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ENVIRONMENTAL MONITORING

Annual Report

-1959-

I Purpose of Report

The Environmental Monitoring Program at Atomics International is directed to the sampling and radioanalysis of soil, vegetation, air, and water from areas proximal to company facilities. The purpose of this report is to present data concerning radioactivity concentrations detected in the environment during 1959 and supersedes the report for January to June 1959[1]. Meteorological data obtained at the SRE Weather Station are compiled and presented to illustrate the weather conditions of the reactor site. Collateral functions of the Environmental Monitoring Program are discussed in regard to support of Operational Health Physics Programs.

II Environmental Monitoring Program and Summary of Results

Environmental radioactivity detected in soil, vegetation, air, and water samples during 1959 are generally commensurate with activity levels monitored since 1956 when the environmental monitoring program was initiated in the San Fernando Valley and Santa Susana areas by Atomics International. Extensive environmental radioactivity data has been accumulated since the program began. A base line activity level for the area concerned has been delineated from frequent surveys. Some deviation occurred in the first quarter of the year, however, presumably as a result of nuclear testing in Nevada in the fall of 1958 (Figure I).

Diversified operations carried out at Santa Susana and at Valley facilities present environmental monitoring problems unique to each location.

A. Soil and Vegetation Radioactivity Concentrations

1. A notable activity increase in February is apparant primarily in vegetation Beta activity presumably as a result of nuclear device testing in Nevada. Included therein were nineteen full scale shots including ten balloon, five tower, and four tunnel explosions[2]. Local

airborne radioactivity concentrations immediately increased to 3.0×10^{-10} uc/cc B- γ. Vegetation samples did not reflect a significant activity increase until February 1959 following intermittent rainfall of nearly two inches in six days as measured at the SRE Weather Station. (Figure XI

Radioactivity in rainwater samples collected throughout the year averaged 10^{-7} uc/cc B- γ. Subsequent to February, environmental activity levels have decreased and stabilized due to decay, deposition, and dispersal in the atmosphere (Figure I).

2. Vegetation Beta-Gamma activity in February attained a maximum average of 9.4×10^{-7} uc/gm at Santa Susana as compared with a gross average of 3.8×10^{-7} uc/gm for all other vegetation samples collected for the month (Figures I and II).

Radioanalysis by Beta absorption and Gamma spectrum analysis of one vegetation sample demonstrating 7100 d/m/gm B- γ indicated short lived fission products as the prime activity contributor including Nb^{97}-Ru^{97}, and Na^{24}. This sample was taken at Station One, Santa Susana. Subsequent decrease in activities as characterized by the succeeding monthly gross average activity levels further indicate the presence of short lived isotopes at the time.

3. Beta-Gamma activity in vegetation represents an excellent reference for monitoring environmental activity fluctuations and concentration levels. Plant metabolism of mineral nutrients, air, and water will concentrate radionuclides in the plant system, and reproducibility of vegetation beta activity data is furthered by higher Beta count rates (compared to Alpha), and by securing similar plant types from each sampling station.

Alpha activity data, while not representing absolute values do afford an indication of variances of Alpha activity in the environment. Soil generally demonstrates more Alpha activity per unit volume than does vegetation. The extended time periods required for Alpha counting precludes a large number of recorded counts thereby affecting the statistical reliability of Alpha activity determinations.

4. Environmental soil and vegetation samples are collected monthly in five survey areas. A total of 980 soil and vegetation samples were collected from the following

areas in 1959 (Figures II - VI):

(a)	Santa Susana	- 14 Stations
(b)	Canoga Park	- 9 Stations
(c)	Simi Valley	- 7 Stations
(d)	Russell Valley	- 6 Stations
(e)	DeSoto Facility Area	- 5 Stations (Established February)
(f)	Van Nuys	- 6 Stations (Deleted February)

Vegetation samples are usually comprised of young green plants, preferably those common throughout the area concerned to permit repetitive sampling when possible. Soil samples represent the upper one half inch layer of the ground surface. Occasional alluvial soil samples are taken from stream beds and rivulets to indicate possible water transport of radionuclides.

B. Environmental Air Sampling

1. Air sampling for long lived beta emitters is carried out at each valley facility and at the Santa Susana site by automatic air monitors. Three of these monitors operate on a twenty-four hour step cycle, collecting an air sample while concurrently counting the previous sample for Beta activity. The fourth air monitor (Vanowen), operates on a four hour cycle to afford more rapid detection of airborne activity increases.

   Portable air monitoring equipment is maintained for special or emergency use. Calibration instrumentation has been acquired to permit air monitor and vacuum pump calibration in the field obviating the return of the equipment to the laboratory for service.

2. Airborne activity levels immediately subsequent to the nuclear device test series in Nevada (Fall 1958), increased to approximately 3.0×10^{-10} uc/cc B-γ at Vanowen and Van Nuys, and later stabilized and decreased to current levels of 1×10^{-13} to 1×10^{-12} uc/cc B-γ. These activities represent the long lived activity contributions, as the samples are allowed a twenty-four hour decay period prior to analysis to exclude naturally occurring short lived isotopes.

The four hour monitor (Vanowen), intermittently detected long lived fission product debris well into 1959. The effect of the inversion layer over the valley basin produces a daily fluctuation in airborne radioactivity concentrations. In general, airborne radioactivity levels at Santa Susana are lower then in the valley basin due to weaker inversion layer effects at the altitude. (~1900 ft. A.S.L.).

C. Water Monitoring

Water samples obtained at Vanowen and DeSoto include tap water, chemical sewer effluent, rainwater, and liquid radioactive waste. External samples submitted for analysis include sea water, special process solutions, plus a monthly sample from the Rocketdyne Field Propulsion Laboratory radioanalyzed in compliance with State Water Pollution Control Board directives (3).

1. Sea water samples obtained from the radioactive waste disposal area lying westerly of the Santa Barbara Channel Islands during three disposal operations in 1959 were radioanalyzed for mixed fission product and uranium concentrations. Analysis of background, pre-operational, and post-operational samples indicated no contamination of the disposal area due to Atomics International waste disposal operations.

2. Vanowen chemical effluent clarifier samples are obtained daily by means of an automatic sampler taking a one minute sample at hourly intervals during the day. The samples are analyzed for gross Alpha and Beta-Gamma activity. Clarifier sample activity levels are generally less than 10^{-7} uc/cc B-γ, however, rapid increases above this level have been observed although short in duration (Figure X).

3. Radioanalysis of liquid waste from DeSoto and Santa Susana Holdup Tanks are made for disposal purposes. Liquid radioactive waste released to the public sewage system must be within the limits prescribed by Title 10, Code of Federal Regulations, Part 20 (10CFR20).

   DeSoto Building #001 has two 1500 gallon holdup tank for waste water retention. Aliquot samples are obtained for radioanalysis when the tanks are full to ensure compliance with 10 CFR 20.

For the period from 23 July to 31 December the average concentration released to the sewage system was 8.7×10^{-7} uc/cc B- γ, representing approximately 70,000 gallons of liquid waste.

4. Tap water samples are obtained at Vanowen to monitor the radioactivity concentrations in the facility water supply. The average concentration of Beta-Gamma activity in Vanowen tap water is 4.0×10^{-7} uc/cc.

5. Rain water samples are collected at Vanowen and at the SRE Weather Station when possible. During 1959, eleven rain water samples were radioanalyzed for Beta-Gamma activity. The maximum concentration detected during the year was 4.8×10^{-7} uc/cc B- β in a February sample. The nuclear test program in Nevada was the probable contributor to this activity.

6. Water samples obtained monthly at Santa Susana include the following areas, Station 2, Run Off Sump, and the Edison Cooling Tower, all of which are near the SRE.; Station 7, LTB; Station 6, Rocketdyne PFL; and Station 11, Burro Flats (Figures VII, VIII and IX).

