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ENVIRONMENTAL SURVEILLANCE SAMPLING RESULTS AT THE NEVADA TEST SITE

#46

JULY, 1969 THROUGH JUNE, 1970

ENVIRONMENTAL SCIENCES DEPARTMENT
REYNOLDS ELECTRICAL & ENGINEERING CO., INC.
MERCURY, NEVADA 89023

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SAMPLING RESULTS

AT THE

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COMPILED BY:

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Reynolds Electrical & Engineering Co., Inc.

AN EG&G COMPANY

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The Environmental Surveillance group of the Environmental Sciences Department collected all the samples, prepared the initial text, and provided technical guidance during the final preparation of this report. Sample analysis was performed by the Laboratory Operations group of the Department. The Reports Coordination group prepared the various figures, edited the text, and coordinated the final preparation of the report.

ABSTRACT

Data derived from the environmental surveillance program at the Nevada Test Site (NTS) for fiscal year 1970 are presented. Gross beta radioactivity results for water and air samples collected throughout the NTS are listed and measurements of gamma radioactivity in soil and vegetation samples are also documented. Tabular data is supplemented by graphical presentations and sampling locations are shown in maps depicting the NTS.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This report contains a summary of the data obtained concerning the radiological conditions in the environment of the Nevada Test Site (NTS), performed under contract to the AEC by the Environmental Sciences Department of the Reynolds Electrical and Engineering Co., Inc.

The Environmental Surveillance Group performs routine and special surveys of the NTS. Samples of air and water are collected for laboratory analysis from living areas of the test site, i.e., near living quarters, administrative buildings, cafeterias, and infirmaries. Additionally, samples of water from waste ponds, sewage basins, open reservoirs, springs, and wells are collected on a routine basis to determine normal levels of radioactivity or any changes of radioactivity. Air samples are also routinely collected at selected locations throughout NTS for the same purpose as for water samples. This report also contains a summary of the data obtained from soil and vegetation samples from selected locations throughout the NTS.

All environmental samples are analyzed routinely for gross beta radioactivity except for soil and vegetation samples. Self-absorption in soil and vegetation samples is great enough to affect the data significantly, therefore these samples are analyzed for gross gamma radioactivity. Selected samples from among all catagories are additionally analyzed for plutonium alpha and tritium. Since these analyses are routinely inconsequential, they are not included in this report but are available upon request.

Significant increases or changes in the radioactivity levels of any environmental samples are reported to the appropriate field monitoring groups for investigation and remedial action. All sample results are maintained by the Environmental Surveillance group for documentation and records, and comparison with previous results to determine trends and correlations where feasible.

This report presents the data derived from the sampling program for the fiscal year 1970 - July 1969 through June 1970.

SECTION 1

AIR SAMPLING

1.1 Introduction

The Environmental Surveillance group maintains low-volume continuously-operating air sampling equipment at twenty-three permanent locations (Figure 1 and Table 1). These locations were chosen to provide monitoring of the particulate airborne radioactivity primarily in the vicinity of major working and living areas within the Nevada Test Site (NTS) boundaries.

1.2 Description of Equipment

The air sampling equipment used consists of a positive displacement Gast pump pulling air through a four-inch Whatman-41 filter paper mounted in a disposable plastic filter head. A dry gas meter is utilized to measure the total volume of displaced air over a period of seven days. The total volume of air sampled during a regular seven day sampling period is approximately 10^3 cubic meters. The flow rate of air through the filter is maintained at approximately four cubic feet per minute.

1.3 Counting Procedures

All air samples collected were held in storage for a minimum of five days before counting. This time interval allows the naturally occurring radon and thoron daughter products to decay to insignificant levels. Air samples were analyzed for gross beta radiation using a Beckman WIDE-BETA II gas proportional counter having an efficiency of 52.4% for beta (the ratio of observed counts to known disintegrations). Background counts for beta on the WIDE-BETA II system were determined by counting for 100 minutes. A Baird Atomic SPECTROMETER was used for determination of gross gamma activity. If the gamma activity was such that the apparent 2σ counting error was less than 50% then the sample was transferred to a multi-channel gamma-spectrum analyzer to qualitatively determine the contributing radionuclides.

Sample activity results, reported by the laboratory, were compared with an established "alert level." The determination of the alert level is based on the radiation concentration guides (RCG) for unknown radionuclides in air for continuous exposure (168 hours) as outlined in USAEC Manual Chapter 0524. The alert level for beta activity has been maintained at $1.0 \times 10^{-11} \mu Ci/cc$ of air after a five-day decay period.

Although a particular air sample may exceed this alert level, it does not necessarily mean that the actual RCG has been exceeded. Whenever a sample does approach or exceed the alert level, more detailed analysis, investigation, or re-sampling are performed to determine the validity of the sample results.

1.4 Data Discussion

The means and ranges of gross beta radioactivity in weekly collections of air samples from the twenty-three permanent locations from July 1969 through June 1970 are tabulated in Table 2 and plotted in Figure 2. During this time period, no sample values exceeding the alert level of 1.0 x $10^{-11}\mu$Ci/cc were recorded. During July 1969 and October 1969, it will be observed from Figure 2 that the widest variations of sampling values occurred. The low value of the mean data in July is probably due to partial sample loss during laboratory processing. The wide variation in range observed during the first week of October 1969 is unexplained, but such anomalies have occurred in previous years and may be due to unusual wind patterns during this period. The cyclic trend upward beginning in February 1970 is a normal seasonal variation that usually occurs. The maximum recorded air concentration occurred during the week ending May 24, 1970. Two sample locations, Area 5 Well 5B and the Area 6 Aid Station, recorded values of 1.09 x $10^{-12}\mu$Ci/cc during this period.

The stated maximum air concentration value may be compared with the maximum value obtained during the last annual reporting period (July 1968 through June 1969) of 4.71 x $10^{-11}\mu$Ci/cc recorded after the SCHOONER event (this sample was collected in Area 11 during December 1968).

Figure 2 is a plot of the means and ranges of all air sampling locations as a function of time. The mean air concentration shows a decline from July 1969 to February 1970 and a cyclic rise to a maximum during December 1970 as noted above.

Figure 3 and Table 3 show the means and ranges for each of the mean values of all twenty-three sampling locations which averaged 1.56 x 10^{-13} μCi/cc. This value compares well with the means observed for all air samples collected over the two previous fiscal periods which averaged 1.73 x $10^{-13}\mu$Ci/cc for fiscal year 1969 and 1.56 x $10^{-13}\mu$Ci/cc for fiscal year 1968.

The highest observed mean value for a sampling location was 1.86 x $10^{-13}\mu$Ci/cc at Area 10 Gate 700, and the lowest was 1.42 x $10^{-13}\mu$Ci/cc at Area 28 Project HENRE site. It will be noted from Figure 3 that a remarkably narrow envelope of mean values was observed throughout the reporting period. Larger than normal variances were usually the result of a single high or low value. These variances did not drastically affect the mean values due to logarithmic transformation of the observed activity results. (The statistical treatment of data for this report is presented in Appendix A.)

Routine gamma counting of pre-filters during this reporting period indicated the presence in many cases of short-lived gamma-emitting radionuclides. Gamma spectrum analyses indicated the origin of the activity in several samples was primarily due to atmospheric fall-out from foreign weapons testing activities.

1.5 Summary

These results indicate no significant change from mean values observed in preceding report periods. The results are more nearly uniform

than usually observed.

Results of Environmental Surveillance sampling activity values obviously cannot be accurately translated into personnel exposure doses. They are instead useful as an index of ambient activity and in the detection of trends, and emphasis is either sustained or shifted to other sample types whenever significant changes in levels are noted.

SECTION 2

WATER SAMPLING

2.1 Introduction

Water samples were collected from selected waste ponds, reservoirs, sewage basins, natural springs, wells, and potable water sources, such as cafeterias, swimming pools, etc., on a "grab sample" basis.

2.2 Collection Methods

Water samples were collected in one liter glass bottles on a weekly, monthly, and special basis depending upon the potential use of water source and the likelihood of its becoming radioactively contaminated. The potable water samples were collected from taps at the point of consumption, usually cafeterias and dispensaries, after allowing the water to run freely for a few minutes. All industrial reservoir water was collected near the inlet points to the reservoirs, while natural spring water samples were "grab" samples obtained by dipping at the surface.

2.3 Sample Preparation

All water samples were analyzed for gross beta and tritium concentrations. A fifteen milliliter aliquot was first taken from the original sample in a five dram plastic vial and submitted to the laboratory to be gamma-counted. A one milliliter sample was aliquoted for tritium analysis which was performed using standard liquid scintillation counting techniques. The remainder of the one-liter sample was evaporated to fifteen milliliters, transferred to a two-inch stainless steel planchet, and evaporated to dryness under infra-red lamps. A wetting agent was added during final evaporation to provide even distribution of the sample on the planchet. From the sample preparation laboratory, the samples were sent to the counting laboratory and counted for beta activity. When indicated, one liter samples of water were submitted for gamma spectrum analysis.

2.4 Counting Procedures

All routine environmental water samples were analyzed by a Beckman WIDE-BETA II system equipped with an automatic sample changer. The efficiency, i.e., the ratio of observed counts to known disintegrations, on the WIDE-BETA system, was 57% for beta activity. The average background was 1.8 counts per minute.

Tritium analyses were performed using a Packard Tri-Carb Liquid Scintillation Spectrometer with an efficiency of 18% and an average background of 16 counts per minute.

2.5 Statistical Summary of Results for Water

2.5.1 Potable Water Samples

The statistical breakdown for potable water samples for fiscal year 1970 was based on nine sampling locations (Table 4 and Figure 4) obtained on a weekly basis.

Table 5 and Figure 5 give the means and ranges for gross beta activity from July 1969 through June 1970. The means ranged from a low of 2.33×10^{-9} μCi/cc recorded on September 14, 1969 to a maximum of 2.36×10^{-8} μCi/cc recorded on June 8, 1970. The maximum value for the year was 8.34×10^{-8} μCi/cc recorded June 28, 1970 at the Area 12 Cafeteria. The average mean for fiscal year 1970 was 4.29×10^{-9} μCi/cc as compared with 4.60×10^{-9} μCi/cc for fiscal year 1969 and 6.41×10^{-9} μCi/cc for fiscal year 1968. The current year's value is well below the RCG level of 1.0×10^{-7} μCi/cc.* (See footnote pg. 8). This value is based upon the exposure guides in USAEC Manual Chapter 0524.

Table 6 and Figure 6 give the means and ranges for gross beta activity for the nine potable water sample locations over the fiscal period 1970. The maximum mean value for a potable water sampling station was at Area 6 Cafeteria and was recorded at 9.36×10^{-9} μCi/cc, a value not significantly different from the other eight mean values reported and well below the RCG of 1.0×10^{-7} μCi/cc. Coincidentally, this value was nearly identical to the maximum mean value observed during fiscal year 1969 which was 9.60×10^{-9} μCi/cc and also occurred at the Area 6 Cafeteria.

There were no potable water sample results above the alert level of 1.0×10^{-7} μCi/cc recorded during fiscal year 1970 as compared with a total of six positive results during 1969.

2.5.2 Natural Springs Water Samples

The term "natural springs" encompasses most of the naturally occurring spring-fed pools located within the NTS. Although these springs may be used infrequently as drinking water by some individuals, they are considered as a separate classification from potable water sources. In an effort to adequately represent the test site, seven sampling locations have been selected (Figure 7 and Table 7). All of these locations were sampled monthly.

Table 8 and Figure 8 show the means and ranges for gross beta activity over a twelve month period (fiscal year 1970). The means ranged from a maximum of 1.79×10^{-8} μCi/cc in August 1969 to a minimum of 5.96×10^{-9} μCi/cc in September 1969. The maximum value recorded for fiscal year 1970 was 9.95×10^{-8} μCi/cc at Area 12, Gold Meadows Pond, in June 1970. The average mean for fiscal year 1970 was 1.58×10^{-8} μCi/cc as compared with 1.45×10^{-8} μCi/cc for fiscal year 1969 and 1.61×10^{-8} μCi/cc in fiscal year 1968. Therefore no statistically significant trend in the data for the three year period is apparent.

There were no samples collected during fiscal year 1970 in excess of the recommended RCG of 1.0×10^{-7} μCi/cc. This represents some

improvement over last year in which two samples did exceed the RCG.

2.5.3 Open Reservoir Water Samples

Open reservoirs have been created throughout the NTS to furnish a ready supply of water for various industrial purposes. Eleven of these reservoirs have been selected as sampling locations (Figure 10 and Table 10). All locations were sampled on a monthly frequency.

Table 11 and Figure 11 give the means and ranges for gross beta activity over the twelve month period of fiscal year 1970. The means ranged from a minimum of 5.49×10^{-9} μCi/cc recorded in July 1969 to a maximum of 1.64×10^{-8} μCi/cc recorded in June 1970. The maximum recorded value for this reporting period was 7.31×10^{-8} μCi/cc which was collected in October 1969 from the Groom Lake Well 4 Reservoir. This location historically yield higher values than other locations, primarily due to its location in the downwind direction from the NTS active test areas. The average mean value from all locations for fiscal year 1970 was computed at 9.75×10^{-9} μCi/cc. This value does not differ markedly from the average reported in fiscal year 1969 which was 1.62×10^{-8} μCi/cc or for fiscal year 1968 which was 1.32×10^{-8} μCi/cc.

There were no open reservoir water samples collected during fiscal year 1970 which were in excess of the RCG value of 1.0×10^{-7} μCi/cc (See Figure 12 and Table 12). This may be compared with the data from fiscal year 1969 in which three such samples did exceed the RCG.

2.5.4 Supply Wells Water Samples

Fourteen supply wells were sampled on the NTS during fiscal year 1970 (Figure 13 and Table 13). Water from these and other wells throughout the test site is used for a variety of purposes ranging from sanitary water supply to drilling mud preparation. The criteria for selecting particular wells to be sampled was based not only upon their potential use for human consumption, but also upon their value as an index for measuring the possible movement of radioactivity through water in the aquifer. Most of these wells are located in areas where the movement of water in the aquifer is from known contaminated test sites. To date, no data have been obtained that would indicate that the ground water at any well sampling location has been significantly affected by movement of contamination through the aquifer.

Table 14 and Figure 14 give the means and ranges for gross beta activity over a year's period from July 1969 through June 1970. The means of sample activity ranged from a minimum of 3.39×10^{-9} μCi/cc recorded in September 1969 to a maximum of 2.29×10^{-8} μCi/cc recorded in June 1970. The highest sample obtained during fiscal year 1970 was 9.80×10^{-8} μCi/cc in June 1970 from Well U20a in Area 20. The average of all mean values computed for fiscal year 1970 was 7.61×10^{-9} μCi/cc. This value is not statistically different from that observed in fiscal year 1969 which was 8.52×10^{-9} μCi/cc or for fiscal year 1968 which was 1.07×10^{-8} μCi/cc.

All sample values obtained during fiscal year 1970 were well below any level of concern and did not exceed the RCG value of $1.0 \times 10^{-7} \mu Ci/cc$.

2.5.5 Final Effluent Samples

Four locations were sampled (Figure 16 and Table 16), all in NTS living areas, to determine what, if any, levels of activity were present in sewage. Each location was sampled on a quarterly basis.

A total of fifteen samples were analyzed from these four locations during this report period. No tabular presentations were prepared due to the small number of samples from each location. Analysis of the data obtained indicates that the lowest value observed was $5.86 \times 10^{-9} \mu Ci/cc$ gross beta activity collected during October 1969 from the Area 12 Camp Sewage Pond. The maximum detected value was $1.20 \times 10^{-6} \mu Ci/cc$ collected during January 1970 from the Area 6 Final Effluent Pond. This latter value is a factor of ten higher than the maximum observed in fiscal year 1969 which was $1.26 \times 10^{-7} \mu Ci/cc$ from the Mercury Final Effluent Pond. All other values obtained from these locations during fiscal year 1970 were within the ranges mentioned above. The average value for all results reported was computed to be $1.00 \times 10^{-7} \mu Ci/cc$. This result is significantly higher than that reported for fiscal year 1969 which was $3.18 \times 10^{-8} \mu Ci/cc$. This is due to the single high value quoted above in the range of 10^{6}. All of the fourteen other samples were from 10^{-8} to $10^{-9} \mu Ci/cc$.

2.5.6 Miscellaneous Water Samples

There were seven miscellaneous water sampling locations sampled during fiscal year 1970. Each location had some unique feature that precluded its inclusion in any of the preceding categories. Therefore, each location has been treated separately.

The first two sampling locations to be discussed are the Mercury swimming pool in Area 23 and the Groom Lake station 2. Both pools are unique in that the water is continuously filtered. The swimming pool in Mercury is open to atmospheric fallout at all times, whereas station 2 at Groom Lake is enclosed (however, dust from the outside can still be tracked in and dispersed in the water).

The next group of related sample locations comprises the permanent bodies of contaminated water located in Area 12 at Upper and Lower Haines Lakes and the Laboratory Sump in Area 23. The Haines Lakes were established as catch basins for industrial water when a water source was exposed during construction of E-Tunnel. This water source became contaminated from a test in E-Tunnel in 1961 and again in 1967 and later tests. The Area 23 Laboratory Sump is a receptacle for plumbing wastes from the Environmental Sciences Laboratories contaminated sample preparation laboratories in Building 650. The sump is connected to a network of perforated pipes underground constituting a leach field allowing liquid contaminated wastes to percolate into the soil.

Papoose Lake is the only drainage basin outside the Test Site which is continually sampled. Any contamination which is detected at this location is the result of airborne surface material or atmospheric fallout from past atmospheric detonations.

The CP-2 waste pond is a catch basin in Area 6 that receives effluent water from the decontamination facilities located nearby.

Table 17 and Figure 17 show the locations of the miscellaneous water sampling stations in relation to the entire NTS. Table 18 gives the ranges for all seven locations based upon samples collected monthly over a twelve month sampling period. The wide ranges noted from Upper and Lower Haines Lakes samples for this fiscal year are the results of periods of peak activity when copious water inflow tended to dilute contamination levels at the points of collection. No attempt was made to compute or average means from these sample locations since the sources sampled included both purposely contaminated and non-contaminated sources.

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* Use of this RCG value complies with the applicable provisions of AEC Manual Chapter 0524 for unknown mixtures of radionuclides. All samples collected are routinely evaluated in the laboratory at a detection level low enough to assure the absence of those radionuclides specified in 0524 that would render this concentration guide invalid.

