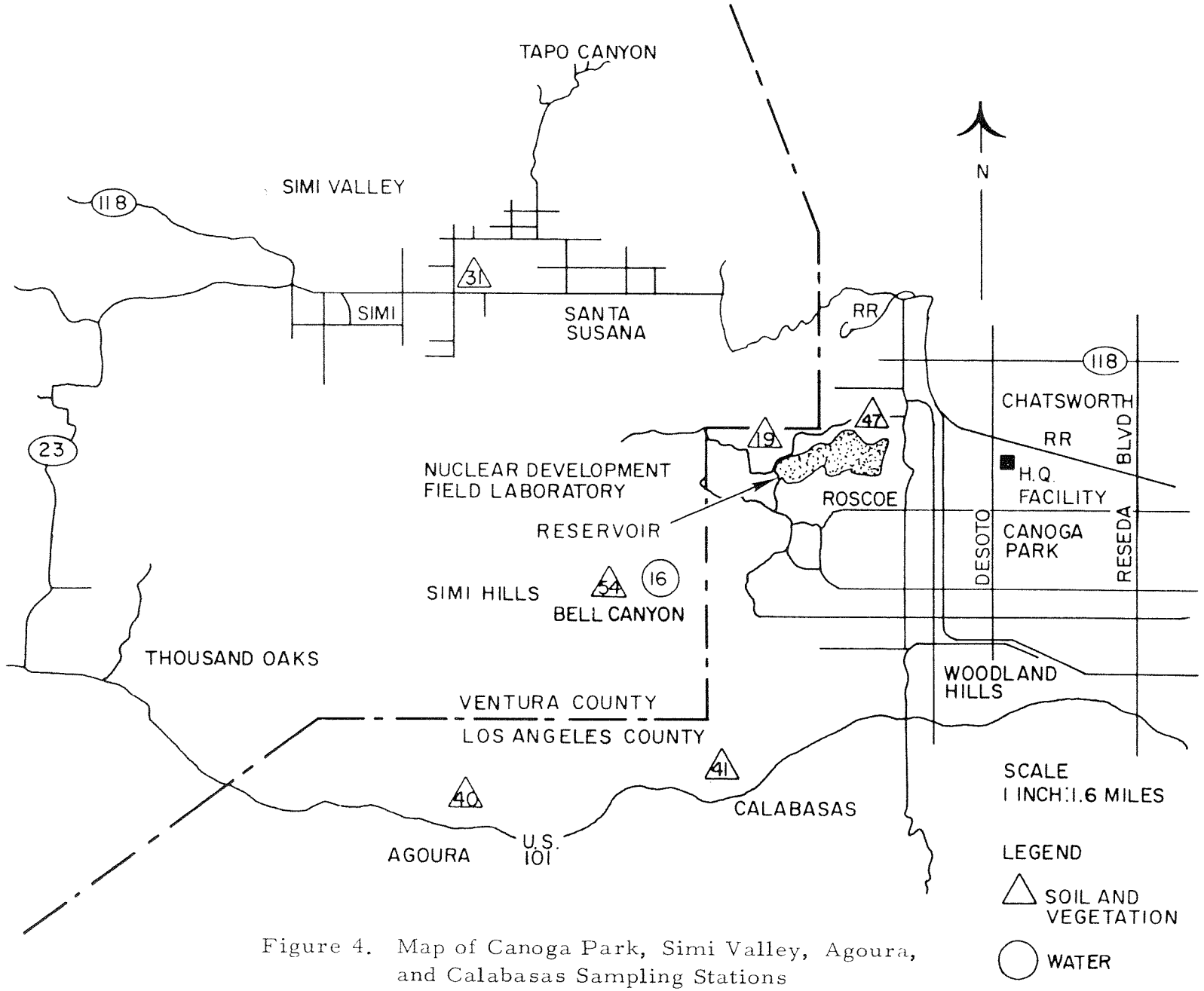

Figure 4. Map of Canoga Park, Simi Valley, Agoura, and Calabasas Sampling Stations