III Meteorology

Meteorological instrumentation maintained at the SRE Weather Station by the Health Physics Department includes a wind velocity and direction recorder plus temperature, humidity, and rainfall recorders. Compilation of data from instrument charts is done monthly and includes composite wind rose, maximum and minimum temperatures, and rainfall when applicable.

1. The predominance of North and North-Westerly winds at the SRE site is apparent, however, the immediate topography of the reactor site will produce gusts and eddy currents. The Aerovane transmitter is situated 150 ft above the reactor floor, and does not necessarily reflect wind conditions at the reactor level.

2. A composite wind rose representing all Aerovane data taken in 1959 is presented in Figure XII, and quarterly composite wind roses are presented in Figures 13, 14, 15, 16. A graph of the average daily temperatures and precipitation is presented in Figure XI .

IV Special Studies and Collateral Programs

In support of operational Health Physics programs, specialized environmental surveys are conducted, and surveillance of

building process and exhaust ventilation, and stack exhaust monitoring is done.

1. Two special environmental surveys of the Santa Susana area were performed in 1959. A survey of the area around the SRE site was performed on 5 June at 10:00 a.m. Ten sampling stations were established around the reactor, with the majority lying westward in consideration of easterly wind conditions prevalent at the time. Comparison of data obtained is this survey with data of the routine area survey indicated no localized contamination of the environs of the SRE.

   A special survey of the Building #353 area was also made on 27 February. Ten sampling points were established around the building. Activity levels were commensurate with the routine survey with no localized activity apparent.

2. Building and local process exhaust ventilation systems are designed to provide radiological contaminant control. Ventilation checks are made at glove boxes, fume hoods, local exhaust duct drops, enclosed machinery and equipment, and general room air changes. Measurement of air flows and face velocities is carried out to ensure adequate contaminant control and radiological safety for operating personnel.

V Recommendations

Stringent regulations pertaining to releases of radioactivity in plant effluent and other media are being proposed by local and other regulatory agencies. This will necessitate a more comprehensive environmental monitoring program, particularly in the areas of plant exhaust air and liquid waste monitoring.*

Re-orientation and re-evaluation of the environmental monitoring program and objectives has been made in view of these increased responsibilities as follows:

1. Collection and radioanalysis of routine environmental soil and vegetation samples should remain essentially the same in scope and frequency, however, more emphasis in monitoring areas closer to company facilities should be considered.

* Reference 4 and 5

2. Incorporate at the Headquarters facilities a comprehensive meteorological monitoring program to provide data for weather orientation of routine and emergency procedures:

   (a) prediction of stack release behavior
   (b) correllation with data from the SRE weather station

3. Institute a routine program of continual measurement and evaluation of building and local exhaust ventilation in process and laboratory areas to ensure operating personnel of adequate radiological health protection. Monitoring this exhaust for radioactivity at each point of loss control should be an integral part of the Health Physics program.

The re-alignment of the environmental monitoring program as outlined will maintain surveillance of general environmental activity levels, and yet provide the monitoring support necessary to ensure that compliance with applicable codes and regulations will be fulfilled.

REFERENCES

(1) TDR #4399 by J. D. Moore, titled "Environmental Monitoring: 1 January to 30 June 1959

(2) Private communication between G. Dennis, Information Assistant, Office of Information, USAEC, and A. P. Bradley, Library Supervisor, Atomics International

(3) Atomics International Responsibility for Waste Pollution Control, Bulletin No. 13, Section VI, Plant Engineering Manual

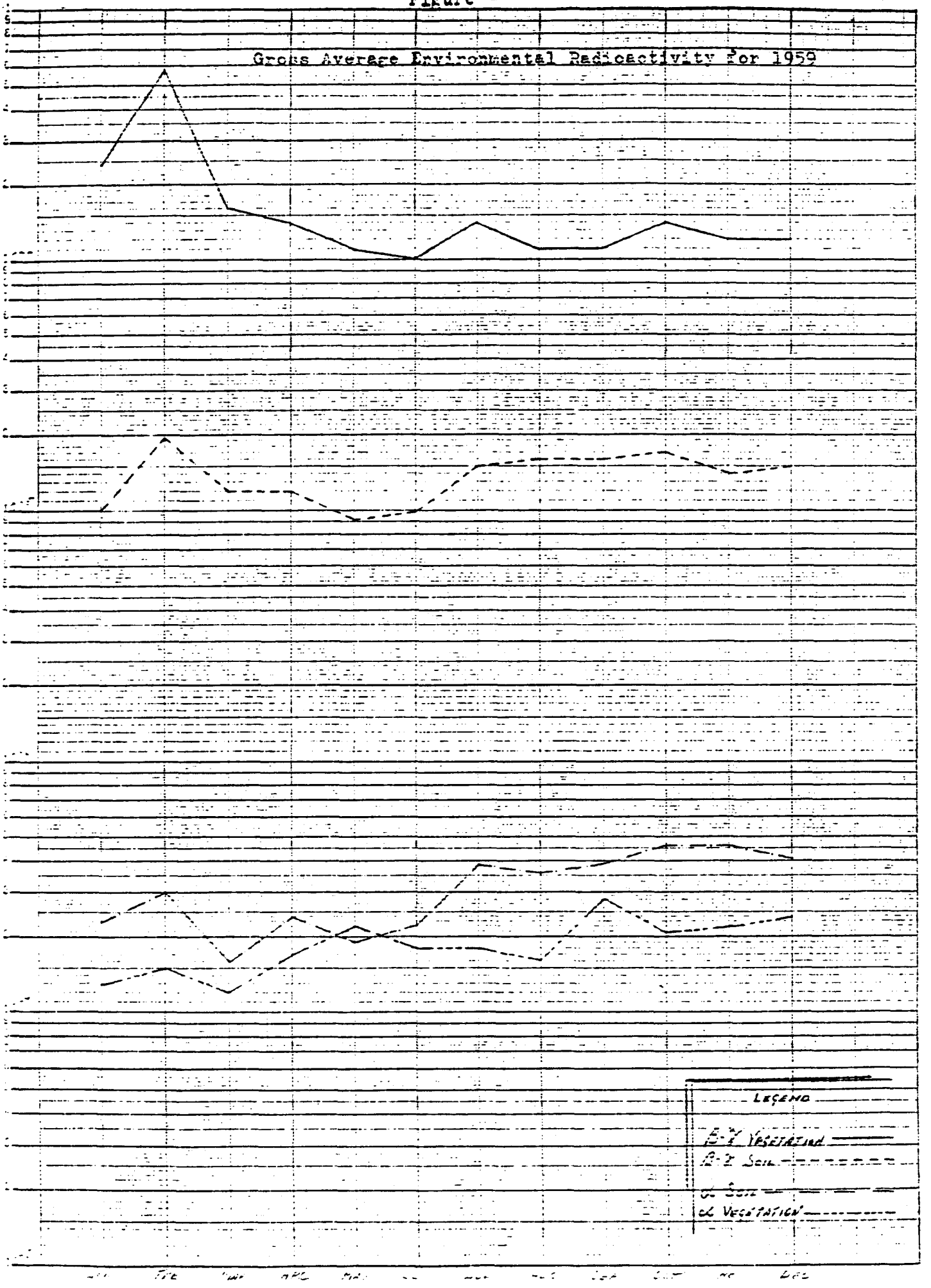
(4) National Bureau of Standards Handbook 69