SECTION 3

SOIL AND VEGETATION SAMPLING

3.2 Introduction

Soil and vegetation samples were collected from twenty-five sampling locations throughout the Nevada Test Site. Both types of samples were obtained in close proximity to each other to permit intercomparisons of data in the future.

3.2 Sampling Methods

Attempts at sampling soil and vegetation have been made locally and elsewhere in previous years with rather disappointing results. Particularly in the case of vegetation sampling, typical problems concerned the absence of homogeneity in choice of species selected, lack of sufficient attention to sampling topography, and lack of consideration of the most advantageous biological characteristics when selecting species of plants for sampling.

The sampling procedures used by the Environmental Surveillance group reflect a concerted effort to overcome the problems outlined above. Sampling locations were chosen to reflect a stable soil surface, i.e., a topographically appropriate area having a minimum amount of channeling effects due to canyons, sand-eddy formations, etc. Soil samples consisted of surface volumes of approximately six inches square and less than one-inch in depth.

Vegetation samples consisted of four species commonly available on the NTS on a year-round basis -- Sagebrush, Blackbrush, Winterfat, and Creosote. A number of considerations were taken into account when selecting species, such as availability, leaf type, leaf density, and structure. Owing to the type of vegetation selected and the sparse rainfall encountered in a desert environment, uptake of radionuclides is minimal, and the data reflect essentially fallout deposition. Sufficient vegetation was collected per sample to yield approximately 100 grams of leaf material. The vegetation was placed in a heavy paper sack, taped shut, and allowed to dry. After the leaves had become sufficiently brittle, they could be shaken loose from the stems and ground up to form a compact sample mass.

3.3 Counting Procedures

Both soil and vegetation samples received gamma spectrum analyses and gross gamma analyses. The samples were leached according to standard laboratory procedures and evaporated on counting planchets. A Baird Atomic SPECTROMETER was used for determination of gross gamma activity. It the activity was such that the apparent 2σ counting error was less than 50%, then the sample was transferred to a multi-channel gamma-spectrum analyzer to qualitatively determine the contributing radionuclides.

3.4 Data Discussion

Table 19 and Figure 18 give the sampling locations for soil and vegetation samples. The means and ranges of gross gamma activity in monthly collections of soil samples and vegetation samples from July 1969 through June 1970 are tabulated in Tables 20, 22 and plotted in Figure 19, and 21 respectively. Soil and vegetation data are tabulated by location in Tables 21, 23 and plotted in Figures 20, and 22 respectively.

3.4.1 Soil Sampling Data

Mean values of gross gamma activity in surface soil ranged from a minimum of $8.75 \times 10^{-6}\mu Ci/gm$ in March 1970 to a maximum of of $1.53 \times 10^{-5}\mu Ci/gm$ in April 1970. These values do not vary significantly from the corresponding means documented in fiscal year 1969, which were $9.86 \times 10^{-6}\mu Ci/gm$ and $1.82 \times 10^{-5}\mu Ci/gm$ respectively. The observed mean values exhibit a close grouping throughout the twelve month period. The maximum value recorded out of 285 soil samples collected was $7.28 \times 10^{-5}\mu Ci/gm$ obtained in November 1969 at the Area 5 Old Fallout Station. The average for the year of all mean values recorded was $1.11 \times 10^{-5}\mu Ci/gm$.

3.4.2 Vegetation Sampling Data

Mean values of gross gamma activity deposited on vegetation during fiscal year 1970 also exhibited a rather close grouping. Mean values ranged from a minimum of $2.87 \times 10^{-6}\mu Ci/gm$ dry weight in January 1970 to a maximum of $1.02 \times 10^{-5}\mu Ci/gm$ dry weight in July 1969. The average value of the monthly means was $4.50 \times 10^{-6}\mu Ci/gm$ dry weight. The average of the monthly means for fiscal year 1970 was not significantly different from the comparable figure for 1969 which was $7.79 \times 10^{-6}\mu Ci/gm$. The maximum recorded value for 1970 was $1.88 \times 10^{-5}\mu Ci/gm$ recorded in May 1970 from Area 11, Stake 11W-4.

APPENDIX A

STATISTICAL TREATMENT OF DATA

A.1 Geometric Mean

The frequency distribution of radioactivity results for air and water samples indicated a positive skew, a degree of distortion from symmetry of a normal curve. This type of asymmetrical distribution is caused by the extremes in the higher values distorting the curve towards the right.

The data must therefore be handled by logarithmic transformation to obtain normality, and treated as normally distributed random variables.

Hence, an estimate of the true mean of a sample type is calculated by:

$$\bar{X} = \log^{-1}\left[\frac{\Sigma \log X_i}{N} + \frac{S^2}{Z}\right]$$

where: X_i = observed value
N = number of observations
S^2 = variance of log value

Though the geometric mean is not widely known and is tedious to compute, its relative advantage is that it is a more typical average than the arithmetic mean since it is less affected by extremes.

A.2 Radioactivity of a Sample

The radioactivity of a sample (X) is indicated by the equation:

$$X = \frac{R_S - R_b}{A\ B\ C}$$

where: R_S = gross count rate of a sample, c/m
R_b = background count rate, c/m
A = counting efficiency for a particular counter (cpm/dpm)
B = conversion factor (2.22 dpm/pCi or 2.22×10^6 dpm/μCi)
C = Subsample amount, cc, liter or gram

The associated percent counting error at the 2-sigma confidence level ($\% E_{2\sigma}$) for each radioactivity value (X) was:

$$\% E_{2\sigma} = \frac{100\ 2}{R_S - R_b}\left[\frac{R_s}{T_S} + \frac{R_b}{T_b}\right]^{\frac{1}{2}}$$

where: $\mathbb{Z}$ = Z, the number of standard deviations for the confidence interval (95.4%)
T_s = sample count interval, minutes
T_b = background count interval, minutes

The radioactivity of a sample was considered statistically significant if the net count rate of the sample was greater than the detection limit, i.e., two times the net count for which the 2-sigma error was 100 percent.

The detection limit was computed by formula:

$$DL = \frac{2\,\mathbb{Z}}{A\,B\,C}\left[\frac{d + R_b}{T_s} + \frac{R_b}{T_b}\right]^{\frac{1}{2}}$$

where: d = net count rate for which the 2-sigma error is 100%.

Any activity value which was equal to or less than the detection level was recorded as zero.

APPENDIX B

TABLES & FIGURES

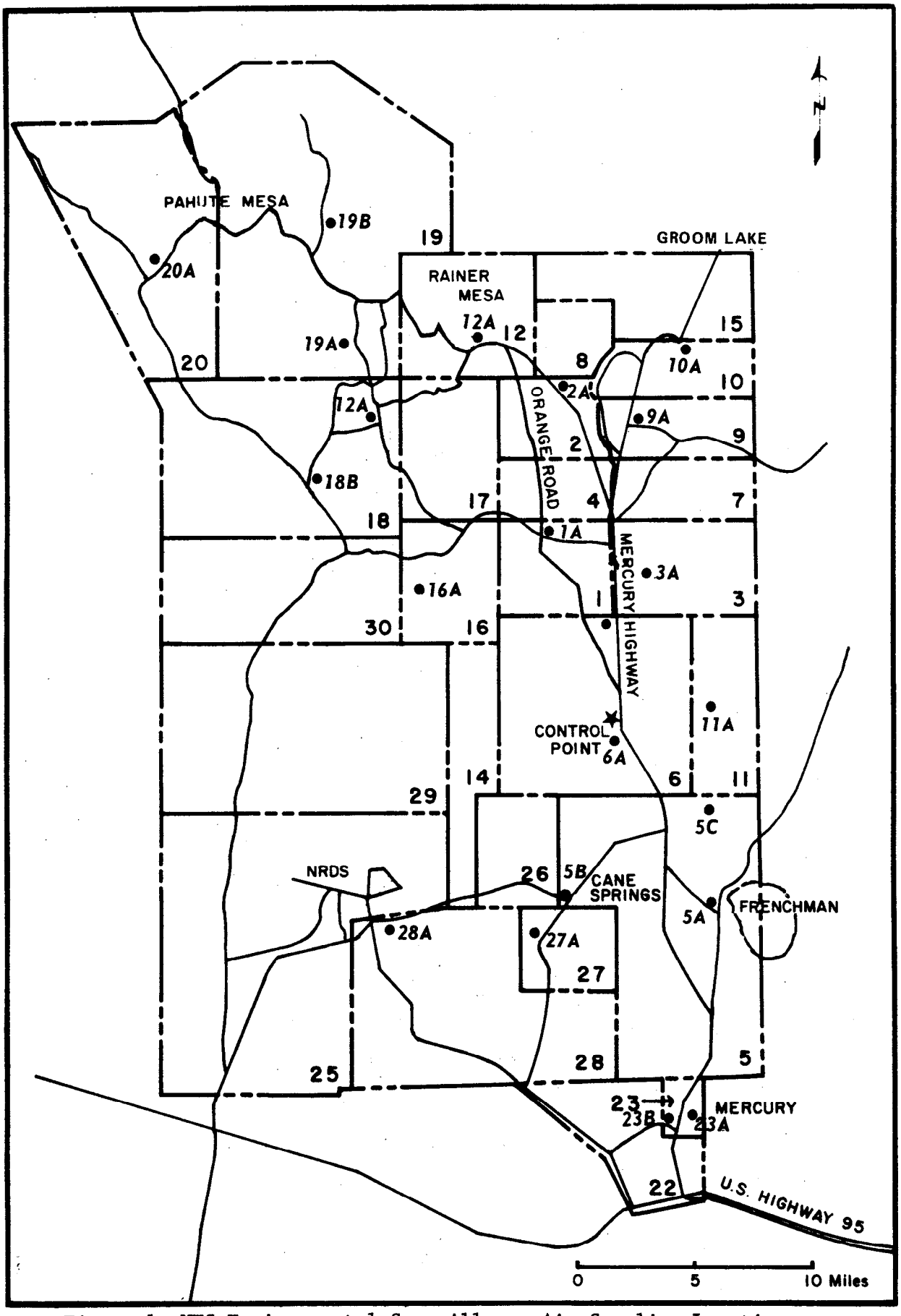

Figure 1 NTS Environmental Surveillance Air Sampling Locations.

TABLE 1

NTS ENVIRONMENTAL SURVEILLANCE
AIR SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATIONS	MAP CODE FOR FIGURE 2
1	Area 1 Gravel Pit	1A
2	Area 2 Compound	2A
3	Area 3 Cafeteria	3A
5	Area 5 Well 5B	5A
5	Area 5 Gate 250	5B
5	Area 5 Compound	5C
6	Area 6 Aid Station	6A
6	Area 6 Well 3 Comp.	6B
9	Area 9 9-300 Bunker	9A
10	Area 10 Gate 700	10A
11	Area 11 Sec. St. 293	11A
12	Area 12 Changehouse	12A
16	Area 16 Tunnel Maint.	16A
18	Area 18 Cafeteria	18A
18	Area 18 Air Strip	18B
19	Area 19 Echo Peak	19A
19	Area 19 St. 19C-10	19B
20	Area 20 Dispensary	20A
23	Area 23 Bldg. 214	23A
23	Area 23 H&S Bldg.	23B
27	Area 27 Dispensary	27A
28	Area 28 Project HENRE	28A
Groom Lake	Station 1	

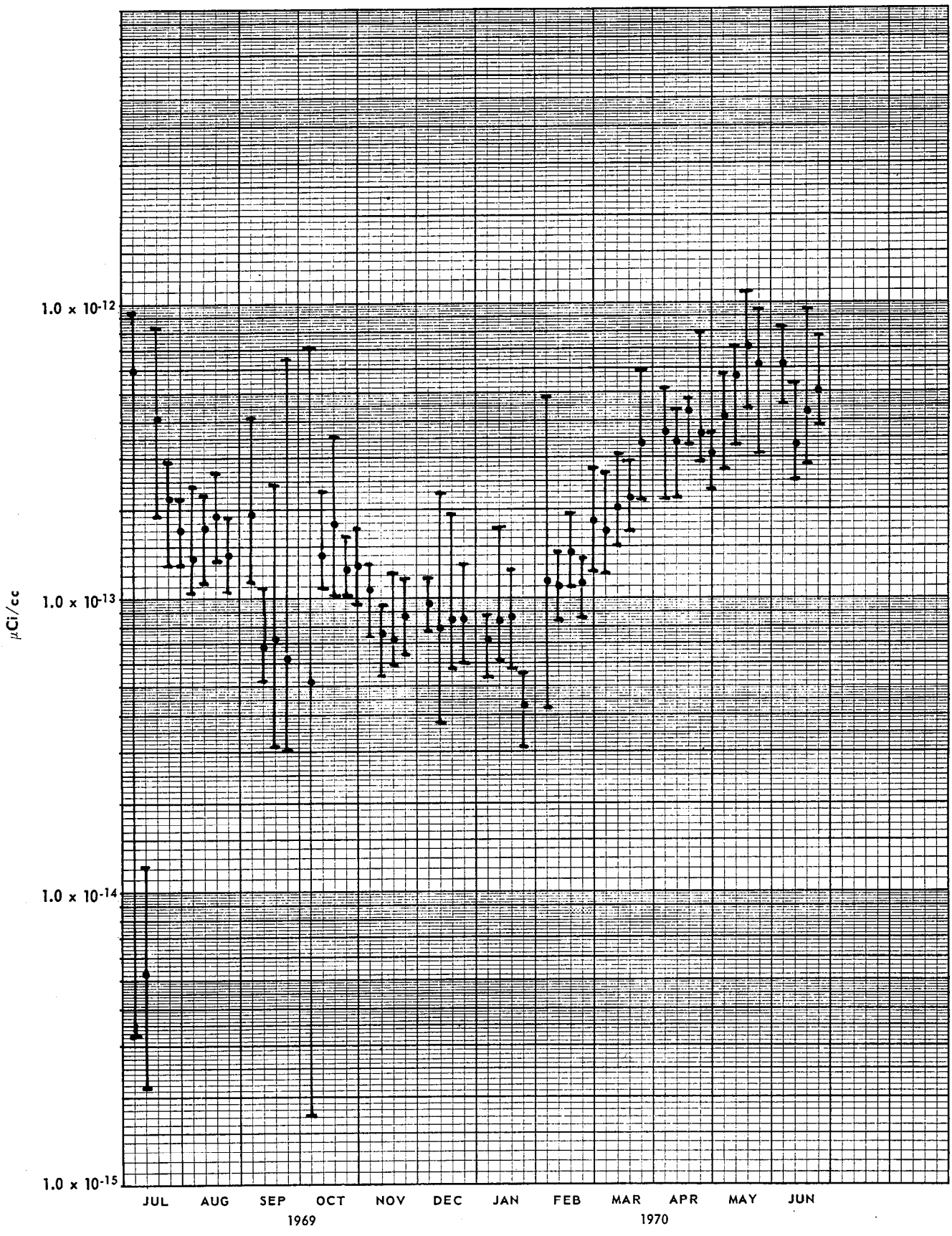

Figure 2 Weekly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Air Samples from July, 1969 through June, 1970.

TABLE 2

Weekly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Air Samples from July 1969 through June 1970

Values in Terms of μCi/cc

DATE (Week Ending)	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
07/06/69	22	5.99×10^{-13}	3.20×10^{-15}	9.31×10^{-13}
07/13/69	13	5.23×10^{-15}	2.35×10^{-15}	1.20×10^{-14}
07/20/69	21	4.24×10^{-13}	1.93×10^{-13}	8.28×10^{-13}
07/27/69	23	2.18×10^{-13}	1.30×10^{-13}	2.90×10^{-13}
08/03/69	23	1.74×10^{-13}	1.30×10^{-13}	2.14×10^{-13}
08/10/69	23	1.38×10^{-13}	1.06×10^{-13}	2.38×10^{-13}
08/17/69	21	1.76×10^{-13}	1.12×10^{-13}	2.20×10^{-13}
08/24/69	23	1.90×10^{-13}	1.35×10^{-13}	2.67×10^{-13}
08/31/69	21	1.41×10^{-13}	1.06×10^{-13}	1.82×10^{-13}
09/07/69	23	1.96×10^{-13}	1.15×10^{-13}	4.05×10^{-13}
09/14/69	23	6.84×10^{-14}	5.33×10^{-14}	1.09×10^{-13}
09/21/69	22	7.19×10^{-14}	3.14×10^{-14}	2.42×10^{-13}
09/28/69	23	6.18×10^{-14}	3.08×10^{-15}	6.51×10^{-13}
10/05/69	23	5.22×10^{-14}	1.75×10^{-15}	7.08×10^{-13}
10/12/69	23	1.40×10^{-13}	1.11×10^{-13}	2.30×10^{-13}
10/19/69	23	1.80×10^{-13}	1.02×10^{-13}	3.51×10^{-13}
10/26/69	23	1.26×10^{-13}	1.01×10^{-13}	1.55×10^{-13}
11/02/69	23	1.29×10^{-13}	9.61×10^{-14}	1.73×10^{-13}
11/09/69	23	1.07×10^{-13}	6.45×10^{-14}	1.30×10^{-13}
11/16/69	23	7.73×10^{-14}	5.51×10^{-14}	9.35×10^{-14}
11/23/69	22	7.18×10^{-14}	5.96×10^{-14}	1.22×10^{-13}
11/30/69	22	8.84×10^{-14}	6.55×10^{-14}	1.16×10^{-13}
12/07/69	20	9.73×10^{-14}	7.90×10^{-14}	1.16×10^{-13}
12/14/69	22	7.92×10^{-14}	3.86×10^{-14}	2.30×10^{-13}
12/21/69	23	8.64×10^{-14}	5.82×10^{-14}	1.92×10^{-13}
12/28/69	23	8.72×10^{-14}	6.00×10^{-14}	1.30×10^{-13}
01/04/70	22	7.29×10^{-14}	5.51×10^{-14}	8.85×10^{-14}
01/11/70	23	8.50×10^{-14}	6.20×10^{-14}	1.75×10^{-13}
01/18/70	23	8.77×10^{-14}	5.95×10^{-14}	1.23×10^{-13}
01/25/70	22	4.36×10^{-14}	3.11×10^{-14}	5.63×10^{-14}
02/01/70	23	1.18×10^{-13}	4.26×10^{-14}	4.80×10^{-13}
02/08/70	22	1.10×10^{-13}	8.55×10^{-14}	1.42×10^{-13}
02/15/70	22	1.46×10^{-13}	1.10×10^{-13}	1.95×10^{-13}
02/22/70	22	1.14×10^{-13}	8.75×10^{-14}	1.38×10^{-13}
03/01/70	22	1.81×10^{-13}	1.27×10^{-13}	2.77×10^{-13}
03/08/70	15	1.69×10^{-13}	1.22×10^{-13}	2.68×10^{-13}
03/15/70	21	2.03×10^{-13}	1.51×10^{-13}	3.09×10^{-13}
03/22/70	22	2.22×10^{-13}	1.71×10^{-13}	2.89×10^{-13}
03/29/70	22	3.39×10^{-13}	2.19×10^{-13}	5.86×10^{-13}
04/05/70	22	3.69×10^{-13}	2.18×10^{-13}	5.11×10^{-13}
04/12/70	22	3.45×10^{-13}	2.24×10^{-13}	4.38×10^{-13}
04/19/70	21	4.36×10^{-13}	3.35×10^{-13}	4.77×10^{-13}
04/26/70	22	3.62×10^{-13}	2.92×10^{-13}	7.88×10^{-13}
05/03/70	22	3.10×10^{-13}	2.35×10^{-13}	3.60×10^{-13}
05/10/70	21	4.15×10^{-13}	2.76×10^{-13}	5.74×10^{-13}
05/17/70	20	5.62×10^{-13}	3.30×10^{-13}	7.10×10^{-13}
05/24/70	21	7.06×10^{-13}	4.43×10^{-13}	1.09×10^{-12}
05/31/70	21	6.12×10^{-13}	3.09×10^{-13}	9.48×10^{-13}
06/07/70	22	6.28×10^{-13}	4.66×10^{-13}	8.21×10^{-13}
06/14/70	22	3.35×10^{-13}	2.52×10^{-13}	5.33×10^{-13}
06/21/70	22	4.34×10^{-13}	2.87×10^{-13}	9.54×10^{-13}
06/28/70	22	5.01×10^{-13}	3.89×10^{-13}	7.68×10^{-13}