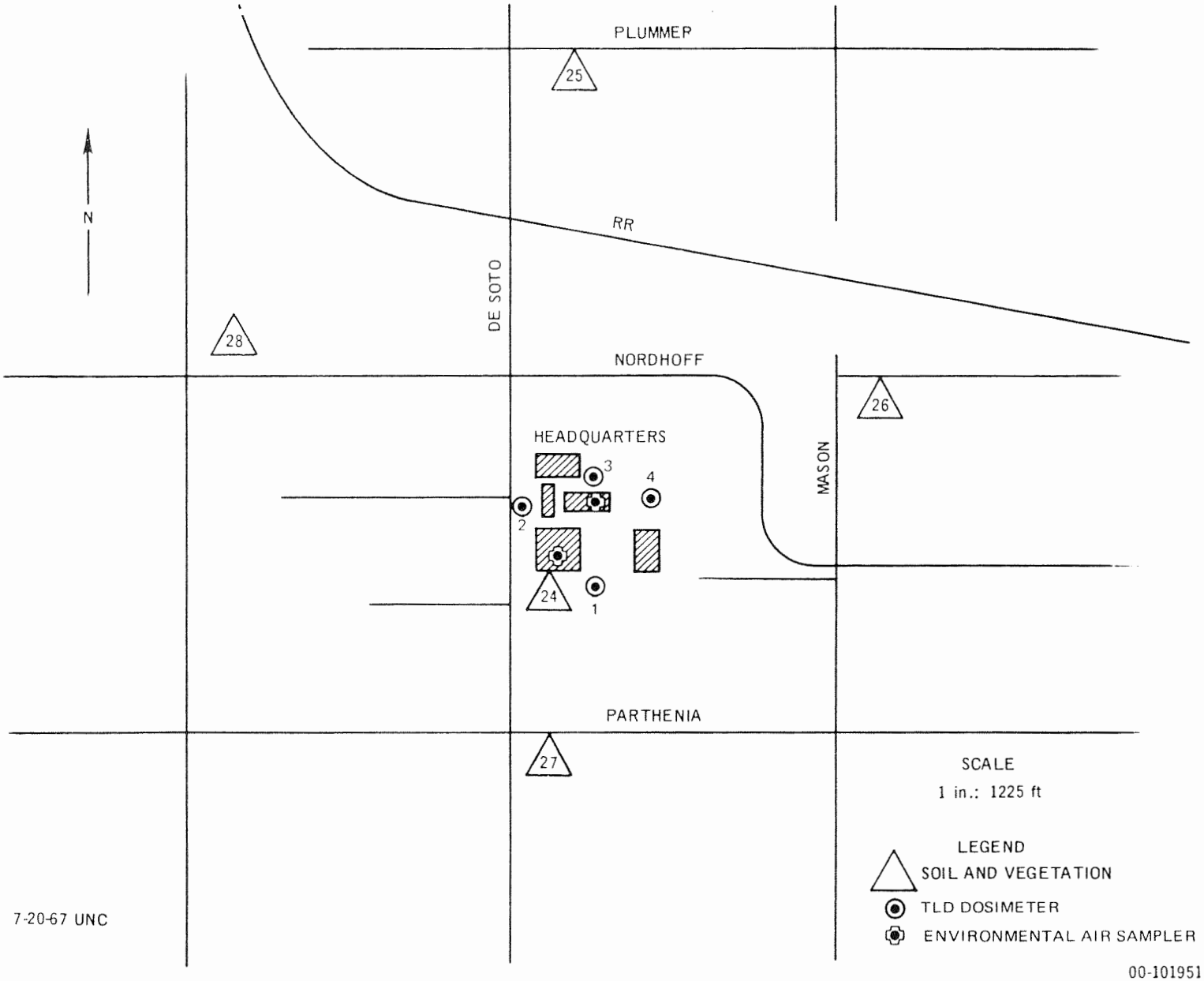

Figure 5. Map of Headquarters Vicinity Sampling Stations