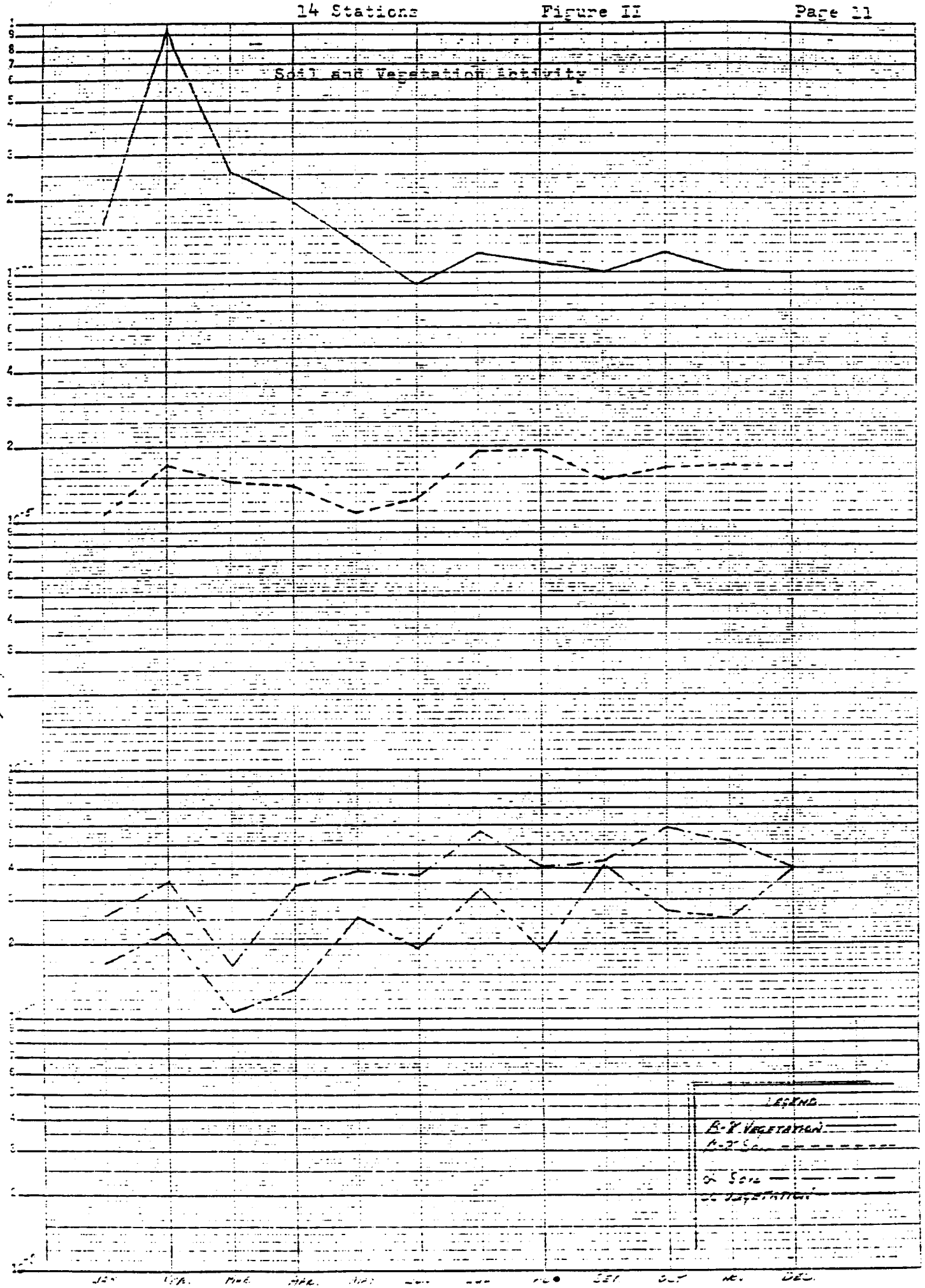
(5) Air Pollution Control District - Rules and Regulations, Chapter 2, Division 20, Health and Safety Code of the State of California