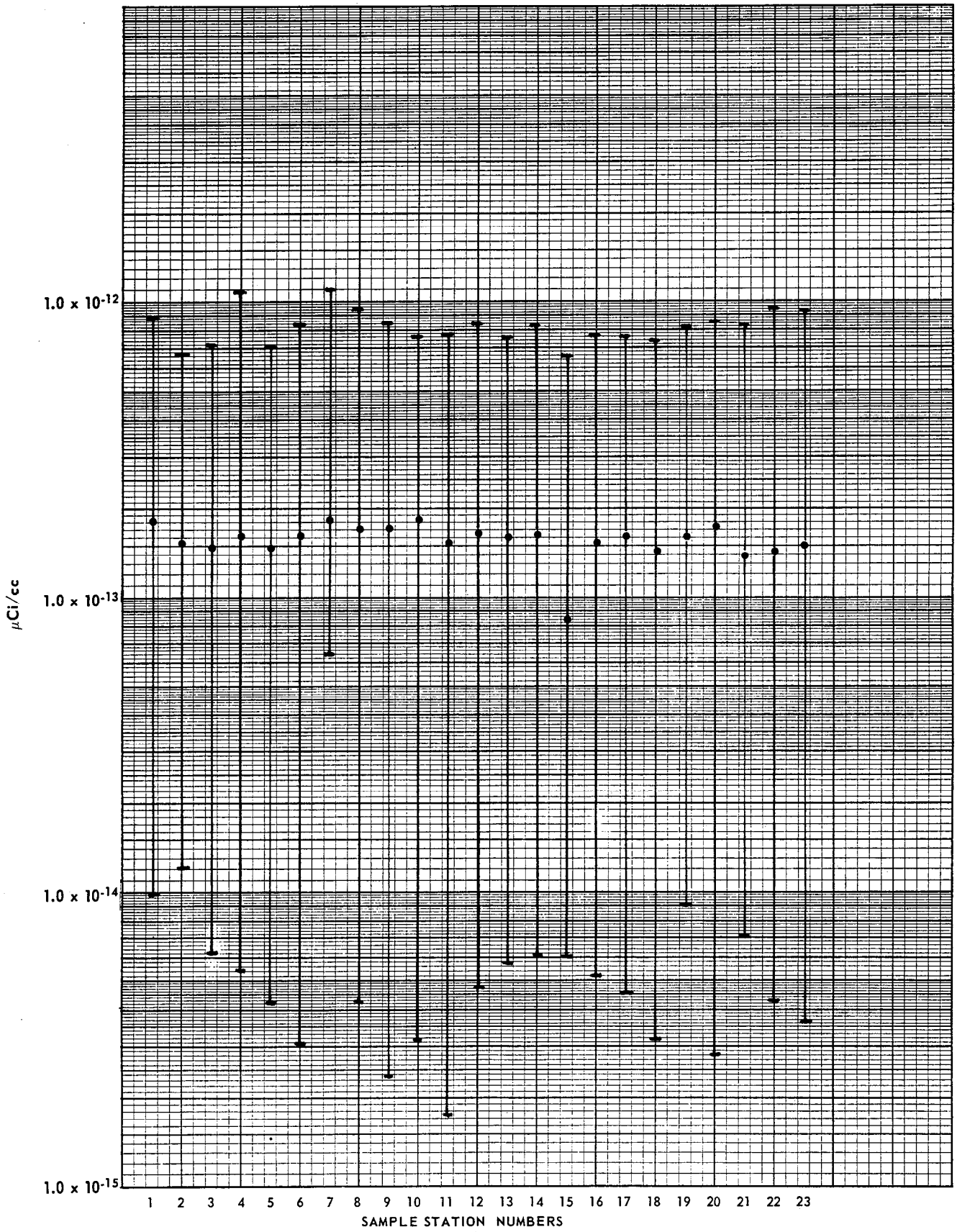

Figure 3 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Air Sampling Station Locations from July, 1969 through June, 1970.

TABLE 3

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Air Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc

STATION NUMBER AND LOCATIONS	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 1 Gravel Pit	47	1.83×10^{-13}	9.80×10^{-15}	8.70×10^{-13}
2. Area 2 Compound	50	1.53×10^{-13}	1.20×10^{-14}	6.71×10^{-13}
3. Area 3 Cafeteria	52	1.48×10^{-13}	6.12×10^{-15}	7.08×10^{-13}
4. Area 5 Well 5B	49	1.63×10^{-13}	5.44×10^{-15}	1.09×10^{-12}
5. Area 5 Gate 250	51	1.48×10^{-13}	4.22×10^{-15}	6.99×10^{-13}
6. Area 5 Compound	51	1.67×10^{-13}	3.08×10^{-15}	8.33×10^{-13}
7. Area 6 Aid Station	50	1.85×10^{-13}	6.42×10^{-14}	1.09×10^{-12}
8. Area 6 Well 3 Complex	52	1.70×10^{-13}	4.35×10^{-15}	9.52×10^{-13}
9. Area 9 9-300 Bunker	51	1.73×10^{-13}	2.35×10^{-15}	8.44×10^{-13}
10. Area 10 Gate 700	49	1.86×10^{-13}	3.14×10^{-14}	7.48×10^{-13}
11. Area 11 Sec. St. 293	52	1.55×10^{-13}	1.75×10^{-15}	7.78×10^{-13}
12. Area 12 Changehouse	52	1.67×10^{-13}	4.64×10^{-15}	8.26×10^{-13}
13. Area 16 Tunnel Maint.	51	1.60×10^{-13}	5.84×10^{-15}	7.51×10^{-13}
14. Area 18 Cafeteria	51	1.62×10^{-13}	6.15×10^{-15}	8.14×10^{-13}
15. Area 18 Airstrip	28 *	8.53×10^{-14}	6.01×10^{-15}	6.48×10^{-13}
16. Area 19 Echo Peak	51	1.56×10^{-13}	5.26×10^{-15}	7.73×10^{-13}
17. Area 19 St. 19 C-10	51	1.62×10^{-13}	4.58×10^{-15}	7.52×10^{-13}
18. Area 20 Dispensary	51	1.44×10^{-13}	3.20×10^{-15}	7.31×10^{-13}
19. Area 23 Bldg. 214	52	1.60×10^{-13}	9.05×10^{-15}	8.04×10^{-13}
20. Area 23 H&S Bldg.	51	1.74×10^{-13}	2.82×10^{-15}	8.60×10^{-13}
21. Area 27 Dispensary	52	1.39×10^{-13}	7.09×10^{-15}	8.02×10^{-13}
22. Area 28 HENRE	49	1.42×10^{-13}	4.30×10^{-15}	9.54×10^{-13}
23. Groom Lake Station 1	50	1.51×10^{-13}	3.66×10^{-14}	9.16×10^{-13}

* Did not run a full year (--7 Mo.)

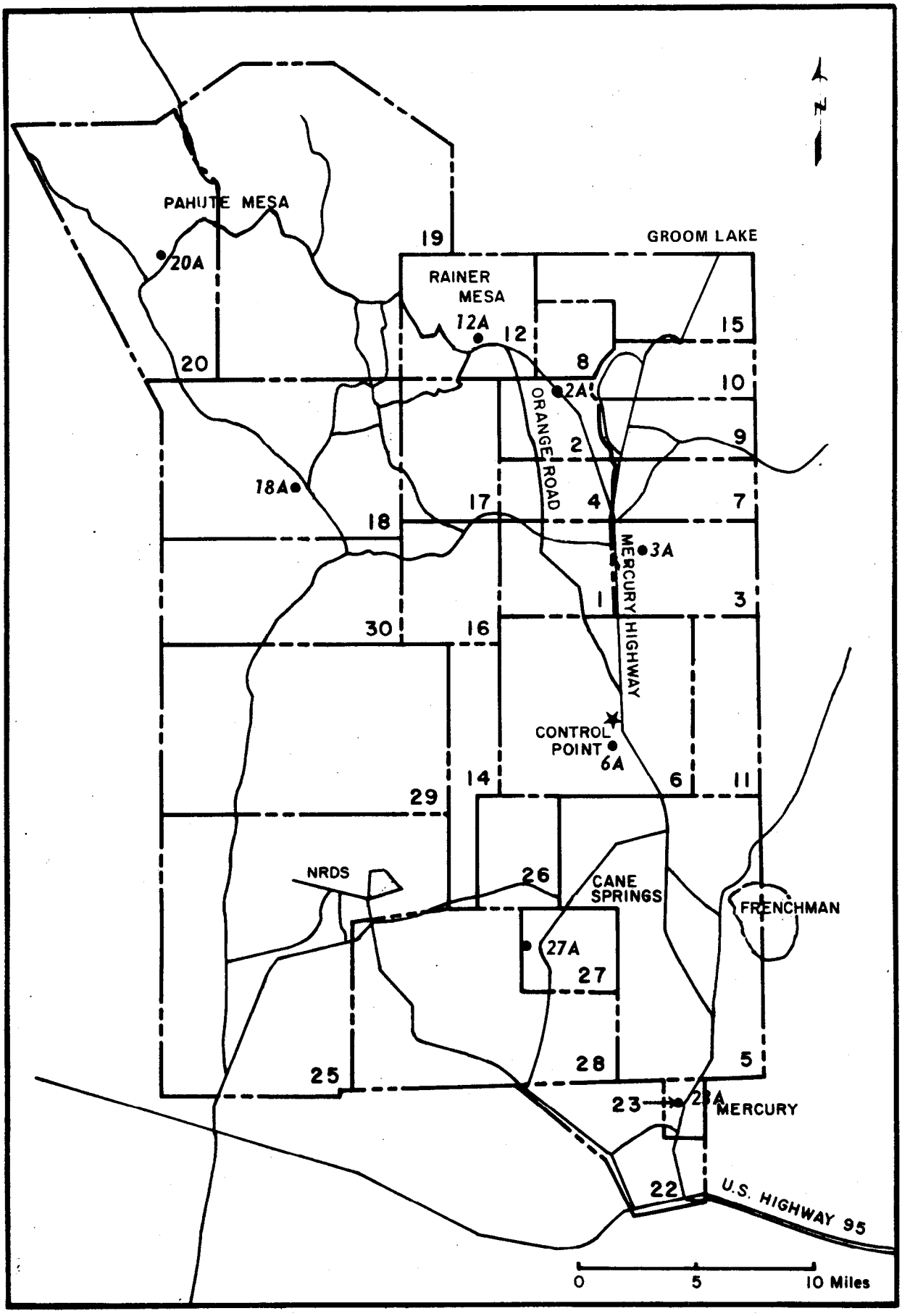

Figure 4 NTS Environmental Surveillance Potable Water Sampling Locations.

TABLE 4

ENVIRONMENTAL SURVEILLANCE
POTABLE WATER SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 4
2	Men's Rest Room	2A
3	Cafeteria	3A
6	Cafeteria	6A
12	Cafeteria	12A
18	Fire Station	18A
20	Dispensary	20A
23	Cafeteria	23A
27	Cafeteria	27A
Groom Lake	Station 1	

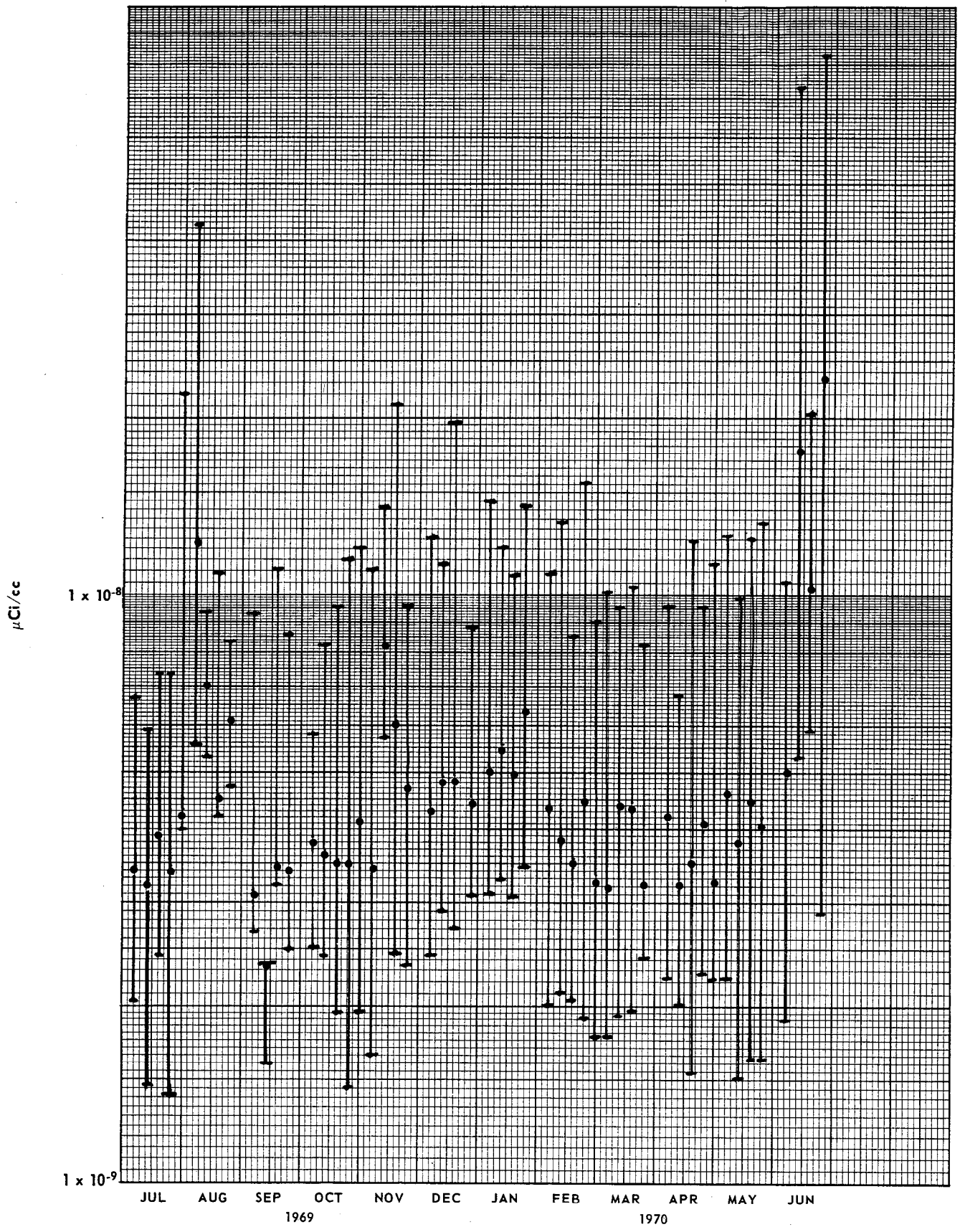

Figure 5 Weekly Means and Ranges of Gross Beta Radioactivity in Potable Water Samples from July, 1969 through June, 1970.