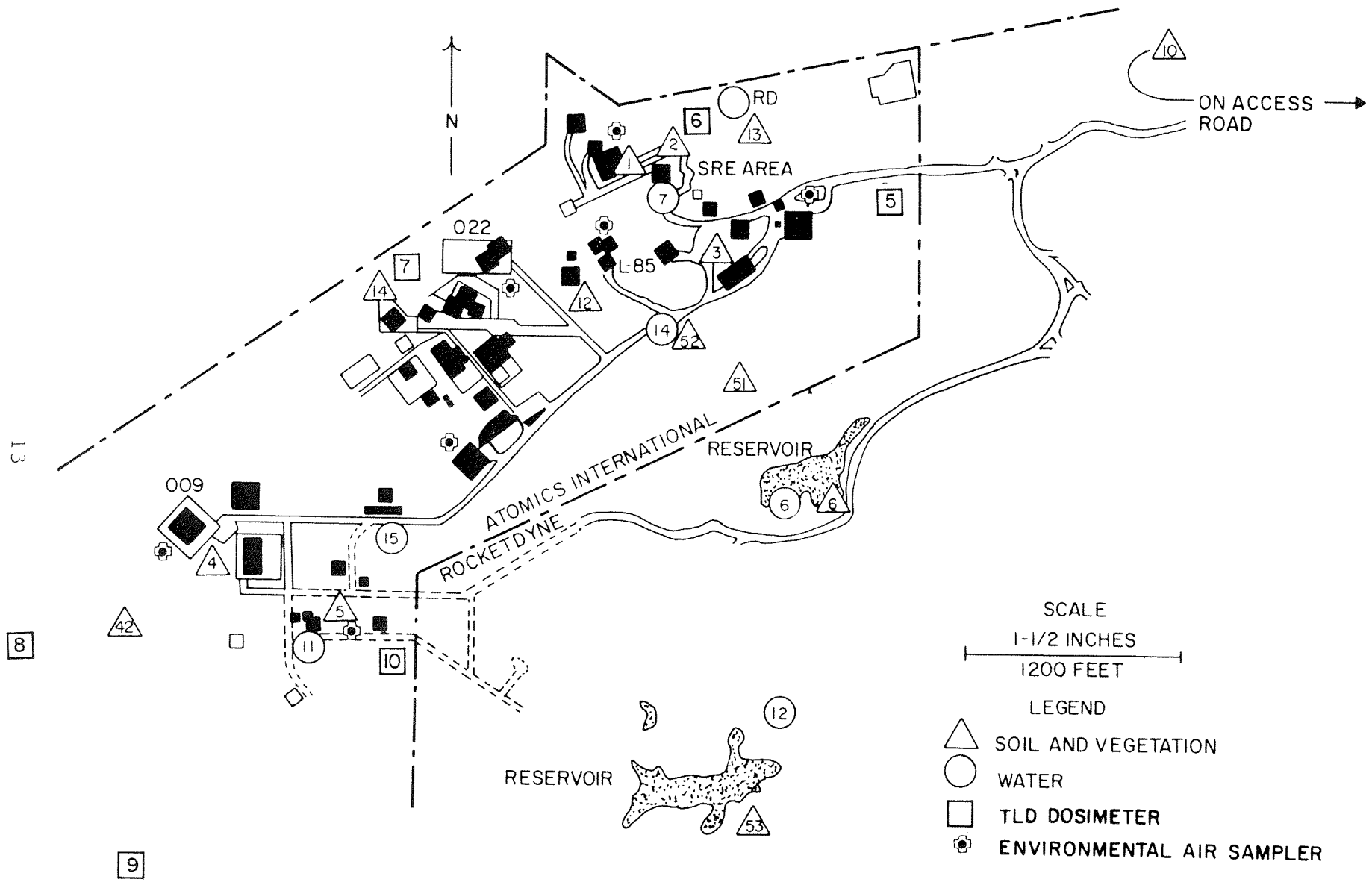

Figure 6. Map of NDFL Sampling Stations

TABLE VII

SAMPLE STATION LOCATIONS
(Continued)