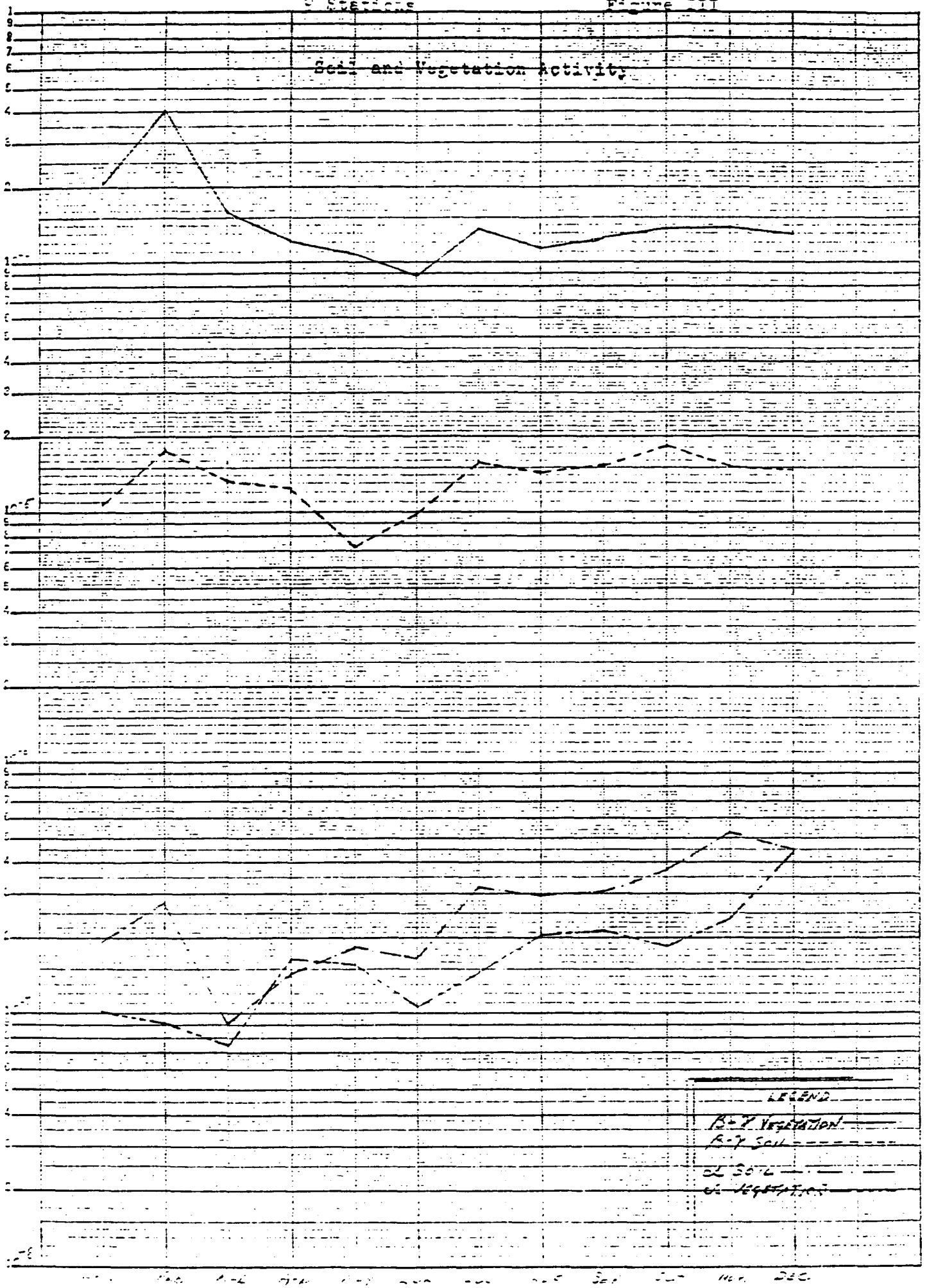
APPENDICES

Figure I

Gross Average Environmental Radioactivity For 1959

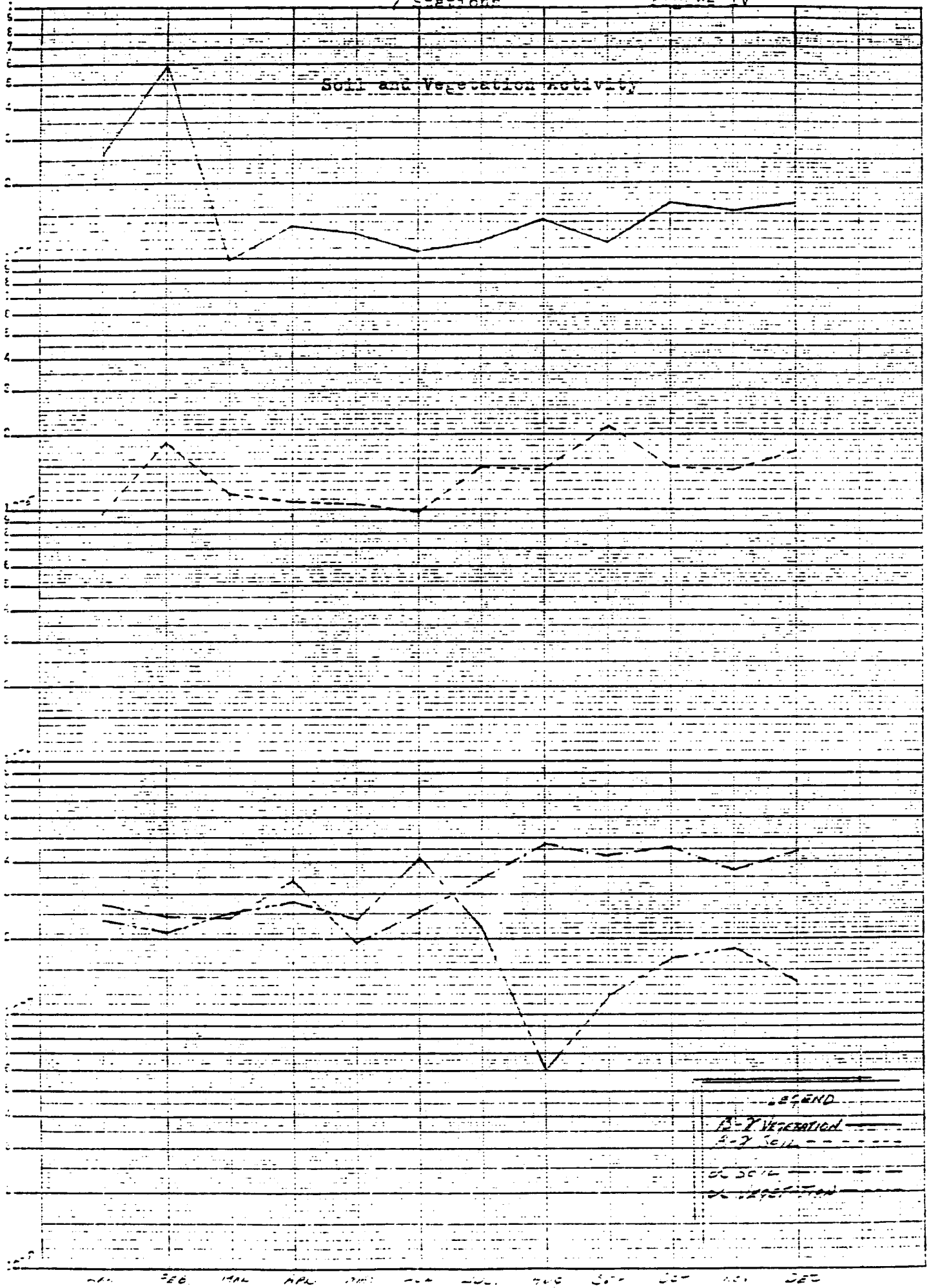



Soil and Vegetation Activity
LEGEND
B-V VEGETATION
A-S Soil
S Soil
V Vegetation
JAN.
FEB.
MAR.
APR.
SEP.
OCT.
NOV.
DEC.


Soil and Vegetation Activity
LEGEND
R-T Vegetation
R-T Soil
CL Soil
CL Vegetation
Feb
Dec