TABLE 5

Weekly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Potable Water Samples from July 1969 through June 1970

Values in Terms of μCi/cc				
DATE (Week Ending)	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
07/06/69	9	3.45×10^{-9}	2.04×10^{-9}	6.67×10^{-9}
07/13/69	9	3.22×10^{-9}	1.45×10^{-9}	5.79×10^{-9}
07/20/69	9	3.87×10^{-9}	2.43×10^{-9}	7.27×10^{-9}
07/27/69	9	3.38×10^{-9}	1.41×10^{-9}	7.31×10^{-9}
08/03/69	9	4.23×10^{-9}	4.02×10^{-9}	2.20×10^{-8}
08/10/69	9	1.24×10^{-8}	5.54×10^{-9}	4.25×10^{-8}
08/17/69	9	7.01×10^{-9}	5.28×10^{-9}	9.31×10^{-9}
08/24/69	9	4.48×10^{-9}	4.26×10^{-9}	1.09×10^{-8}
08/31/69	8	6.07×10^{-9}	4.67×10^{-9}	8.33×10^{-9}
09/07/69	8	3.08×10^{-9}	2.64×10^{-9}	9.32×10^{-9}
09/14/69	9	2.33×10^{-9}	1.70×10^{-9}	2.33×10^{-9}
09/21/69	9	3.43×10^{-9}	3.22×10^{-9}	1.11×10^{-8}
09/28/69	9	3.38×10^{-9}	2.48×10^{-9}	8.58×10^{-9}
10/05/69	5	3.82×10^{-9}	2.53×10^{-9}	5.77×10^{-9}
10/12/69	9	3.60×10^{-9}	2.44×10^{-9}	8.19×10^{-9}
10/19/69	9	3.52×10^{-9}	1.96×10^{-9}	9.50×10^{-8}
10/26/69	6	3.46×10^{-9}	1.46×10^{-9}	1.15×10^{-8}
11/02/69	9	4.13×10^{-9}	1.96×10^{-9}	1.19×10^{-8}
11/09/69	9	3.42×10^{-9}	1.65×10^{-9}	1.10×10^{-8}
11/16/69	9	8.08×10^{-9}	5.74×10^{-9}	1.42×10^{-8}
11/23/69	9	5.96×10^{-9}	2.45×10^{-9}	2.10×10^{-8}
11/30/69	9	4.66×10^{-9}	2.35×10^{-9}	9.51×10^{-9}
12/07/69	9	4.28×10^{-9}	2.44×10^{-9}	1.27×10^{-8}
12/14/69	9	4.79×10^{-9}	2.93×10^{-9}	1.13×10^{-8}
12/21/69	9	4.78×10^{-9}	2.70×10^{-9}	1.97×10^{-8}
12/28/69	9	4.43×10^{-9}	3.10×10^{-9}	8.85×10^{-9}
01/04/70	7	5.01×10^{-9}	3.10×10^{-9}	1.46×10^{-8}
01/11/70	9	5.44×10^{-9}	3.30×10^{-9}	1.21×10^{-8}
01/18/70	9	4.95×10^{-9}	3.07×10^{-9}	1.08×10^{-8}
01/25/70	9	6.35×10^{-9}	3.48×10^{-9}	1.42×10^{-8}
02/01/70	9	4.35×10^{-9}	2.02×10^{-9}	1.09×10^{-8}
02/08/70	9	3.81×10^{-9}	2.10×10^{-9}	1.34×10^{-8}
02/15/70	9	3.49×10^{-9}	2.04×10^{-9}	8.53×10^{-9}
02/22/70	9	4.46×10^{-9}	1.91×10^{-9}	1.56×10^{-8}
03/01/70	9	3.27×10^{-9}	1.78×10^{-9}	8.96×10^{-9}
03/08/70	9	3.18×10^{-9}	1.77×10^{-9}	1.03×10^{-8}
03/15/70	9	4.39×10^{-9}	1.93×10^{-9}	9.50×10^{-9}
03/22/70	9	4.34×10^{-9}	1.98×10^{-9}	1.08×10^{-8}
03/29/70	8	3.25×10^{-9}	2.42×10^{-9}	8.29×10^{-9}
04/05/70	9	4.24×10^{-9}	2.23×10^{-9}	9.62×10^{-9}
04/12/70	4	3.23×10^{-9}	2.03×10^{-9}	6.72×10^{-8}
04/19/70	9	3.52×10^{-9}	1.58×10^{-9}	1.24×10^{-8}
04/26/70	8	4.11×10^{-9}	2.28×10^{-9}	9.47×10^{-8}
05/03/70	8	3.25×10^{-9}	2.21×10^{-9}	1.13×10^{-8}
05/10/70	9	4.62×10^{-9}	2.23×10^{-9}	1.27×10^{-8}
05/17/70	9	3.82×10^{-9}	1.50×10^{-9}	9.90×10^{-8}
05/24/70	9	4.46×10^{-9}	1.63×10^{-9}	1.25×10^{-8}
05/31/70	9	4.05×10^{-9}	1.63×10^{-9}	1.33×10^{-8}
06/07/70	9	5.03×10^{-9}	1.89×10^{-9}	1.05×10^{-8}
06/14/70	9	1.78×10^{-8}	5.33×10^{-9}	7.30×10^{-8}
06/21/70	8	1.03×10^{-8}	5.91×10^{-9}	2.03×10^{-8}
06/28/70	8	2.36×10^{-8}	2.89×10^{-9}	8.34×10

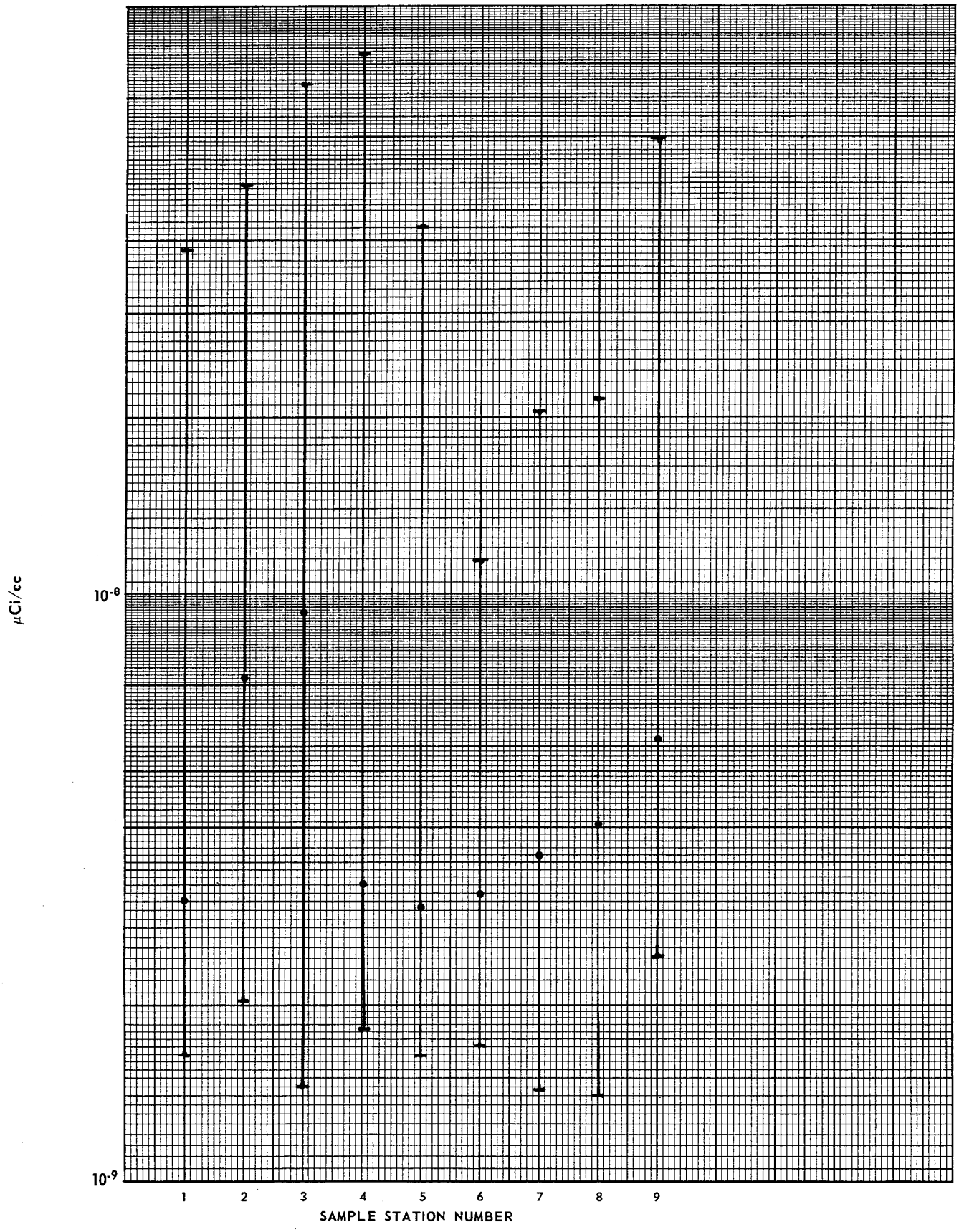

Figure 6 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Potable Water Sampling Locations from July, 1969 through June, 1970.

TABLE 6

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Potable Water Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 2 Men's Rest Room	48	3.03×10^{-9}	1.65×10^{-9}	3.87×10^{-8}
2. Area 3 Cafeteria	51	7.19×10^{-9}	2.04×10^{-9}	4.95×10^{-8}
3. Area 6 Cafeteria	48	9.36×10^{-9}	1.46×10^{-9}	7.30×10^{-8}
4. Area 12 Cafeteria	49	3.25×10^{-9}	1.81×10^{-9}	8.34×10^{-8}
5. Area 18 Dispensary	51	2.94×10^{-9}	1.63×10^{-9}	4.25×10^{-8}
6. Area 20 Dispensary	51	3.10×10^{-9}	1.71×10^{-9}	1.15×10^{-8}
7. Area 23 Cafeteria	51	3.63×10^{-9}	1.45×10^{-9}	2.03×10^{-8}
8. Area 27 Cafeteria	48	4.04×10^{-9}	1.41×10^{-9}	2.15×10^{-8}
9. Groom Lake Station 1	49	5.61×10^{-9}	2.44×10^{-9}	5.95×10^{-8}

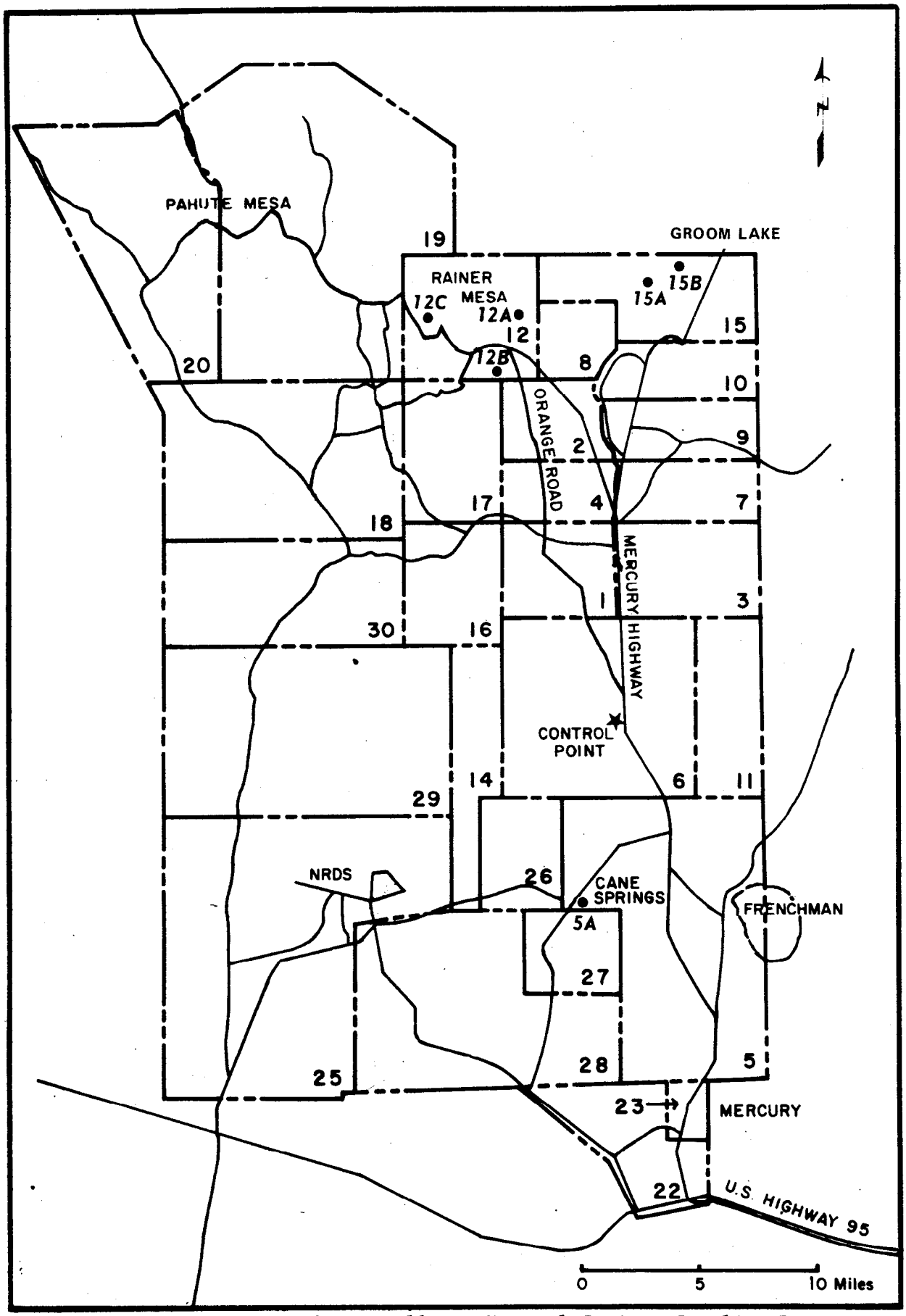

Figure 7 NTS Environmental Surveillance Natural Springs Sampling Locations.

TABLE 7

ENVIRONMENTAL SURVEILLANCE
NATURAL SPRINGS SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 7
5	Cane Spring	5A
12	White Rock Spring	12A
12	Captain Jack Spring	12B
12	Gold Meadows Pond	12C
15	Oak Butte Spring	15A
15	Tub Spring	15B

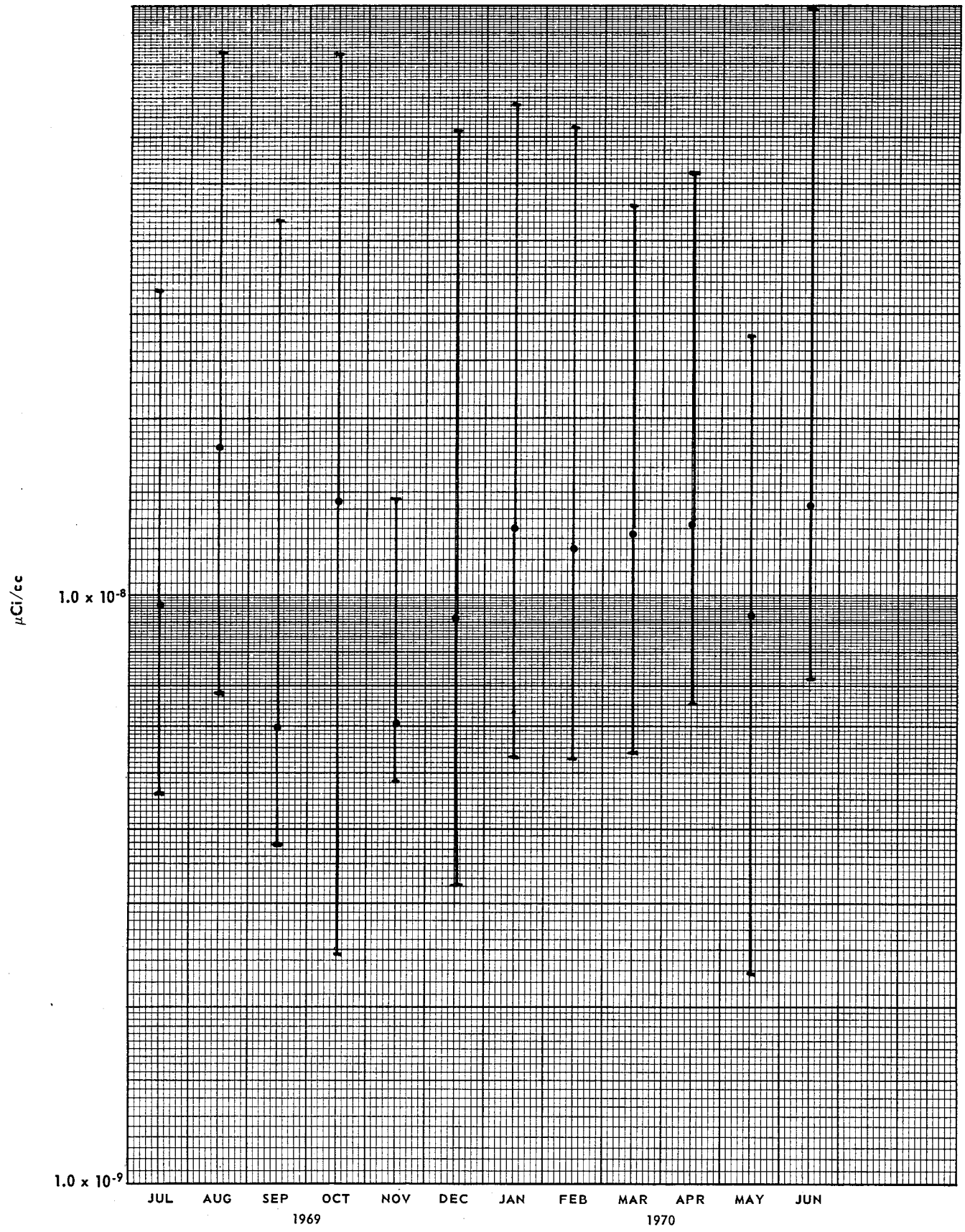

Figure 8 Monthly Means and Ranges of Gross Beta Radioactivity in NTS Natural Springs Water Samples from July, 1969 through June, 1970.

TABLE 8

Monthly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Natural Springs Water Samples from July 1969 through June 1970.