Station	Location
SV-54	Bell Creek
W-6	Rocketdyne Reservoir, SSFL
W-7	Process Water from Bldg. 003, NDFL
W-11	Process Water from Bldg. 363, NDFL
W-12	Rocketdyne Reservoir, SSFL
W-16	Bell Creek
A-1	Atomics International Headquarters, Building 001 Roof
A-2	Atomics International Headquarters, Building 004 Roof
A-3	Building 009, NDFL
A-4	Building 011, NDFL
A-5	Building 012, NDFL
A-6	Building 040, NDFL
A-7	Building 074, NDFL
A-8	Building 143, NDFL
A-9	Building 363, NDFL
TLD-1	Atomics International Headquarters, South of Building 102 on Fence
TLD-2	Atomics International Headquarters, West of Building 001 on Gate to Plant Water Supply Enclosure
TLD-3	Atomics International Headquarters, Guard Post No. 1, Building 201
TLD-4	Atomics International Headquarters, East Fence Gate
TLD-5	Building 113, NDFL
TLD-6	SRE Retention Dam, NDFL
TLD-7	Electric Sub-Station No. 719, NDFL
TLD-8	Property Line Gate, West End of H. Street, NDFL
TLD-9	Water Tank No. 701, NDFL
TLD-10	Building 854, NDFL

SV - Soil and Vegetation Sample Station
W - Water Sample Station
A - Air Sample Station
TLD - Thermoluminescent Dosimeter Location

B. SAMPLING AND SAMPLE PREPARATION METHODS

Soil

Surface soil types available for sampling range from decomposed granite to clay and loam. Samples are taken from the top 1/2-inch layer of undisturbed ground surface. The soil samples are packaged in plastic containers and returned to the laboratory for analysis.

Sample preparation consists of transferring the soils to pyrex beakers and drying in a muffle furnace at approximately 500° C for eight hours. After cooling, the soil is sieved to obtain uniform particle size. Two-gram aliquots of the sieved soil are weighed and transferred to copper planchets. The soil is wetted in the planchet with alcohol, evenly distributed to obtain uniform sample thickness, dried, and counted. Soil specific gravity ranges from 1.07 gram/mℓ to 1.41 gram/mℓ, and averages 1.24 gram/mℓ.

Vegetation

Vegetation samples obtained in the field are of the same perrenial plant types wherever possible, generally sunflower or wild tobacco leaves. Vegetation leaves are stripped from plants and sealed in ice cream cartons for transfer to the laboratory for analysis. Plant root systems are not normally analyzed.

Vegetation samples are first washed with tap water to remove foreign matter, and then thoroughly rinsed with distilled water. Washed vegetation is dried in tared beakers at 100° C for 24 hours for dry weight determination, then ashed in a muffle furnace at approximately 500° C for eight hours, producing a completely burned ash. One-gram aliquots of pulverized ash from each beaker are weighed and transferred to copper planchets. The vegetation ash is wetted in the planchet with alcohol, evenly distributed to obtain uniform sample thickness, dried, and counted for alpha and beta radiation. The dry/ash weight ratio is used for the determination of the standard dry weight gross radioactivity concentration value.

Water

Surface water samples are obtained monthly at the NDFL and from Bell Creek. The water is drawn into one-liter polyethylene bottles and transferred to the laboratory.

Five-hundred ml of water are evaporated to dryness in crystallizing dishes at approximately 90° C. The residue salts are redissolved into distilled water and transferred to copper planchets, re-dried under heat lamps, and counted.

Air

Environmental air sampling is conducted continuously at the Headquarters and NDFL sites with automatic air samplers operating on 24-hour sampling cycles. Airborne particulate radioactivity is collected on HV-70 filter paper which is automatically changed at the end of each sampling period. The filters are removed from the sampler and counted for long-lived radioactivity following a minimum 72-hour decay period. The volume of a typical daily environmental air sample is approximately 20 cubic meters.