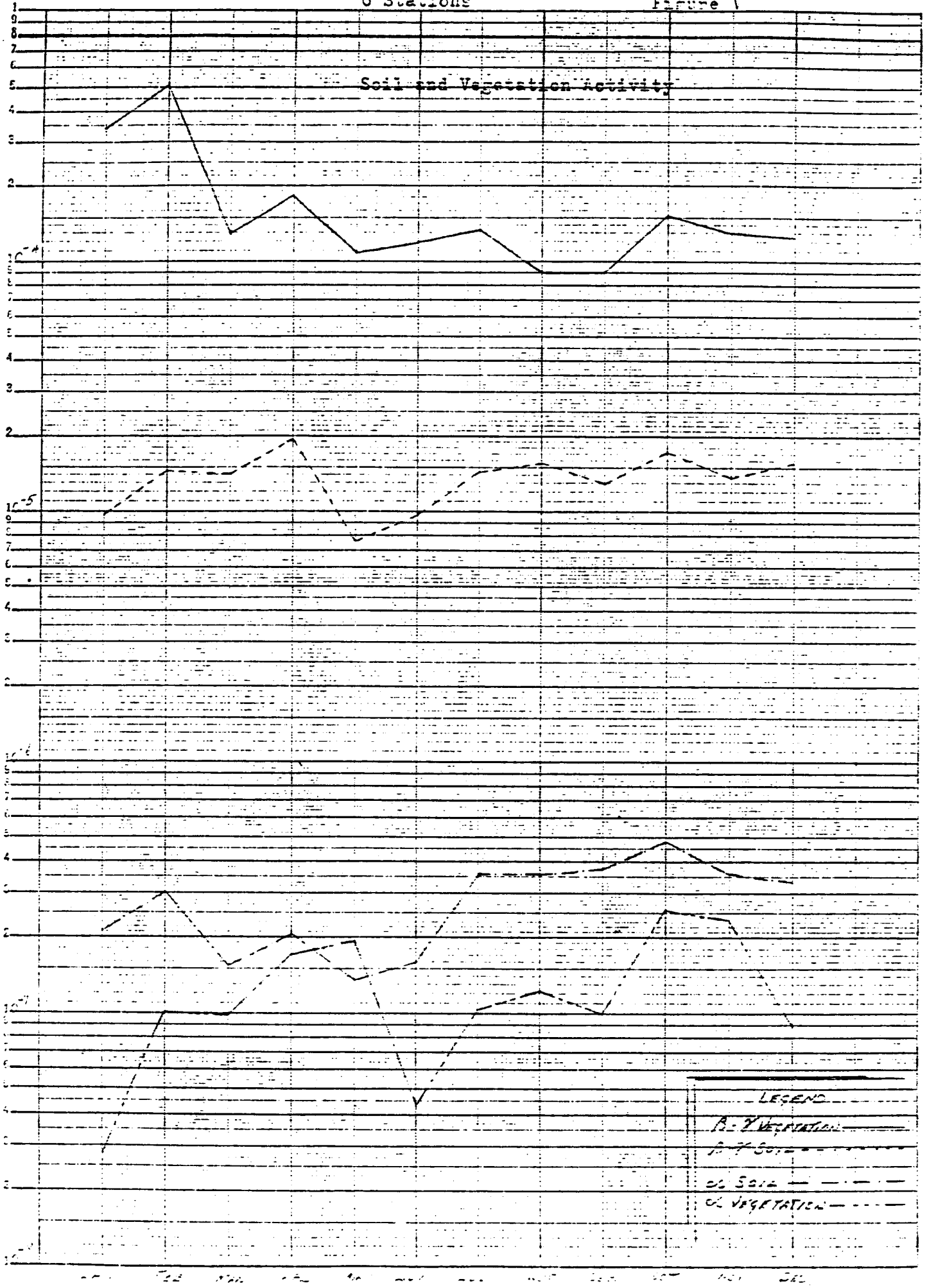
7 Stations

Figure IV



6 Stations Figure V

Soil and Vegetation Activity



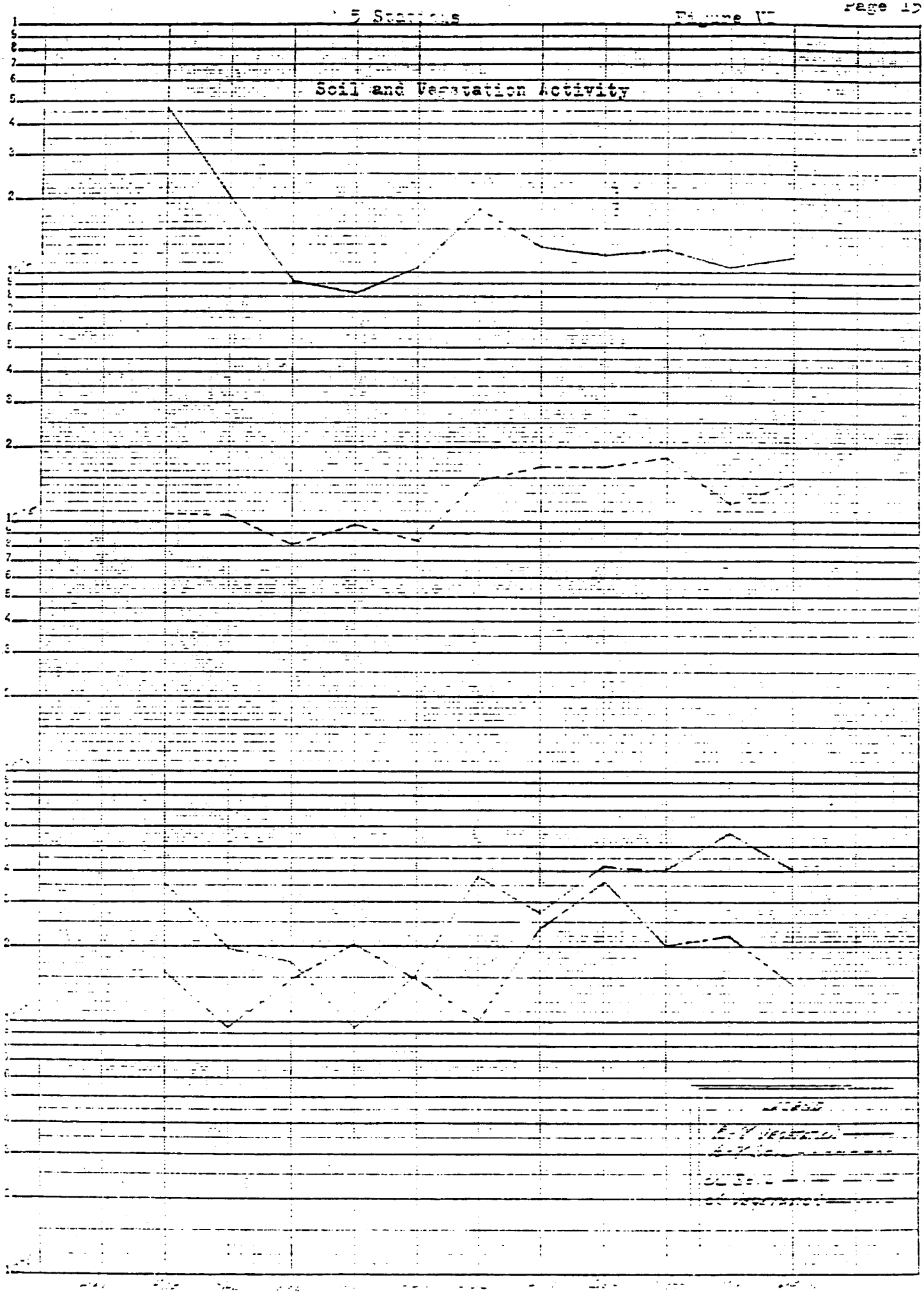
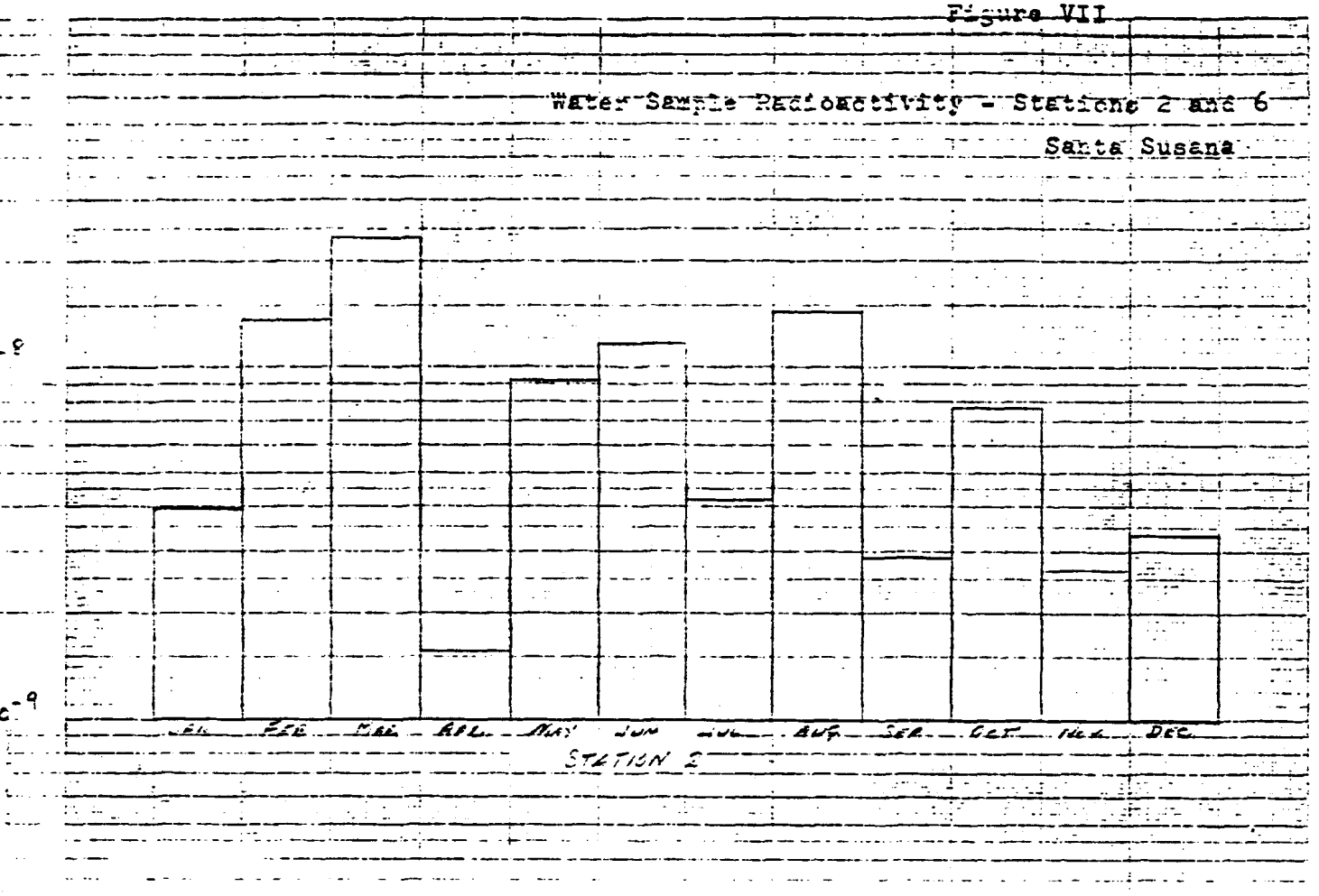