Values in Terms of μCi/cc				
			RANGE	
DATE	TOTAL NO. OF SAMPLES	MEAN	MINIMUM	MAXIMUM
July 1969	6	9.64×10^{-9}	4.64×10^{-9}	3.28×10^{-8}
August 1969	6	1.79×10^{-8}	6.79×10^{-9}	3.58×10^{-8}
September 1969	6	5.96×10^{-9}	3.78×10^{-9}	4.30×10^{-8}
October 1969	6	1.45×10^{-8}	2.50×10^{-9}	8.28×10^{-8}
November 1969	5	6.08×10^{-9}	4.85×10^{-9}	1.45×10^{-8}
December 1969	6	9.11×10^{-9}	3.20×10^{-9}	6.15×10^{-8}
January 1970	6	1.30×10^{-8}	5.30×10^{-9}	6.78×10^{-8}
February 1970	6	1.20×10^{-8}	5.32×10^{-9}	6.20×10^{-8}
March 1970	6	1.27×10^{-8}	5.40×10^{-9}	4.58×10^{-8}
April 1970	6	1.31×10^{-8}	6.54×10^{-9}	5.17×10^{-8}
May 1970	6	9.20×10^{-9}	2.28×10^{-9}	2.73×10^{-8}
June 1970	6	1.42×10^{-8}	7.17×10^{-9}	9.95×10^{-8}

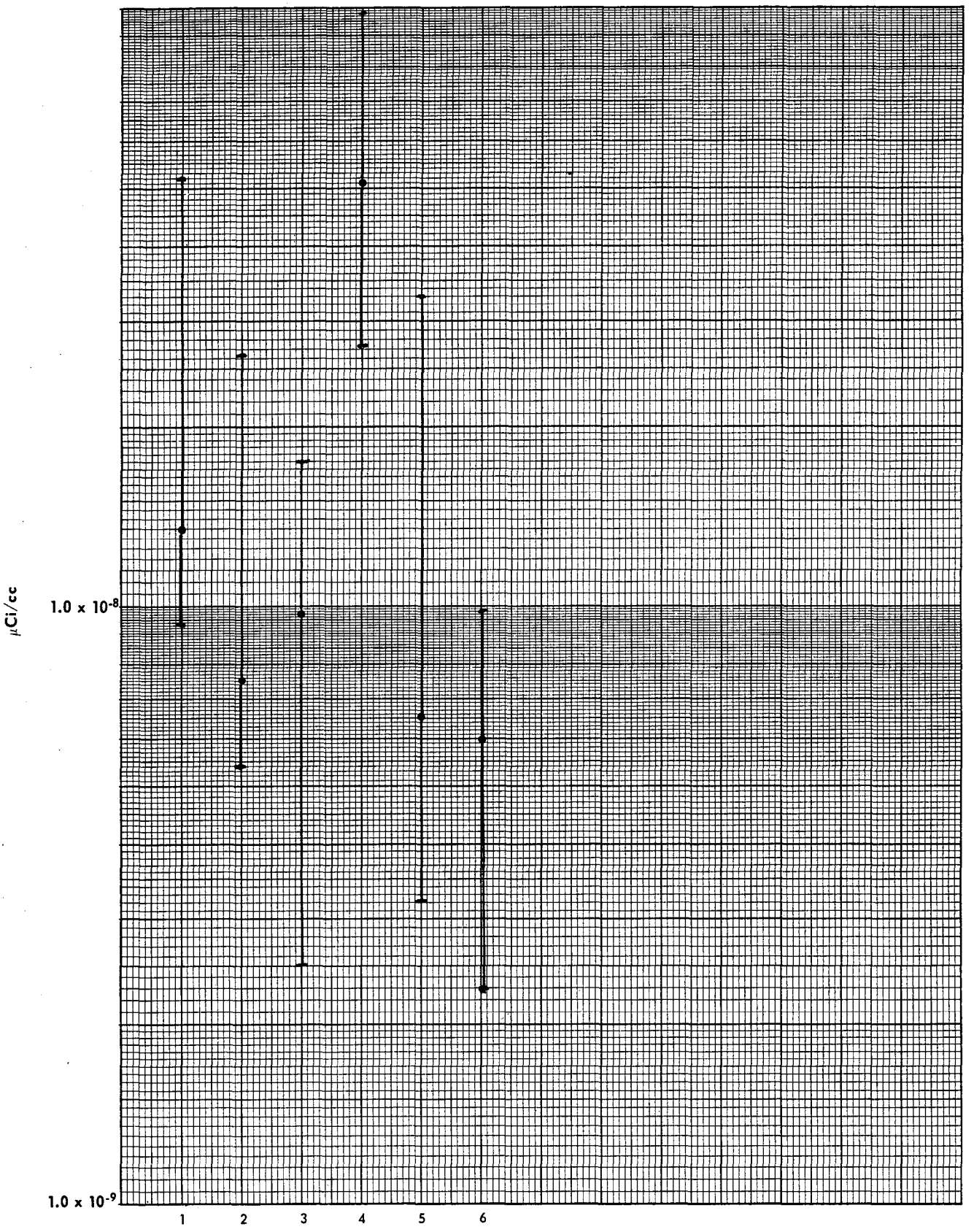

Figure 9 Means and Ranges of Gross Beta Radioactivity in NTS Environmental Natural Springs Sampling Locations from July, 1969 through June, 1970.

TABLE 9

Means and Ranges of Gross Beta Radioactivity at NTS Natural Springs Water Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 5 Cane Spring	12	1.35×10^{-8}	9.27×10^{-9}	5.19×10^{-8}
2. Area 12 White Rock Spring	12	7.53×10^{-9}	5.40×10^{-9}	2.64×10^{-8}
3. Area 12 Capt. Jack Spring	12	9.73×10^{-9}	2.50×10^{-9}	1.74×10^{-8}
4. Area 12 Gold Meadows Pond	11	5.16×10^{-8}	2.73×10^{-8}	9.95×10^{-8}
5. Area 15 Oak Butte Spring	12	6.53×10^{-9}	3.20×10^{-9}	3.31×10^{-8}
6. Area 15 Tub Spring	12	5.97×10^{-9}	2.28×10^{-9}	9.84×10^{-9}

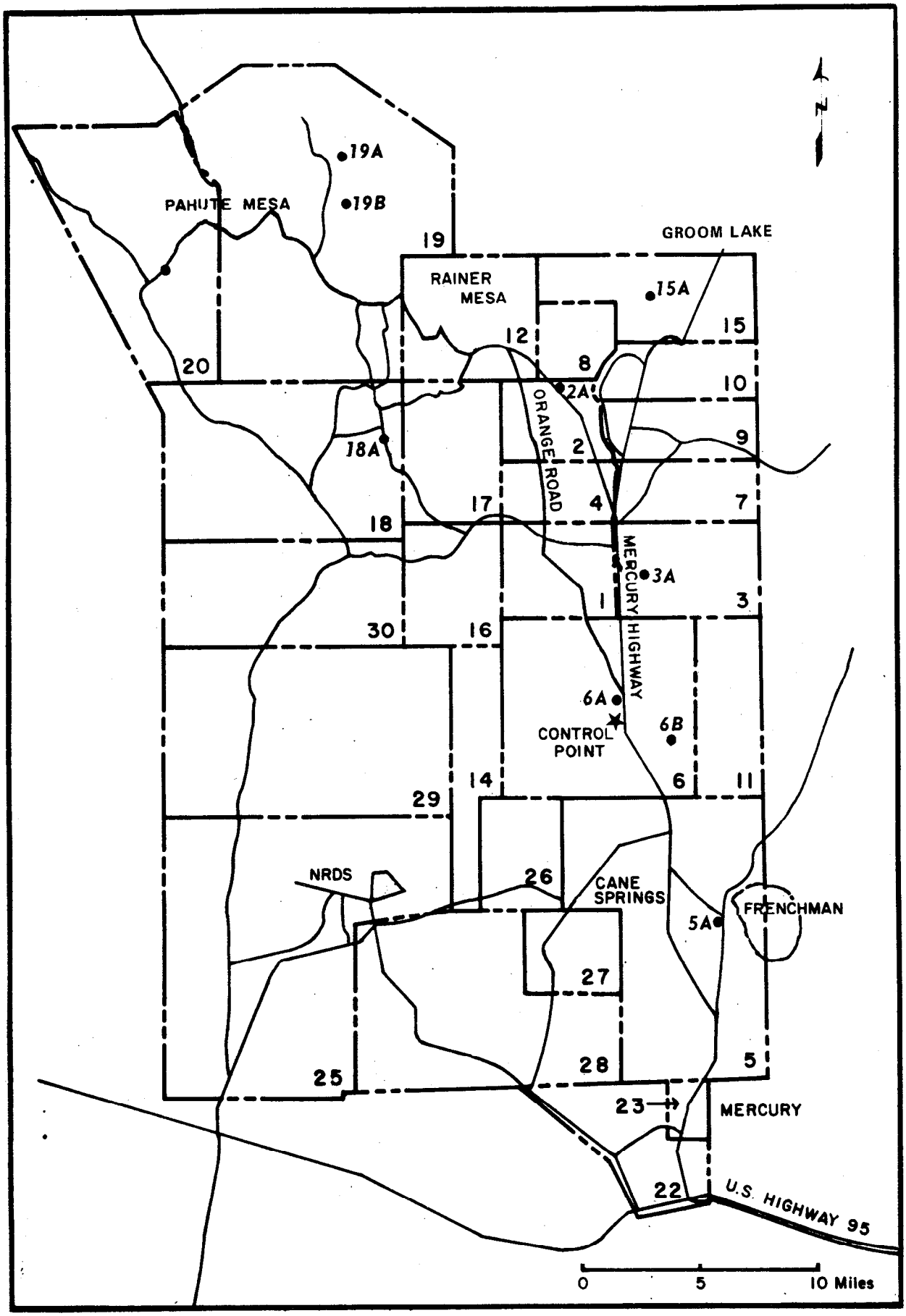

Figure 10 NTS Environmental Surveillance Open Reservoirs Sampling Locations.

TABLE 10

ENVIRONMENTAL SURVEILLANCE
OPEN RESERVOIR SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 10
2	Well 2 Reservoir	2A
3	Well A Reservoir	3A
5	Well 5B Reservoir	5A
6	Well 3 Reservoir	6A
	Well C1 Reservoir	6B
15	Well Ue15d Reservoir	15A
18	Camp 17 Reservoir	18A
19	Well Ue19gr Reservoir	19A
	Well Ue19e Reservoir	19B
20	Well U20A Reservoir	20A
Groom Lake	Well 4 Reservoir	

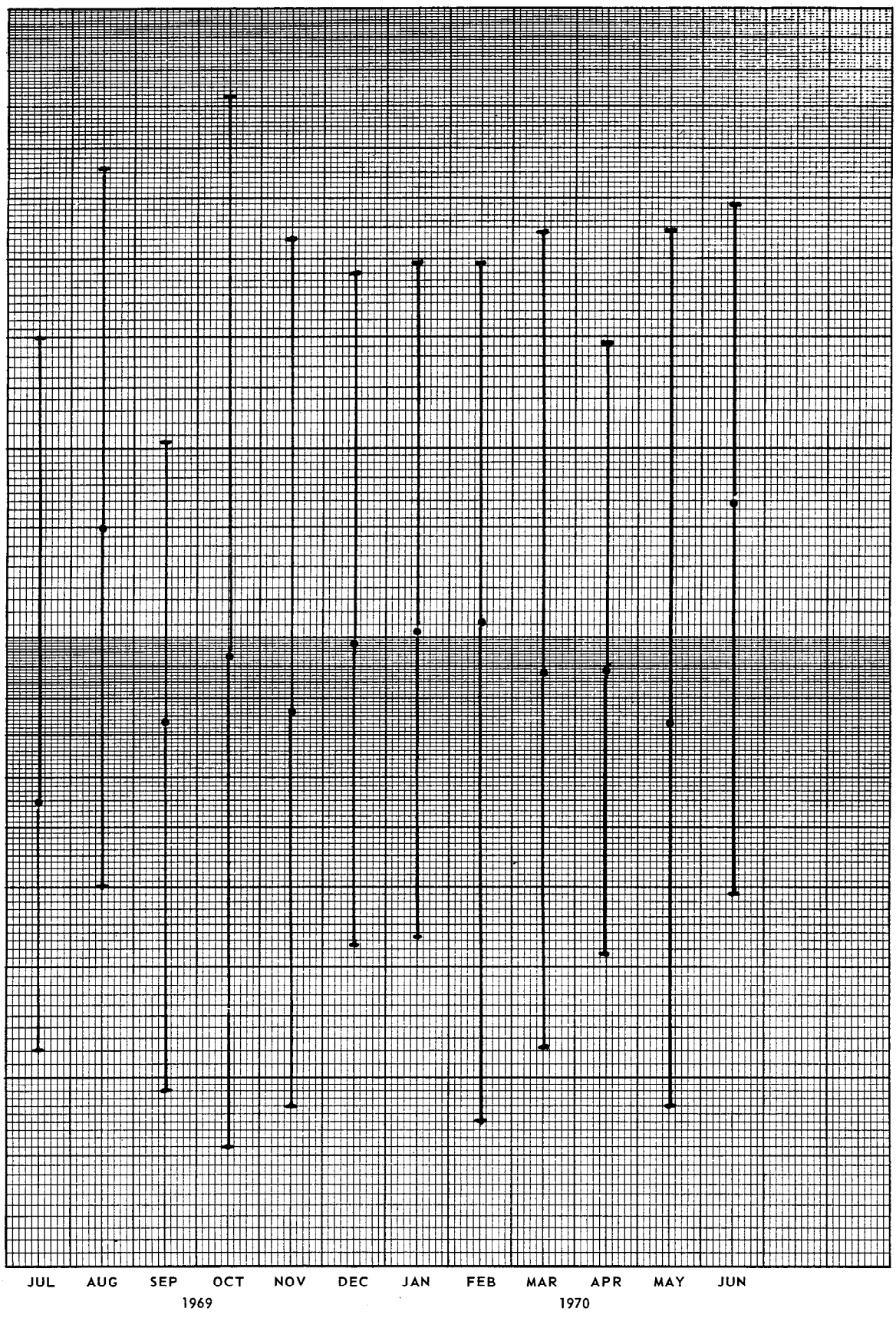

Figure 11 Monthly Means and Ranges of Gross Beta Radioactivity in Open Reservoir Water Samples from July, 1969 through June, 1970.

TABLE 11

Monthly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Open Reservoir Water Samples from July 1969 through June 1970

Values in Terms of μCi/cc

DATE	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
July 1969	11	5.49×10^{-9}	2.21×10^{-9}	3.00×10^{-8}
August 1969	12	1.50×10^{-8}	4.03×10^{-9}	5.60×10^{-8}
September 1969	12	7.38×10^{-9}	1.90×10^{-9}	2.05×10^{-8}
October 1969	11	9.40×10^{-9}	1.55×10^{-9}	7.31×10^{-8}
November 1969	12	7.64×10^{-9}	1.81×10^{-9}	4.36×10^{-8}
December 1969	12	9.83×10^{-9}	3.25×10^{-9}	3.81×10^{-8}
January 1970	12	1.02×10^{-8}	3.33×10^{-9}	3.91×10^{-8}
February 1970	12	1.06×10^{-8}	1.69×10^{-9}	3.89×10^{-8}
March 1970	12	8.82×10^{-9}	2.23×10^{-9}	4.43×10^{-8}
April 1970	12	8.89×10^{-9}	3.15×10^{-9}	2.96×10^{-8}
May 1970	12	7.41×10^{-9}	1.82×10^{-9}	4.45×10^{-8}
June 1970	11	1.64×10^{-8}	3.90×10^{-9}	4.84×10^{-8}

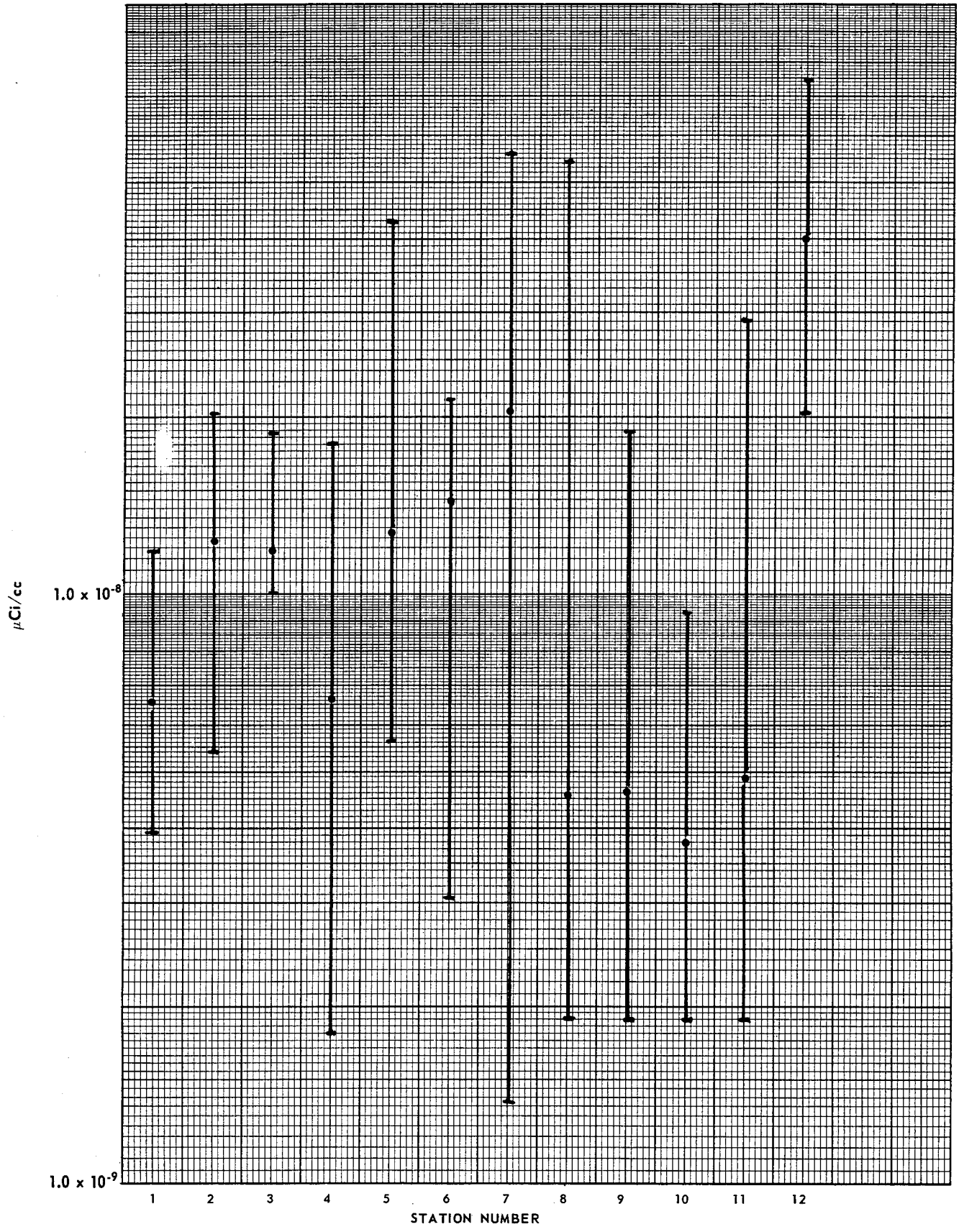

Figure 12 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Open Reservoir Sampling Locations from July, 1969 through June, 1970.