A graph of daily averaged airborne long-lived alpha and beta-gamma radioactivity concentrations detected at the Headquarters and NDFL facilities during 1972, is presented in Figure 7. The average beta-gamma concentration for each month is also indicated by horizontal bars. The graph shows prominent peaks occurring during the first three months, and a generally increasing concentration trend through the Spring months and diminishing through Fall.

C. COUNTING AND CALIBRATION PROCEDURES

Environmental soil, vegetation, water, and air samples are counted for alpha and beta-gamma radioactivity with a low-background proportional counting system capable of the simultaneous counting of both alpha and net beta radioactivity. The sample-detector configuration provides a nearly 2π geometry. The thin-window detector is continually purged with methane counting gas. A preset time mode of operation is used for all samples; however, an overriding preset count mode is available to limit the counting time for high activity samples. The minimum detection limits shown in Table VIII were determined by using typical values for counting time, system efficiency, background count rates (approximately 0.05 cpm α and 1.0 cpm $\beta\gamma$) and sample size. In addition, the minimum statistically significant amount of radioactivity, irrespective of sample configuration, is established as that amount equal in count rate to three times the standard deviation of the system background count rate.

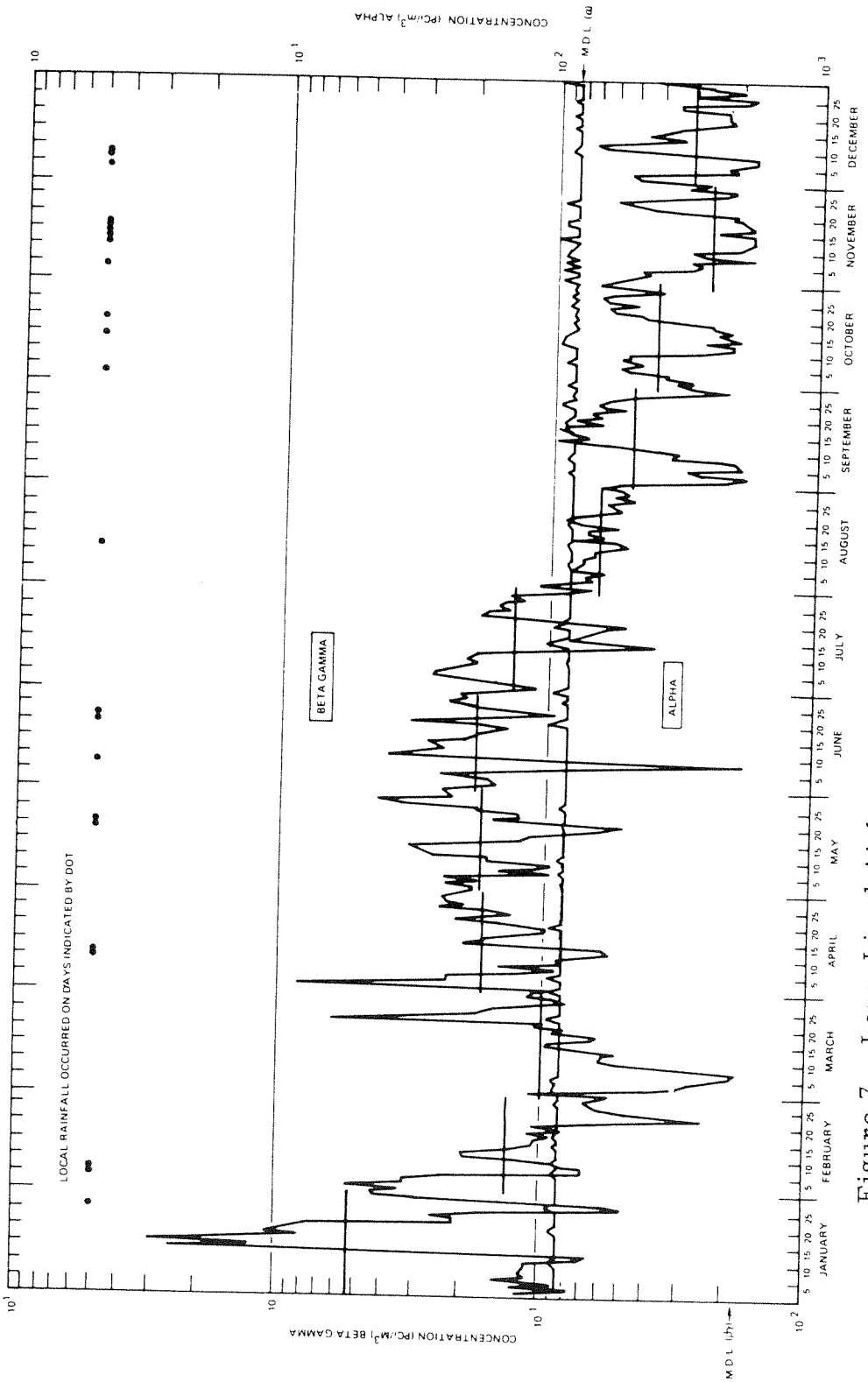

Figure 7. Long-Lived Airborne Radioactivity, Headquarters and NDFL

TABLE VIII

MINIMUM RADIOACTIVITY DETECTION LIMITS

Sample	Activity	Minimum Detection Limits*
Soil	α	0.05 ± 0.03 (pCi/gram)
	$\beta\gamma$	0.22 ± 0.11 (pCi/gram)
Vegetation	α	0.10 ± 0.06 (pCi/gram-ash)
	$\beta\gamma$	0.35 ± 0.18 (pCi/gram-ash)
Water	α	0.20 ± 0.12 (pCi/liter)
	$\beta\gamma$	0.63 ± 0.32 (pCi/liter)