Soil and Vegetation Activity

Figure VII

Water Sample Radioactivity - Stations 2 and 6

Santa Susana



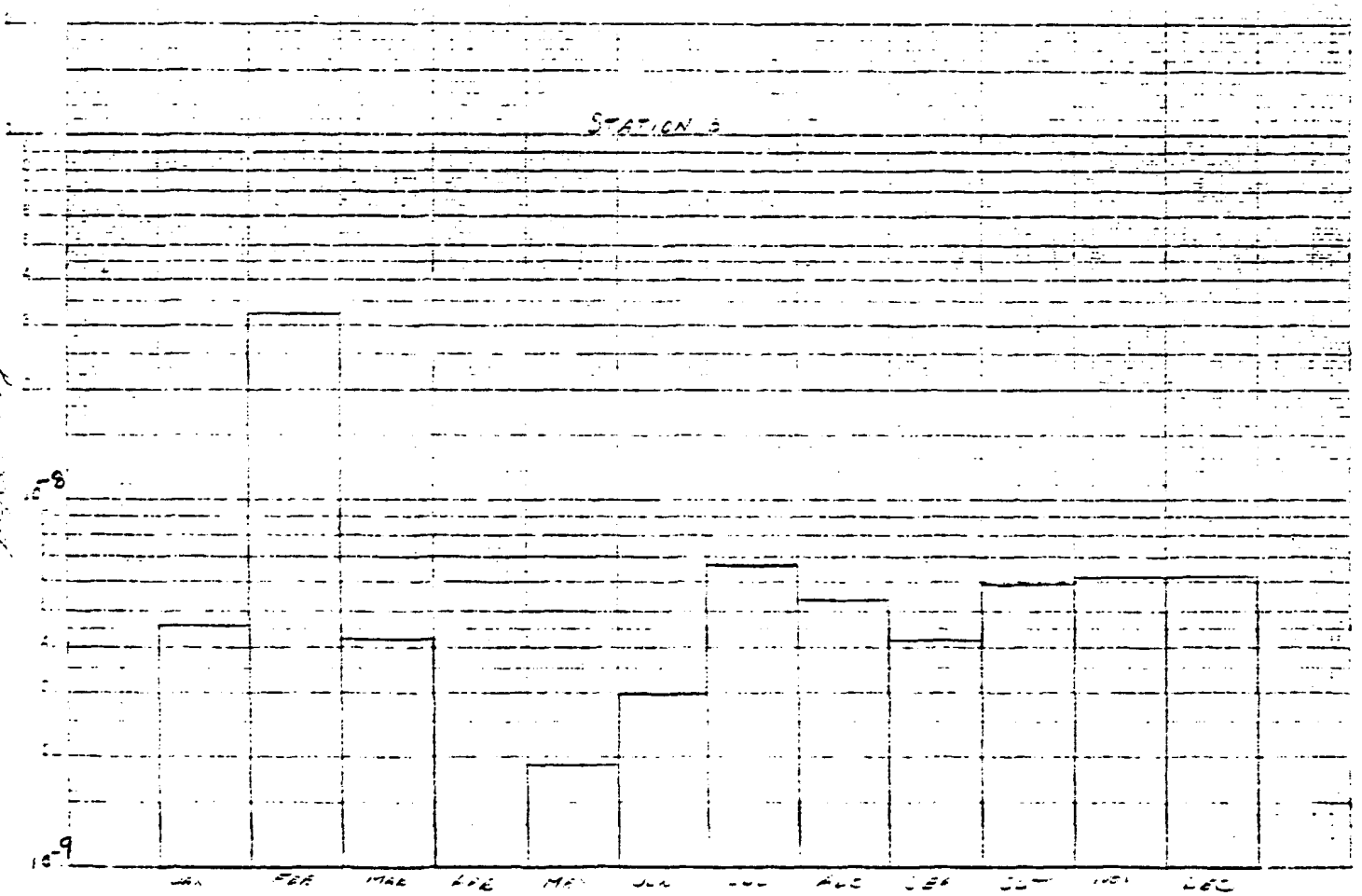
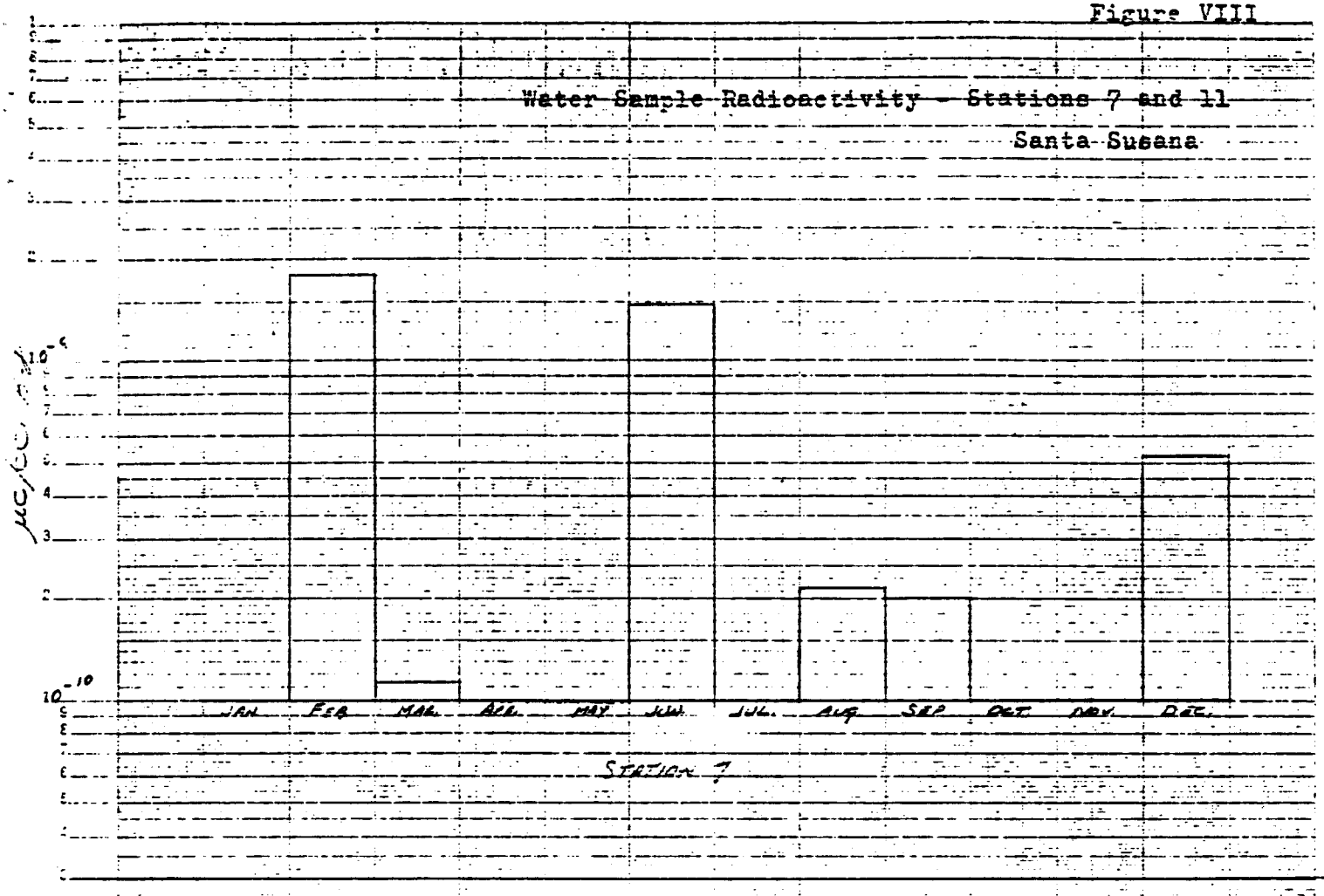