TABLE 12

Means and Ranges of Gross Beta Radioactivity at NTS Open Reservoir Water Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc				
STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGES	
			MINIMUM	MAXIMUM
1. Area 2 Well 2 Res.	12	6.66×10^{-9}	3.95×10^{-9}	1.18×10^{-8}
2. Area 3 Well A Res.	12	1.24×10^{-8}	5.46×10^{-9}	2.03×10^{-8}
3. Area 5 Well 5B Res.	12	1.18×10^{-8}	1.00×10^{-8}	1.89×10^{-8}
4. Area 5 Well Ue5c Res.	11	6.71×10^{-9}	1.81×10^{-9}	1.81×10^{-8}
5. Area 6 Well 3 Res.	12	1.28×10^{-8}	5.64×10^{-9}	4.29×10^{-8}
6. Area 6 Well C1 Res.	12	1.45×10^{-8}	3.07×10^{-9}	2.14×10^{-8}
7. Area 15 Well Ue15d	12	2.04×10^{-8}	1.39×10^{-9}	5.62×10^{-8}
8. Area 18 Camp 17 Res.	11	4.58×10^{-9}	1.90×10^{-9}	5.42×10^{-8}
9. Area 19 Well Ue19gr Res.	12	4.62×10^{-9}	1.90×10^{-9}	1.88×10^{-8}
10. Area 19 Well Ue19e Res.	11	3.81×10^{-9}	1.90×10^{-9}	9.29×10^{-9}
11. Area 20 Well U20a Res.	12	4.87×10^{-9}	1.90×10^{-9}	2.90×10^{-8}
12. Groom Lake Well 4 Res.	12	4.02×10^{-8}	2.05×10^{-8}	7.31×10^{-8}

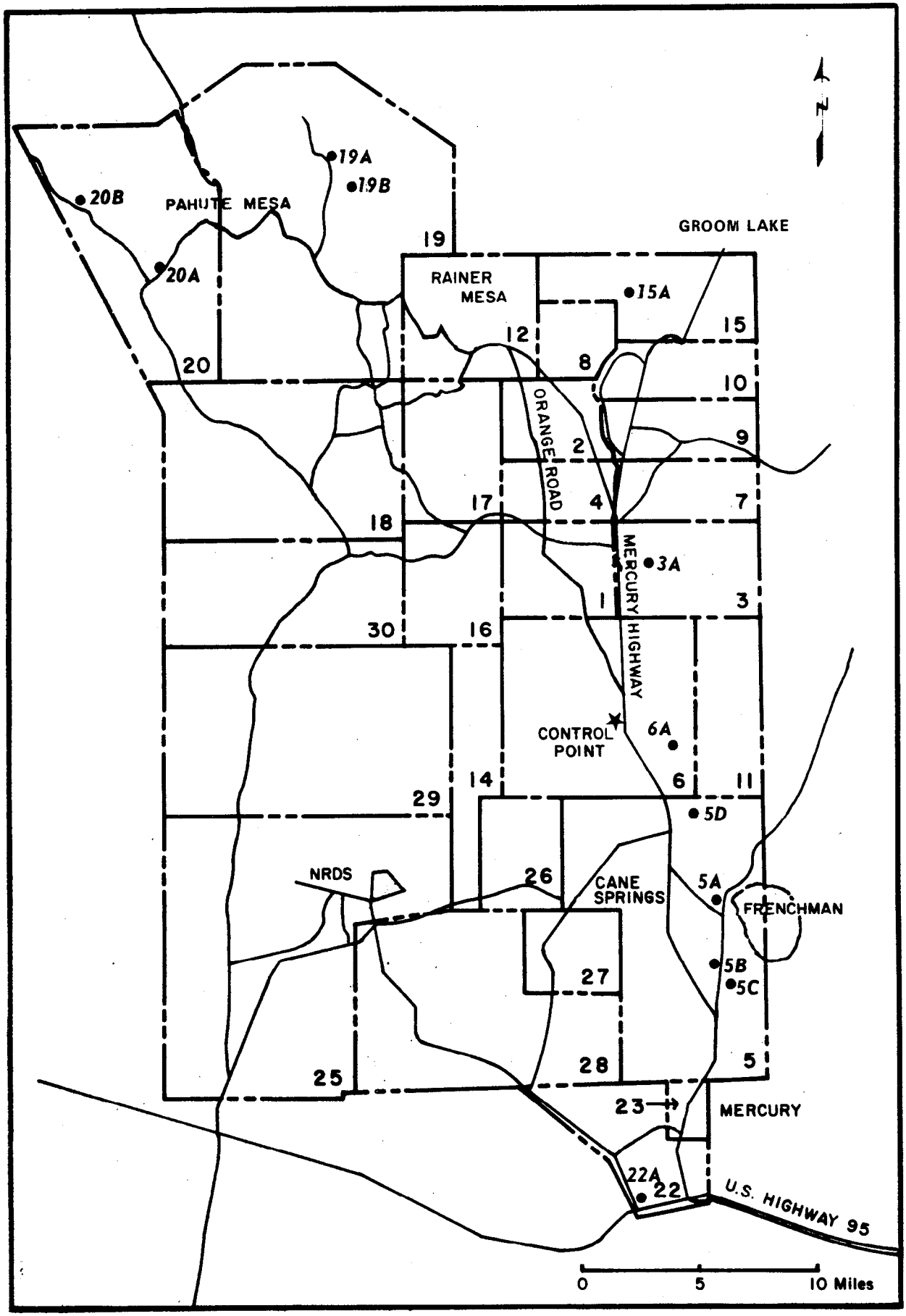

Figure 13. NTS Environmental Surveillance Supply Wells Sampling Locations.

TABLE 13

ENVIRONMENTAL SURVEILLANCE
SUPPLY WELLS SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATIONS	MAP CODE FOR FIGURE 13
3	Well A	3A
5	Well 5A	5A
	Well 5B	5B
	Well 5C	5C
	Well Ue5C	5D
6	Well C1	6A
15	Well Ue15d	15A
19	Well Ue19GS	19A
	Well Ue19E	19B
20	Well U20A	20A
	Well U20J	20B
22	Army Well #1	22A
Groom Lake	Well 3	
	Well 4	

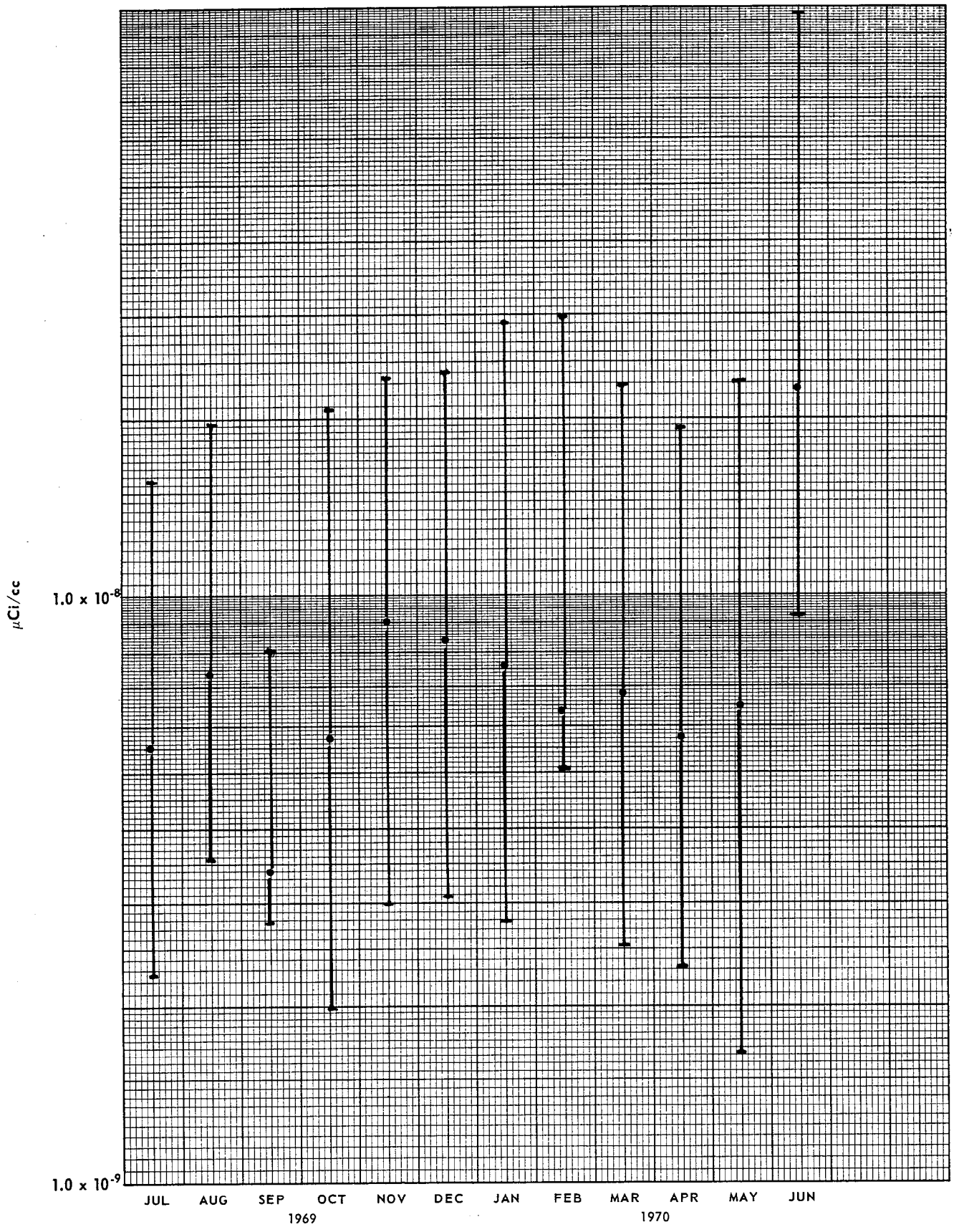

Figure 14 Monthly Means and Ranges of Gross Beta Radioactivity in Supply Well Samples from July, 1969 through June, 1970.

TABLE 14

Monthly Means and Ranges of Gross Beta Radioactivity in NTS Environmental Supply Wells Water Samples from July 1969 through June 1970

Values in Terms of μCi/cc

DATE	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
July 1969	12	5.53×10^{-9}	2.28×10^{-9}	1.57×10^{-8}
August 1969	14	7.38×10^{-9}	3.60×10^{-9}	1.95×10^{-8}
September 1969	14	3.39×10^{-9}	2.80×10^{-9}	8.01×10^{-9}
October 1969	13	5.68×10^{-9}	2.00×10^{-9}	2.08×10^{-8}
November 1969	13	9.05×10^{-9}	2.98×10^{-9}	2.36×10^{-8}
December 1969	12	8.46×10^{-9}	3.10×10^{-9}	2.41×10^{-8}
January 1970	13	7.67×10^{-9}	2.80×10^{-9}	2.92×10^{-8}
February 1970	11	6.37×10^{-9}	5.10×10^{-9}	2.95×10^{-8}
March 1970	11	6.86×10^{-9}	2.55×10^{-9}	2.27×10^{-8}
April 1970	11	5.78×10^{-9}	2.39×10^{-9}	1.94×10^{-8}
May 1970	13	6.54×10^{-9}	1.67×10^{-9}	2.31×10^{-8}
June 1970	12	2.29×10^{-8}	9.26×10^{-9}	9.80×10^{-8}

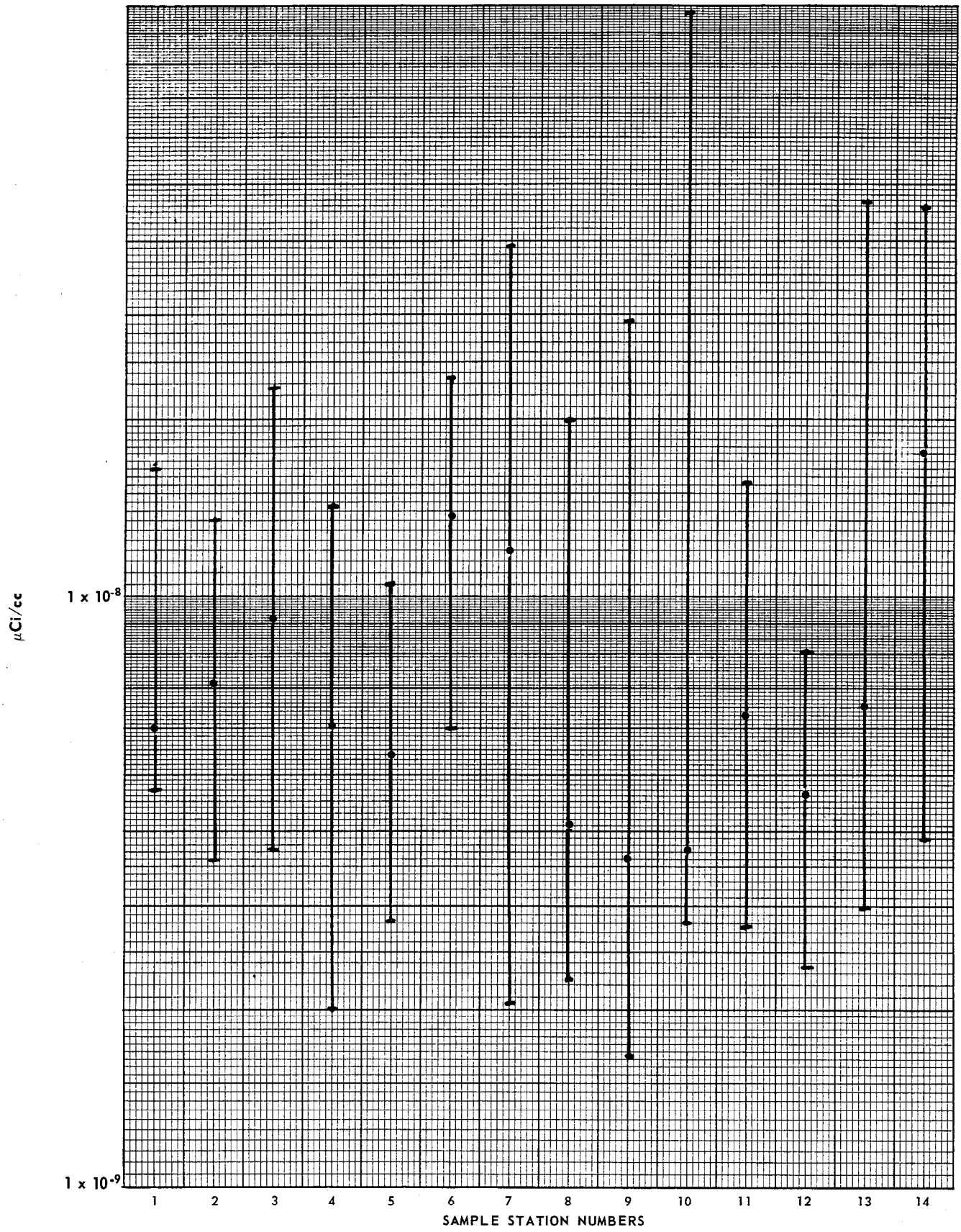

Figure 15 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Supply Well Sampling Locations from July, 1969 through June, 1970.

TABLE 15

Means and Ranges of Gross Beta Radioactivity at NTS Supply Wells Water Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc				
STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 3 Well A	12	6.02×10^{-9}	4.71×10^{-9}	1.66×10^{-8}
2. Area 5 Well 5A	12	7.14×10^{-9}	3.54×10^{-9}	1.36×10^{-8}
3. Area 5 Well 5B	12	9.23×10^{-9}	3.75×10^{-9}	2.29×10^{-8}
4. Area 5 Well 5C	9	6.03×10^{-9}	2.00×10^{-9}	1.44×10^{-8}
5. Area 5 Well Ue5c	10	5.45×10^{-9}	2.85×10^{-9}	1.05×10^{-8}
6. Area 6 Well C1	12	1.39×10^{-8}	5.98×10^{-9}	2.36×10^{-8}
7. Area 15 Well Uei5d	11	1.20×10^{-8}	2.05×10^{-9}	3.94×10^{-8}
8. Area 19 Well Uel9gr	12	4.15×10^{-9}	2.28×10^{-9}	2.00×10^{-8}
9. Area 19 Well Uel9e	11	3.62×10^{-9}	1.67×10^{-9}	2.93×10^{-8}
10. Area 20 Well U20a	8	3.78×10^{-9}	2.80×10^{-9}	9.80×10^{-8}
11. Area 20 Well U20j	5	6.39×10^{-9}	2.79×10^{-9}	1.56×10^{-8}
12. Area 22 Army Well 1	11	4.65×10^{-9}	2.36×10^{-9}	8.09×10^{-9}
13. Groom Lake Well 3	12	6.50×10^{-9}	2.98×10^{-9}	4.71×10^{-8}
14. Groom Lake Well 4	12	1.78×10^{-8}	3.88×10^{-9}	4.54×10^{-8}

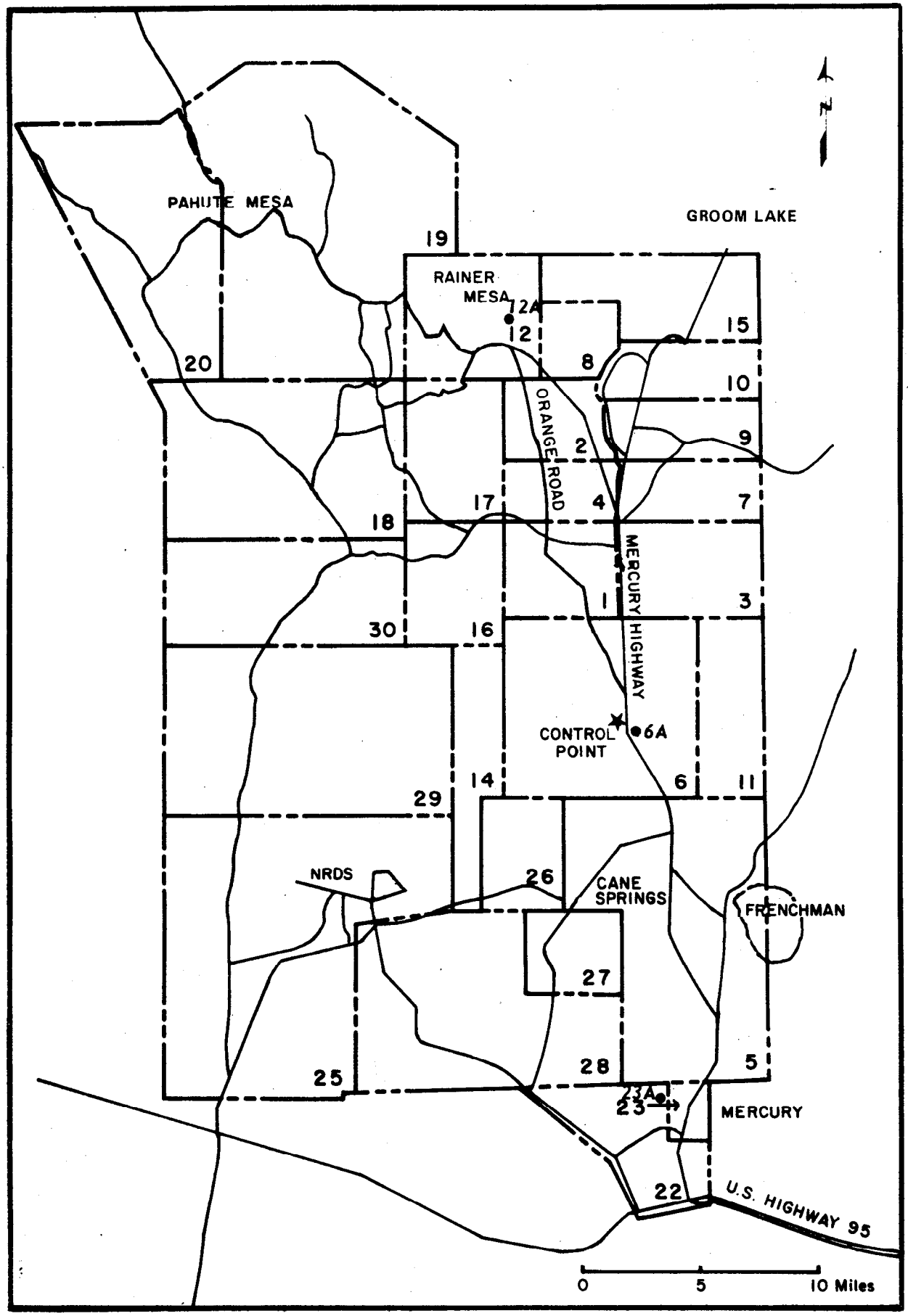

Figure 16 NTS Environmental Surveillance Final Effluent Pond Sampling Locations.