Air	α	0.0085 ± 0.0053 (pCi/m^3)
	$\beta\gamma$	0.018 ± 0.0093 (pCi/m^3)

*Standard Error

Counting system efficiencies are determined routinely with RaD+E+F (with alpha absorber), Th^{230}, and U^{235} standard sources, and with K^{40} in the form of standard reagent grade KCl, which is used to simulate soil and vegetation samples. Self-absorption standards are made by dividing sieved KCl into samples increasing in mass by 200-milligram increments from 100 to 3000 milligrams. The samples are placed in copper planchets of the type used for environmental samples and counted. The ratio of sample activity to the observed net count rate for each sample is plotted as a function of sample weight. The correction factor (ratio) corresponding to sample weight is obtained from the graph. The product of the correction factor and the net sample count rate yields the sample activity (dpm). This method has been proved usable by applying it to variously sized aliquots of uniformly mixed environmental samples and observing that the resultant specific activities fall within the expected statistical counting error.

APPENDIX A

A COMPARISON OF ENVIRONMENTAL RADIOACTIVITY DATA FOR 1972 WITH PREVIOUS YEARS

This section compares environmental monitoring results for the calendar year 1972 with previous annual data. The annual average radioactivity concentrations determined in all sample types are presented in the following tables.

SOIL RADIOACTIVITY DATA 1963 THROUGH 1972

Year	On Site – Average μCi/gram x 10^{-6}			Off Site – Average μCi/gram x 10^{-6}		
	No. Samples	α	β-γ	No. Samples	α	β-γ
1972	144	0.56	25.	48	0.57	24.
1971	144	0.55	25.	48	0.53	23.
1970	144	0.47	27.	48	0.48	25.
1969	144	0.42	27.	48	0.42	25.
1968	144	0.47	26.	48	0.48	26.
1967	144	0.42	28.	48	0.39	24.
1966	144	0.41	29.	48	0.44	25.
1965	144	0.46	36.	142	0.47	29.
1964	152	0.46	32.	299	0.44	26.
1963	156	0.43	45.	455	0.42	42.