Figure VIII

Water Sample Radioactivity — Stations 7 and 11

Santa Susana



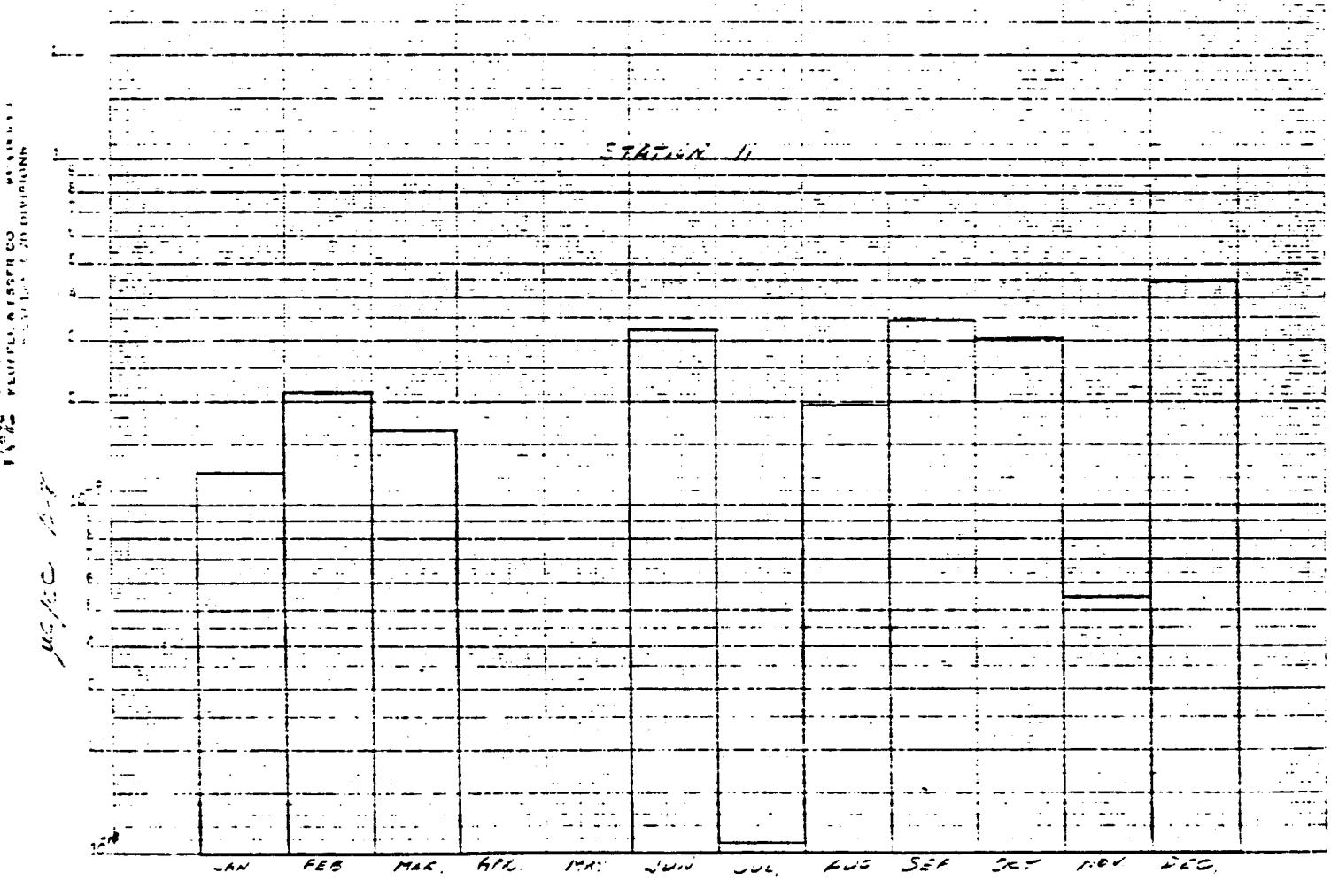
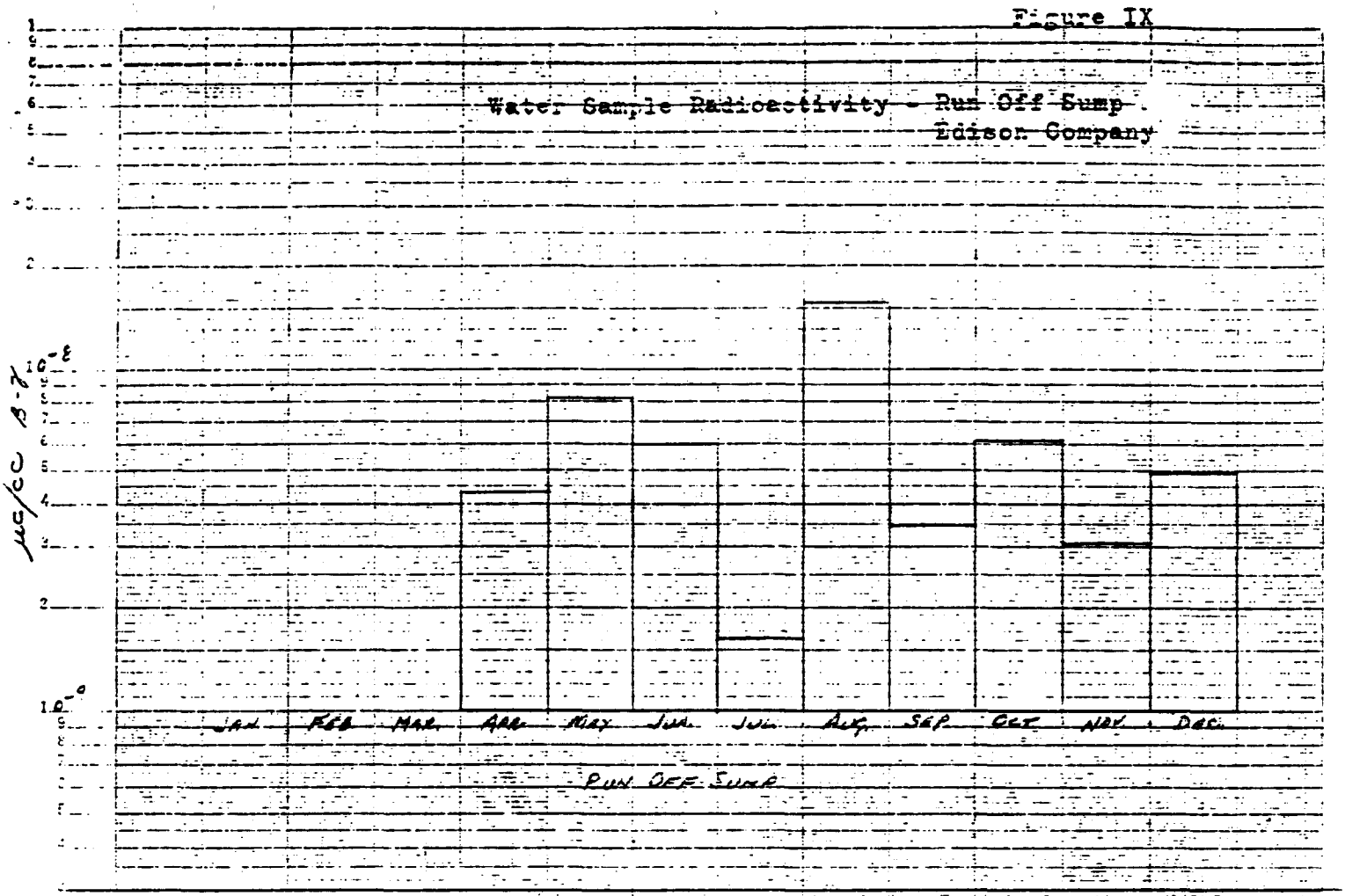