TABLE 16

ENVIRONMENTAL SURVEILLANCE
FINAL EFFLUENT SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 16
6	Final Effluent Pond	6A
12	Final Effluent Pond	12A
23	Final Effluent Pond	27A
Groom Lake	Pond	

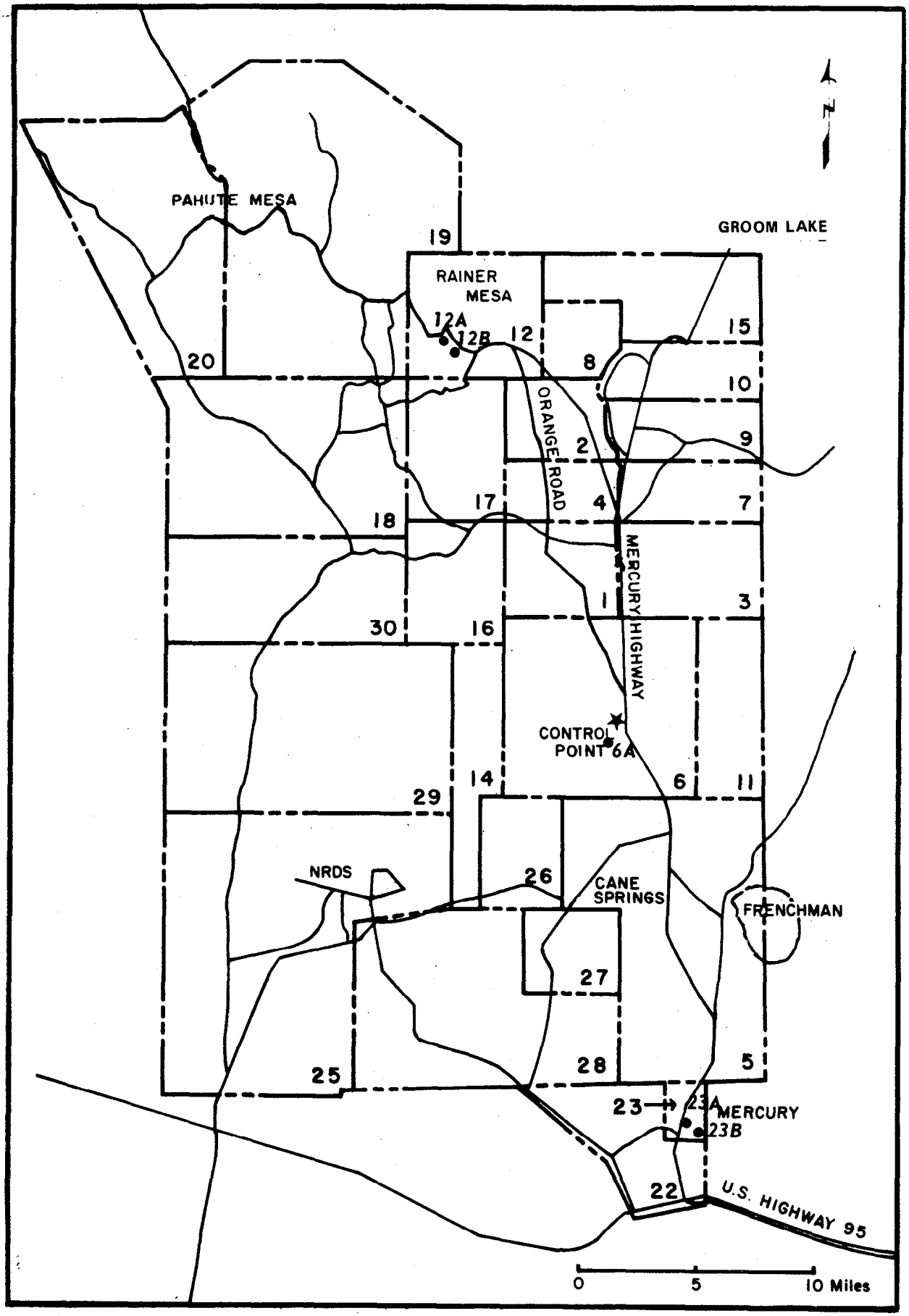

Figure 17 NTS Environmental Surveillance Miscellaneous Water Sampling Locations.

TABLE 17

ENVIRONMENTAL SURVEILLANCE
MISCELLANEOUS WATER SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 16
6	CP-2 Waste Pond	6A
12	Upper Haines Lake	12A
	Lower Haines Lake	12B
23	Swimming Pool	23A
	H&S Sump	23B
Groom Lake	Station 2	
	Station 3	

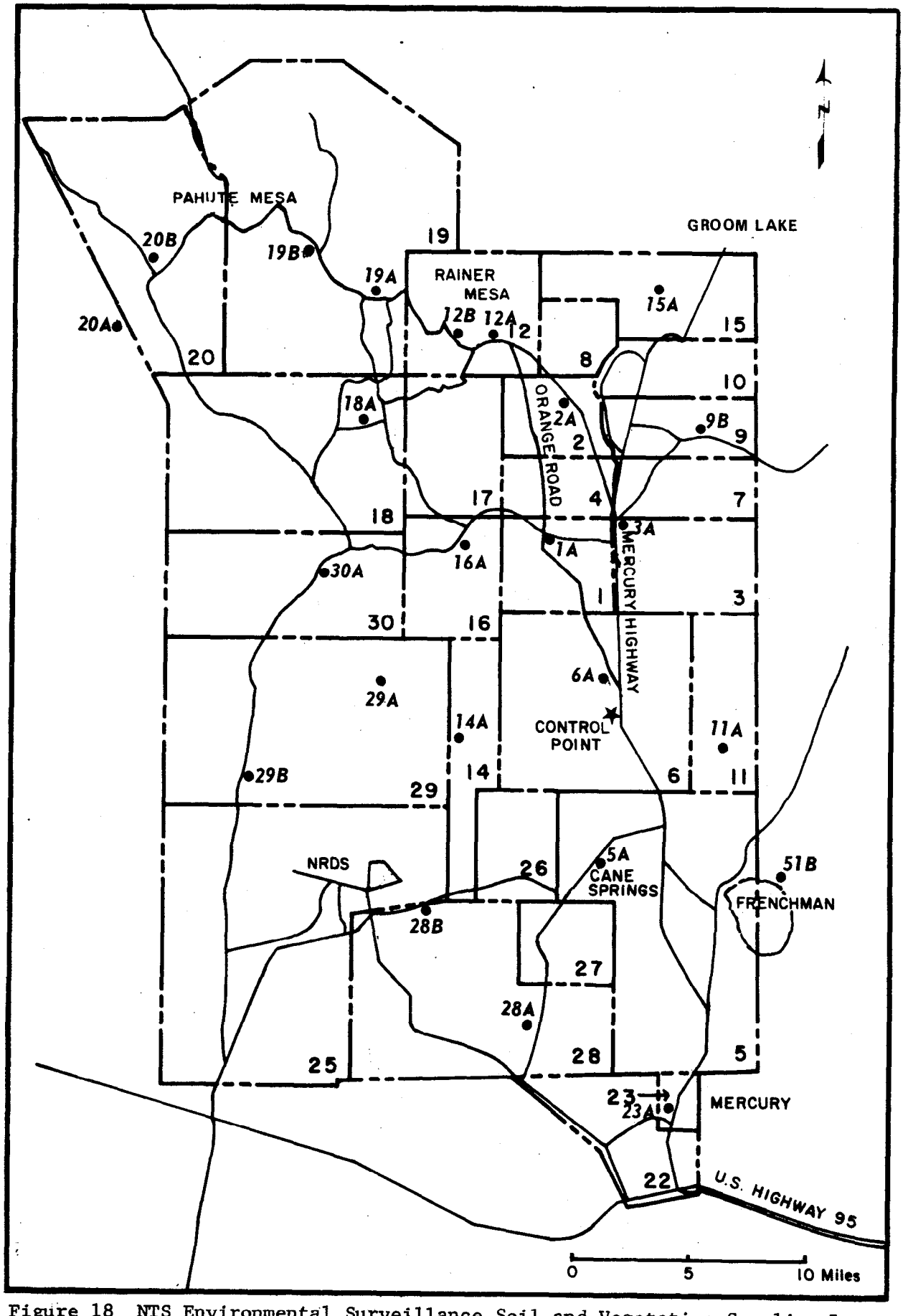

Figure 18 NTS Environmental Surveillance Soil and Vegetation Sampling Locations.

TABLE 18

Ranges of Gross Beta Radioactivity at NTS Miscellaneous Water Sampling Station Locations from July 1969 through June 1970

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	RANGE	
	MINIMUM	MAXIMUM
1. Area 6 CP-2 Waste Pond	3.87×10^{-8}	1.37×10^{-5}
2. Area 12 Upper Haines	3.41×10^{-9}	2.20×10^{-4}
3. Area 12 Lower Haines	1.96×10^{-7}	1.85×10^{-4}
4. Area 23 Swimming Pool	1.60×10^{-9}	3.37×10^{-8}
5. Area 23, H&S Sump	8.58×10^{-9}	5.97×10^{-4}
6. Groom Lake Station 2	4.80×10^{-9}	1.41×10^{-7}
7. Groom Lake Station 3	1.73×10^{-8}	1.04×10^{-6}

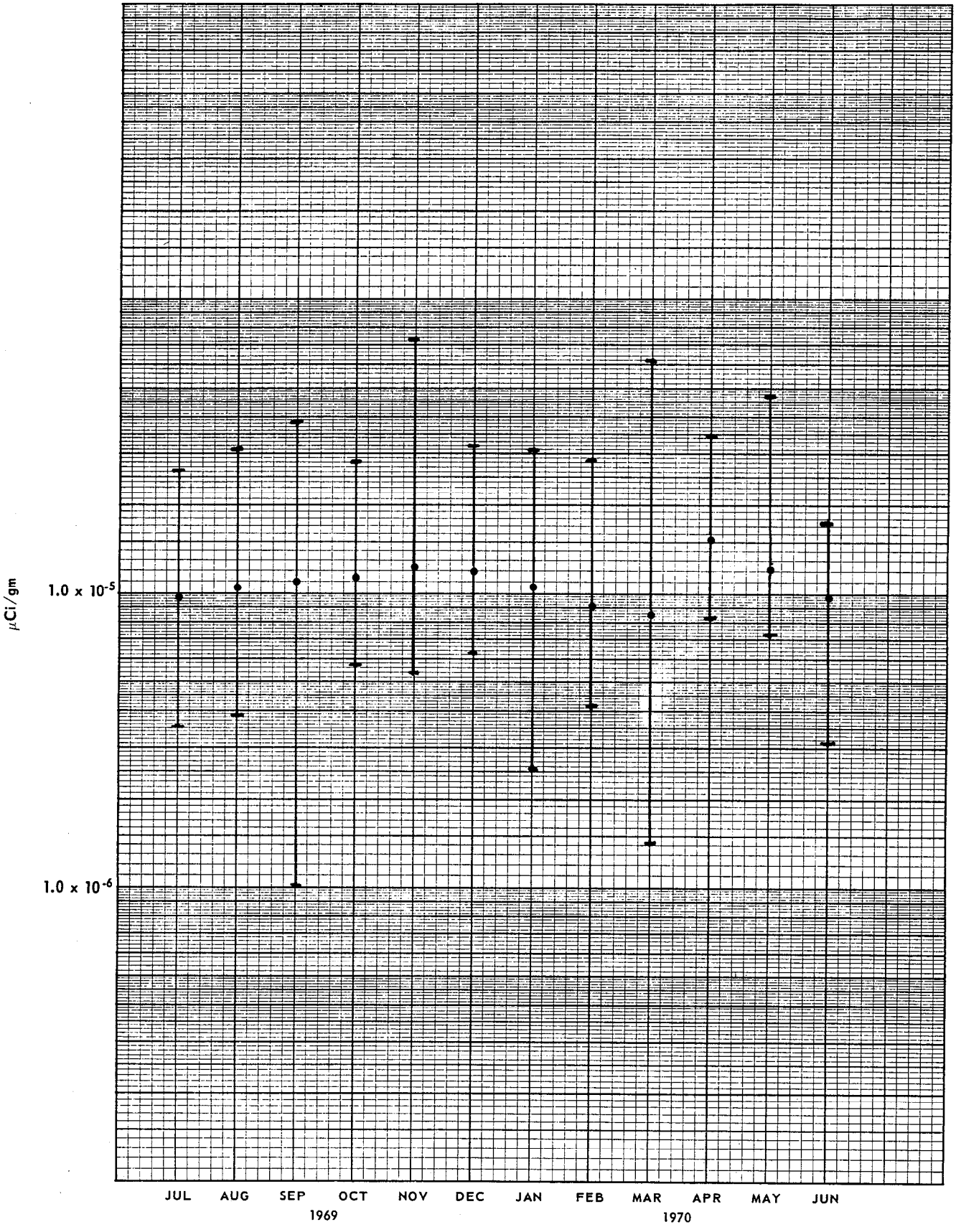

Figure 19 Monthly Means and Ranges of Gross Gamma Radioactivity in NTS Environmental Soil Samples from July, 1969 through June, 1970.

TABLE 19

ENVIRONMENTAL SURVEILLANCE
SOIL AND VEGETATION SAMPLING LOCATIONS

AREA	SAMPLE STATION LOCATIONS	SPECIES	MAP CODE FOR FIGURE 18
1	Junction of "O" and "C" Road	d	1A
2	Stake O-65/66	b	2A
3	BJY Burn Pit	a	3A
5	Cane Spring Road, Stake 9-10	d	5A
	Old Fallout Station	d	5B
6	CP Area	d	6A
9	Stake 9B-36	d	9A
11	Stake 11W-4	c	11A
12	ESSA Sta., Rainer Mesa	a	12A
	Area 12 Campsite	a	12B
14	Saddle Mountain	a	14A
15	Stake 15E-14	b	15A
16	Area 16 Campsite	a	16A
18	Stake 18B-16	a	18A
19	Stake 19F-13	a	19A
	Stake 19MN-1	a	19B
20	Stake 20L-12	a	20A
	Stake 20E-1	a	20B
23	Pistol Range Road	d	23A
28	Pan Am Stake 152	d	28A
	Project HENRE Site	d	28B
29	Shoshone Mountain	a	29A
	40 Mile Canyon	a	29B
30	Stake 30C-33/24	a	30A
	Groom Lake	c	

CODE EXPLANATION FOR SPECIES:

(a) SAGEBRUSH - Artemesia spp.
(b) BLACKBRUSH - Coleogyne ramossisima
(c) WINTERFAT - Erotia lanata
(d) CREOSOTE - Larrea divaricata

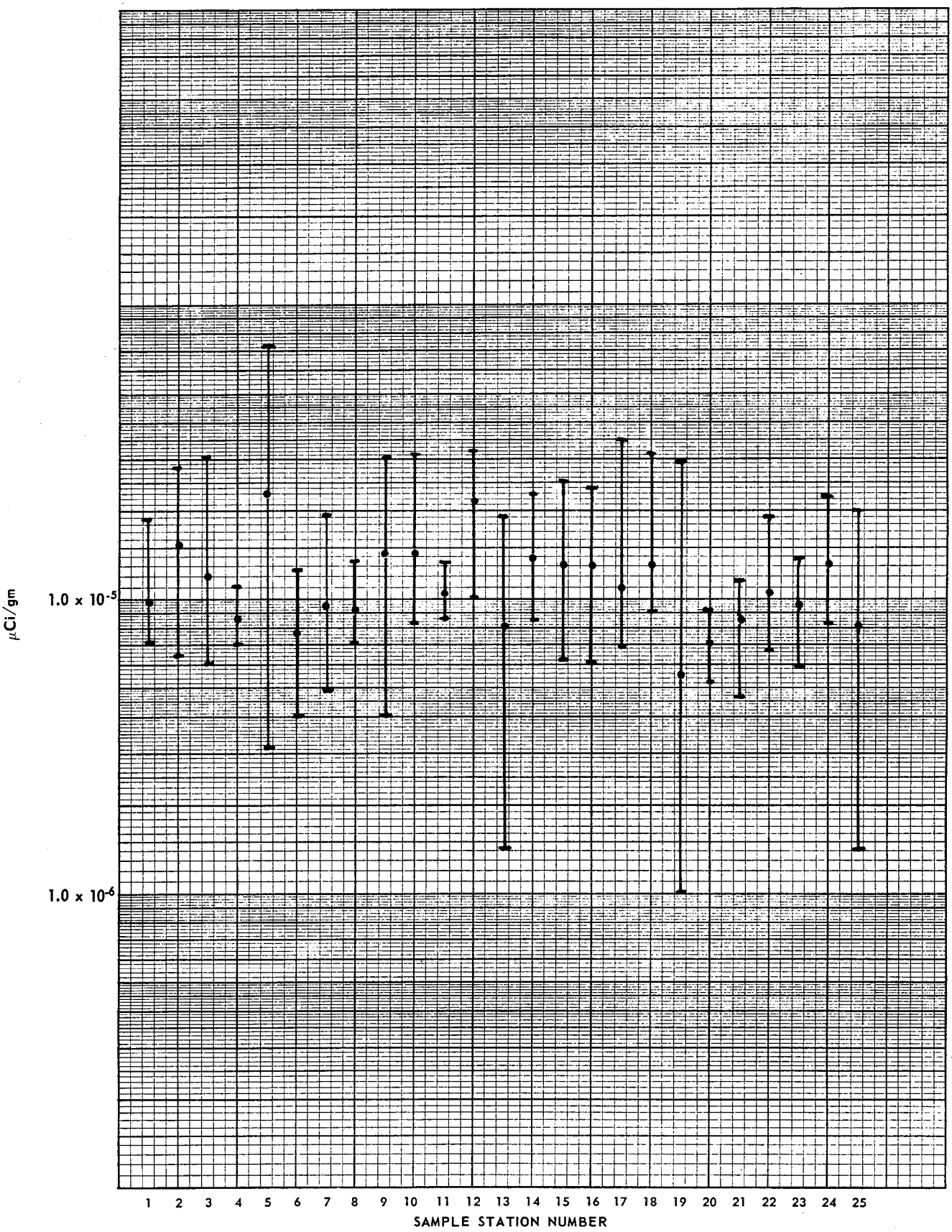

Figure 20 Means and Ranges of Gross Gamma Radioactivity at NTS Soil Sampling Locations from July, 1969 through June, 1970.