VEGETATION RADIOACTIVITY DATA – 1963 THROUGH 1972

Year	On Site – Average μCi/gram Ash x 10^{-6}			Off Site – Average μCi/gram Ash x 10^{-6}		
	No. Samples	α	β-γ	No. Samples	α	β-γ
1972	144	0.23	145.	48	0.36	125.
1971	144	0.24	165.	48	0.31	132.
1970	144	0.33	159.	48	0.30	142.
1969	144	0.40	165.	48	0.36	144.
1968	144	0.51	158.	48	0.51	205.
1967	144	0.62	286.	48	0.39	413.
1966	144	0.37	169.	48	0.37	123.
1965	144	0.56	162.	142	0.61	138.
1964	154	0.50	211.	293	0.51	181.
1963	156	0.44	465.	456	0.37	388.

NDFL PROCESS WATER RADIOACTIVITY DATA – 1963 THROUGH 1972

Year	No. Samples	Alpha	Beta-Gamma
		Average μCi/cc x 10^{-9}	Average μCi/cc x 10^{-9}
1972	24	0.22	3.7
1971	24	0.28	4.9
1970	24	0.18	5.3
1969	24	0.11	5.0
1968	24	0.16	5.0
1967	24	0.13	6.1
1966	24	0.13	4.6
1965	24	0.22	6.0
1964	23	0.17	5.2
1963	24	0.18	7.0

BELL CREEK AND ROCKETDYNE SSFL RESERVOIR RADIOACTIVITY DATA

Sample	Bell Creek MUD 54			Bell Creek Vegetation 54			Bell Creek Water 16			Reservoir No. 6 Water			Reservoir No. 12 Water		
Year	No. Samples	Average μCi/gram x 10^{-6}		No. Samples	Average μCi/gram – Ash x 10^{-6}		No. Samples	Average μCi/mℓ x 10^{-9}		No. Samples	Average μCi/mℓ x 10^{-9}		No. Samples	Average μCi/mℓ x 10^{-9}	
		α	β-γ		α	β-γ		α	β-γ		α	β-γ		α	β-γ
1972	12	0.32	22.	12	0.12	139.	12	0.20	2.5	12	0.22	5.3	12	0.22	5.5
1971	12	0.36	23.	12	0.19	128.	12	0.15	3.8	12	0.18	6.2	12	0.16	6.4
1970	12	0.44	24.	12	0.23	165.	12	0.15	3.7	12	0.15	6.9	12	0.12	7.4
1969	12	0.35	27.	12	0.28	166.	12	0.04	4.0	12	0.07	5.9	11	0.10	5.7
1968	11	0.32	24.	11	0.39	170.	8	0.05	4.6	11	0.23	8.1	12	0.33	7.7
1967	12	0.40	24.	12	0.38	180.	12	0.07	5.8	12	0.19	6.6	10	0.17	7.0
1966	3	0.39	25.	3	1.1	108.	3	0.75	2.5	9	0.11	5.8	8	1.1	6.3

AIRBORNE RADIOACTIVITY DATA

Year	Headquarters Average μCi/mℓ x 10^{-12}			NDFL Average μCi/mℓ x 10^{-12}		
	No. Samples	α	β-γ	No. Samples	α	β-γ
1972	708	0.0085	0.14	2430	0.0086	0.14
1971	730	0.0087	0.30	2476	0.0086	0.33
1970	668	-	0.34	2434	-	0.36
1969	687	-	0.27	2364	-	0.26
1968	650	-	0.32	2157	-	0.32
1967	712	-	0.39	2400	-	0.41
1966	706	-	0.18	2205	-	0.17
1965	483	-	0.83	1062	-	0.21
1964	355	-	2.7	Insufficient Data		
1963	360	-	6.6	292	-	4.7

APPENDIX B

REFERENCES

1. AEC Manual Chapter 0524, Appendix
2. Code of Federal Regulations, Title 10, Part 20
3. California Administrative Code, Title 17, Public Health

APPENDIX C

EXTERNAL DISTRIBUTION

1. Bureau of Radiological Health, California Department of Public Health
2. Radiological Health Division, Los Angeles County Health Department
3. U. S. Atomic Energy Commission, San Francisco Operations Office
4. Gordon Facer, MA AEC-HQ
5. Andrew J. Pressesky, RDT AEC-HQ
6. James Miller, BER AEC-HQ
7. AEC-HQ Library, Attention: Charles Sherman