TABLE 20

Monthly Means and Ranges of Gross Gamma Radioactivity in NTS Environmental Soil Samples from July 1969 through June 1970

Values in Terms of μCi/gram

DATE	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
July 1969	24	9.81×10^{-6}	3.57×10^{-6}	2.59×10^{-5}
August 1969	24	1.06×10^{-5}	3.86×10^{-6}	3.05×10^{-5}
September 1969	25	1.10×10^{-5}	1.1×10^{-6}	3.87×10^{-5}
October 1969	24	1.15×10^{-5}	5.66×10^{-6}	2.79×10^{-5}
November 1969	24	1.28×10^{-5}	5.33×10^{-6}	7.28×10^{-5}
December 1969	24	1.20×10^{-5}	6.31×10^{-6}	3.14×10^{-5}
January 1970	24	1.07×10^{-5}	2.52×10^{-6}	3.10×10^{-5}
February 1970	23	9.04×10^{-6}	4.05×10^{-6}	2.87×10^{-5}
March 1970	25	8.75×10^{-6}	1.41×10^{-6}	6.30×10^{-5}
April 1970	25	1.53×10^{-5}	8.07×10^{-6}	3.47×10^{-5}
May 1970	24	1.21×10^{-5}	7.11×10^{-6}	4.72×10^{-5}
June 1970	19	9.90×10^{-6}	3.12×10^{-6}	1.77×10^{-5}

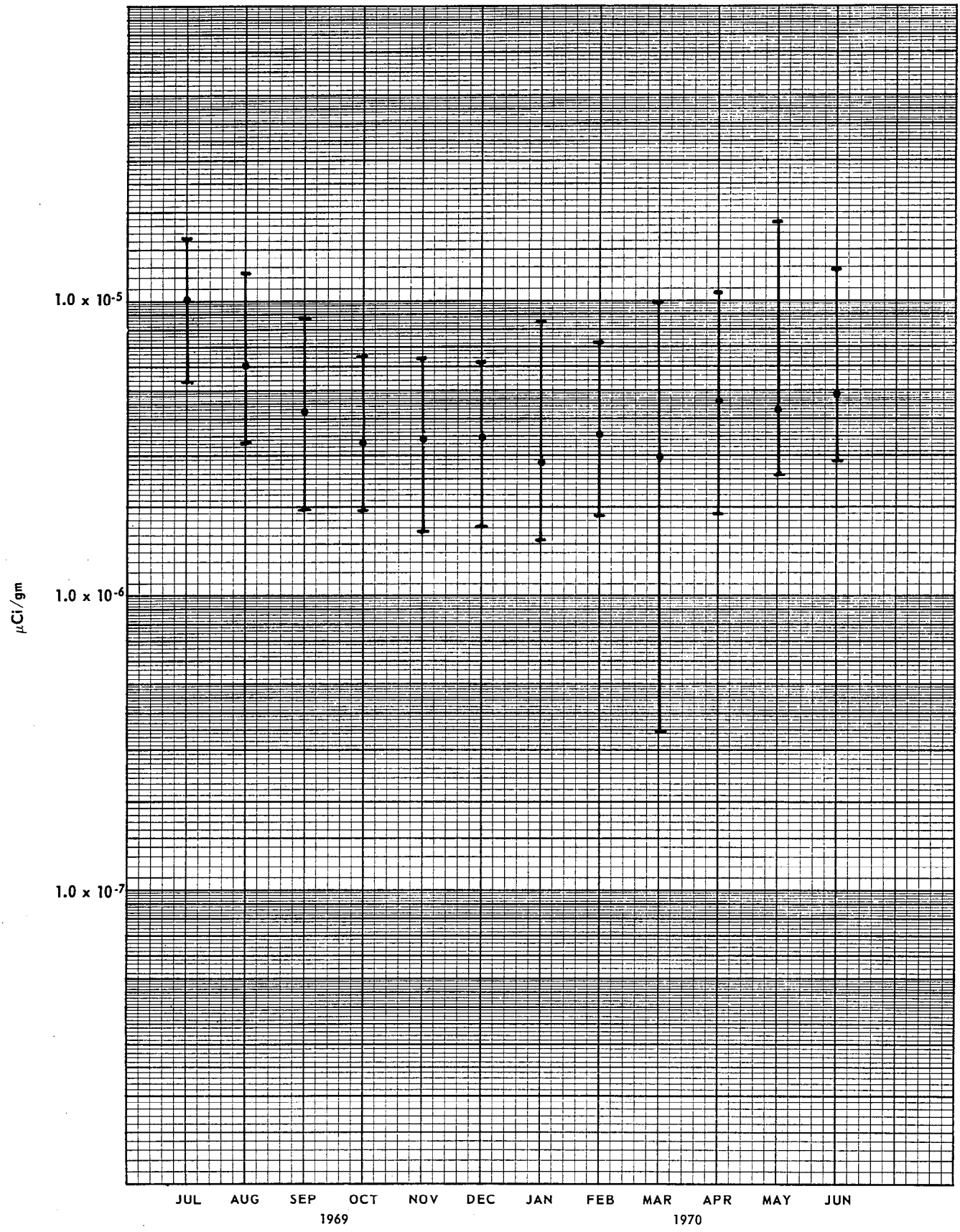

Figure 21 Monthly Means and Ranges of Gross Gamma Radioactivity in NTS Environmental Vegetation Samples from July, 1969 through June, 1970.

TABLE 21

Means and Ranges of Gross Gamma Radioactivity at NTS Soil Sampling Station Locations from July 1969 through June 1970

Values in Terms of $\mu Ci/gram$

STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 1 Jct. "O" and "C" Road	11	9.84×10^{-6}	7.18×10^{-6}	1.85×10^{-5}
2. Area 2 St. 0-65/66	11	1.52×10^{-5}	6.47×10^{-6}	2.79×10^{-5}
3. Area 3 BJY Burn Pit	12	1.19×10^{-5}	6.00×10^{-6}	3.06×10^{-5}
4. Area 5 Cane Spr. Rd. St. 9/10	12	8.70×10^{-6}	6.99×10^{-6}	1.10×10^{-5}
5. Area 5 Old Fallout St.	12	2.31×10^{-5}	3.12×10^{-6}	7.28×10^{-5}
6. Area 6 C.P. Area	12	7.82×10^{-6}	4.05×10^{-6}	1.25×10^{-5}
7. Area 9 St. 9B-36	12	9.50×10^{-6}	4.94×10^{-6}	1.92×10^{-5}
8. Area 11 St. 11W-4	12	9.21×10^{-6}	7.02×10^{-6}	1.33×10^{-5}
9. Area 12 ESSA Station Rainer Mesa	11	1.44×10^{-5}	4.14×10^{-6}	3.01×10^{-5}
10. Area 12 Campsite	12	1.45×10^{-5}	8.42×10^{-6}	3.05×10^{-5}
11. Area 14 Saddle Mtn.	12	1.04×10^{-5}	8.53×10^{-6}	1.31×10^{-5}
12. Area 15 St. 15E-14	12	2.17×10^{-5}	1.02×10^{-5}	3.14×10^{-5}
13. Area 16 Camp	11	8.10×10^{-6}	1.43×10^{-6}	1.89×10^{-5}
14. Area 18 St. 18B-16	11	1.39×10^{-5}	8.52×10^{-6}	2.27×10^{-5}
15. Area 19 St. 19F-13	10	1.31×10^{-5}	6.29×10^{-6}	2.49×10^{-5}
16. Area 19 St. 19MN-1	11	1.31×10^{-5}	6.01×10^{-6}	2.40×10^{-5}
17. Area 20 St. 20L-12	10	1.11×10^{-5}	6.93×10^{-6}	3.47×10^{-5}
18. Area 20 St. 20E-1	11	1.31×10^{-5}	9.02×10^{-6}	3.15×10^{-5}
19. Area 23 Pistol Range Rd.	12	5.57×10^{-6}	1.01×10^{-6}	2.93×10^{-5}
20. Area 28 Pam Am St. 152	12	7.07×10^{-6}	5.33×10^{-6}	9.06×10^{-6}
21. Area 28 HENRE Site	12	8.64×10^{-6}	4.67×10^{-6}	1.16×10^{-5}
22. Area 29 Shoshone Mtn.	11	1.06×10^{-5}	6.80×10^{-6}	1.88×10^{-5}
23. Area 29 40 Mile Canyon	9	9.65×10^{-6}	5.95×10^{-6}	1.37×10^{-5}
24. Area 30 St. 30C-33/34	12	1.35×10^{-5}	8.39×10^{-6}	2.23×10^{-5}
25. Groom Lake	12	8.07×10^{-6}	1.41×10^{-6}	1.99×10^{-5}

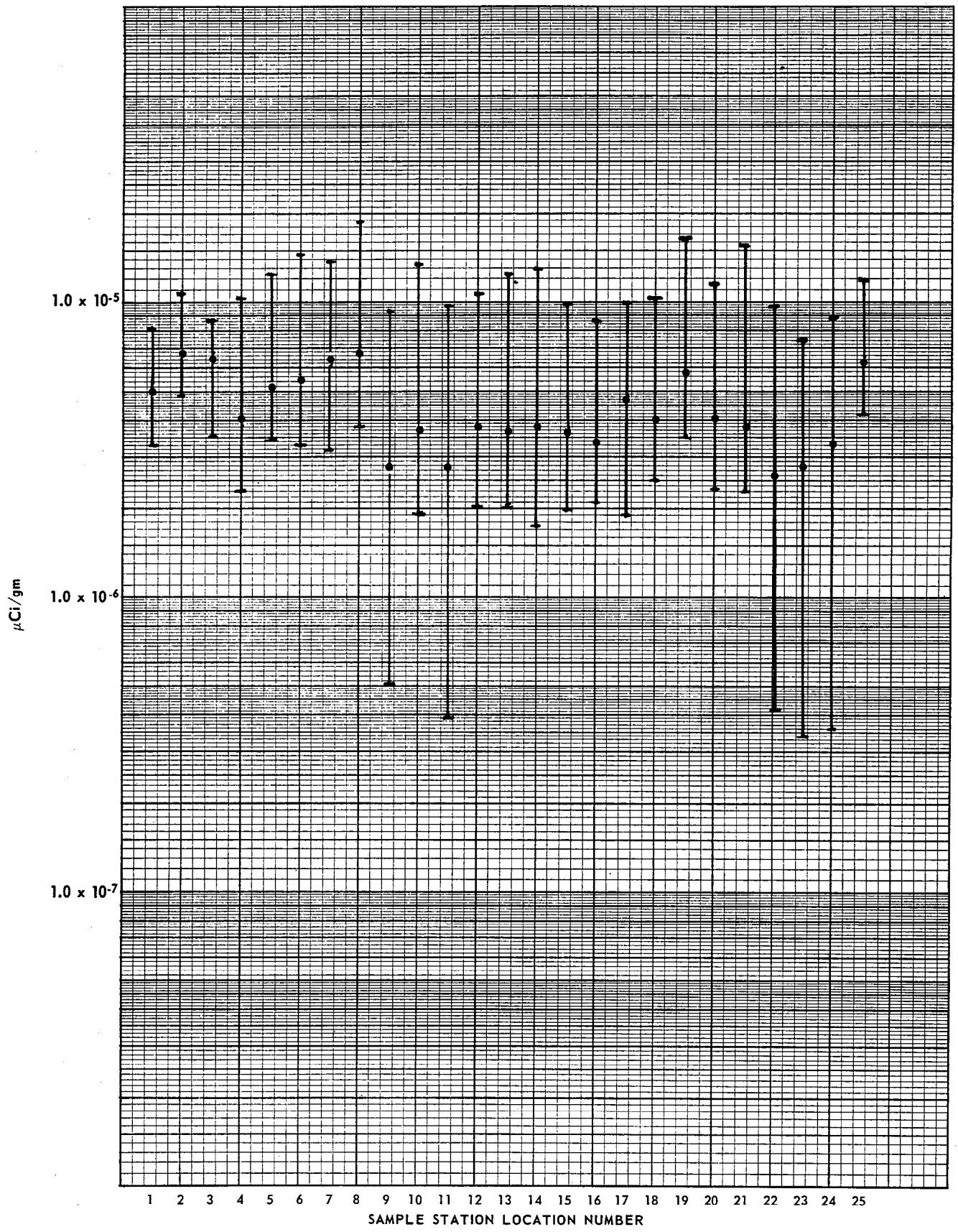

Figure 22 Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July, 1969 through June, 1970.

TABLE 22

Monthly Means and Ranges of Gross Gamma Radioactivity in NTS Environmental Vegetation Samples from July 1969 through June 1970

Values in Terms of μCi/gram				
			RANGE	
DATE	TOTAL NO. OF SAMPLES	MEAN	MINIMUM	MAXIMUM
July 1969	25	1.02×10^{-5}	5.40×10^{-6}	1.62×10^{-5}
August 1969	25	6.12×10^{-6}	3.32×10^{-6}	1.23×10^{-5}
September 1969	20	4.33×10^{-6}	1.89×10^{-6}	8.77×10^{-6}
October 1969	25	3.37×10^{-6}	1.97×10^{-6}	6.45×10^{-6}
November 1969	24	3.42×10^{-6}	1.66×10^{-6}	6.27×10^{-6}
December 1969	25	3.50×10^{-6}	1.70×10^{-6}	6.11×10^{-6}
January 1970	25	2.87×10^{-6}	1.54×10^{-6}	8.43×10^{-6}
February 1970	24	3.52×10^{-6}	1.89×10^{-6}	7.15×10^{-6}
March 1970	25	2.97×10^{-6}	3.42×10^{-7}	9.84×10^{-6}
April 1970	25	4.66×10^{-6}	1.90×10^{-6}	1.06×10^{-5}
May 1970	16	4.32×10^{-6}	2.56×10^{-6}	1.88×10^{-5}
June 1970	13	4.82×10^{-6}	2.87×10^{-6}	1.28×10^{-5}

TABLE 23

Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July 1969 through June 1970

Values in Terms of μCi/gram

STATION NUMBER AND LOCATION	TOTAL NO. OF SAMPLES	MEAN	RANGE	
			MINIMUM	MAXIMUM
1. Area 1 Jct. "O" and "C" Road	10	4.95×10^{-6}	3.27×10^{-6}	8.07×10^{-6}
2. Area 2 St. O-65/66	11	6.81×10^{-6}	4.92×10^{-6}	1.04×10^{-5}
3. Area 3 BJY Burn Pit	10	6.42×10^{-6}	3.52×10^{-6}	8.56×10^{-6}
4. Area 5 Cane Spr. Rd. St. 9/10	11	4.03×10^{-6}	2.28×10^{-6}	1.03×10^{-5}
5. Area 5 Old Fallout St.	12	5.20×10^{-6}	3.47×10^{-6}	1.24×10^{-5}
6. Area 6 C.P. Area	10	5.44×10^{-6}	3.28×10^{-6}	1.47×10^{-5}
7. Area 9 St. 9B-36	11	6.22×10^{-6}	3.17×10^{-6}	1.38×10^{-5}
8. Area 11 St. 11W-4	10	6.80×10^{-6}	3.78×10^{-6}	1.88×10^{-5}
9. Area 12 ESSA Station Rainer Mesa	11	2.82×10^{-6}	5.08×10^{-7}	9.27×10^{-6}
10. Area 12 Campsite	12	3.76×10^{-6}	1.89×10^{-6}	1.36×10^{-5}
11. Area 14 Saddle Mtn.	11	2.74×10^{-6}	3.91×10^{-7}	9.83×10^{-6}
12. Area 15 St. 15E-14	12	3.81×10^{-6}	2.04×10^{-6}	1.06×10^{-5}
13. Area 16 Camp	11	3.73×10^{-6}	2.04×10^{-6}	1.23×10^{-5}
14. Area 18 St. 18B-16	10	3.80×10^{-6}	1.76×10^{-6}	1.30×10^{-5}
15. Area 19 St. 19F-13	10	3.64×10^{-6}	1.98×10^{-6}	9.84×10^{-6}
16. Area 19 St. 19MN-1	11	3.38×10^{-6}	2.09×10^{-6}	8.73×10^{-6}
17. Area 20 St. 20L-12	10	4.74×10^{-6}	1.90×10^{-6}	9.86×10^{-6}
18. Area 20 St. 20E-1	10	4.00×10^{-6}	2.49×10^{-6}	1.02×10^{-5}
19. Area 23 Pistol Range Rd.	12	5.34×10^{-6}	3.52×10^{-6}	1.62×10^{-5}
20. Area 28 Pan Am St. 152	11	4.13×10^{-6}	2.34×10^{-6}	1.13×10^{-5}
21. Area 28 HENRE Site	11	3.79×10^{-6}	2.33×10^{-6}	1.54×10^{-5}
22. Area 29 Shoshone Mtn.	11	2.58×10^{-6}	4.18×10^{-7}	9.86×10^{-6}
23. Area 29 40 Mile Canyon	12	2.83×10^{-6}	3.45×10^{-7}	7.33×10^{-6}
24. Area 30 St. 30C-33/34	10	3.34×10^{-6}	3.60×10^{-7}	8.91×10^{-6}
25. Groom Lake	12	6.32×10^{-6}	4.23×10^{-6}	1.28×10^{-5}

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