Figure IX

Water Sample Radioactivity - Run Off Sump
Edison Company



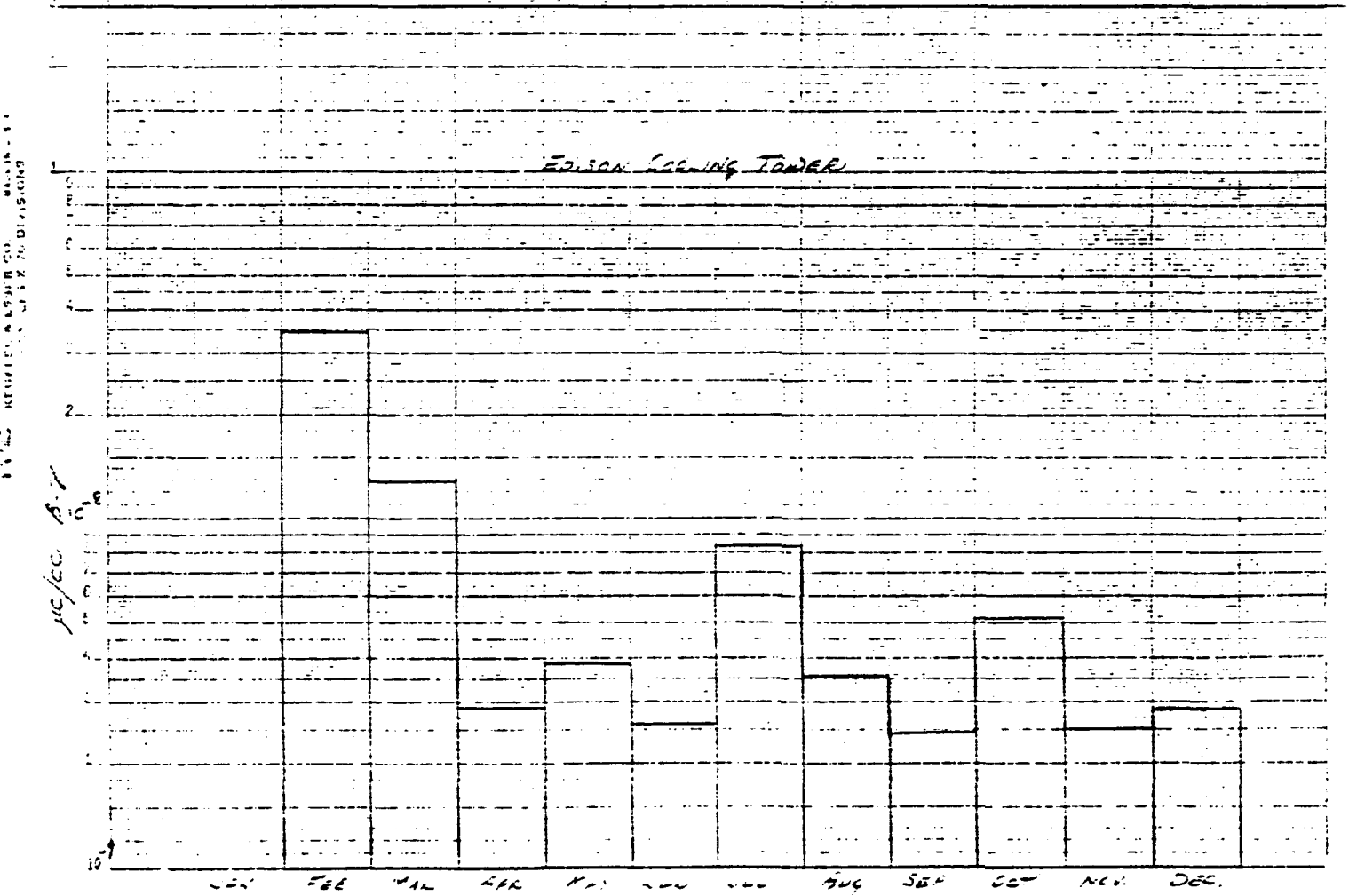
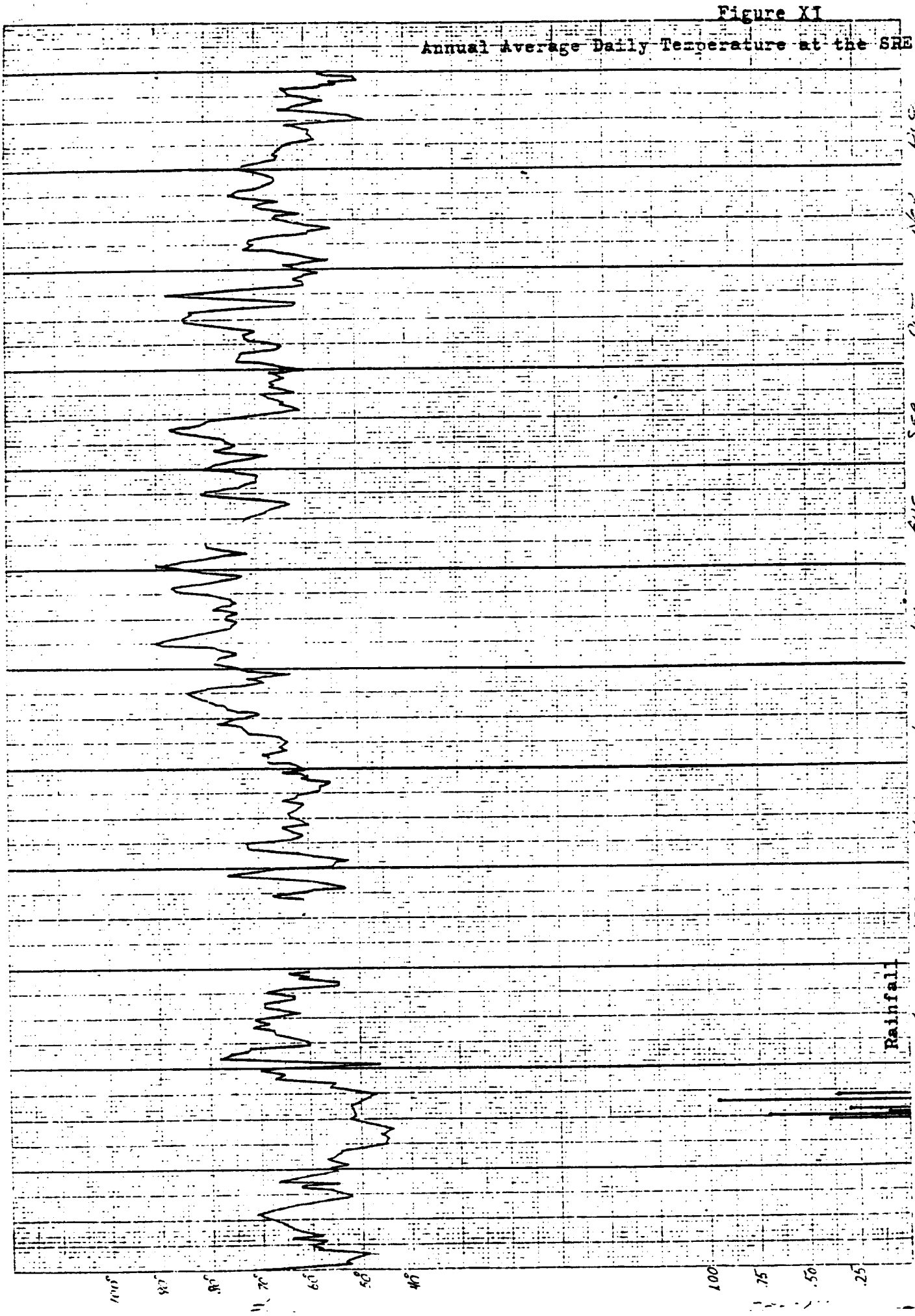


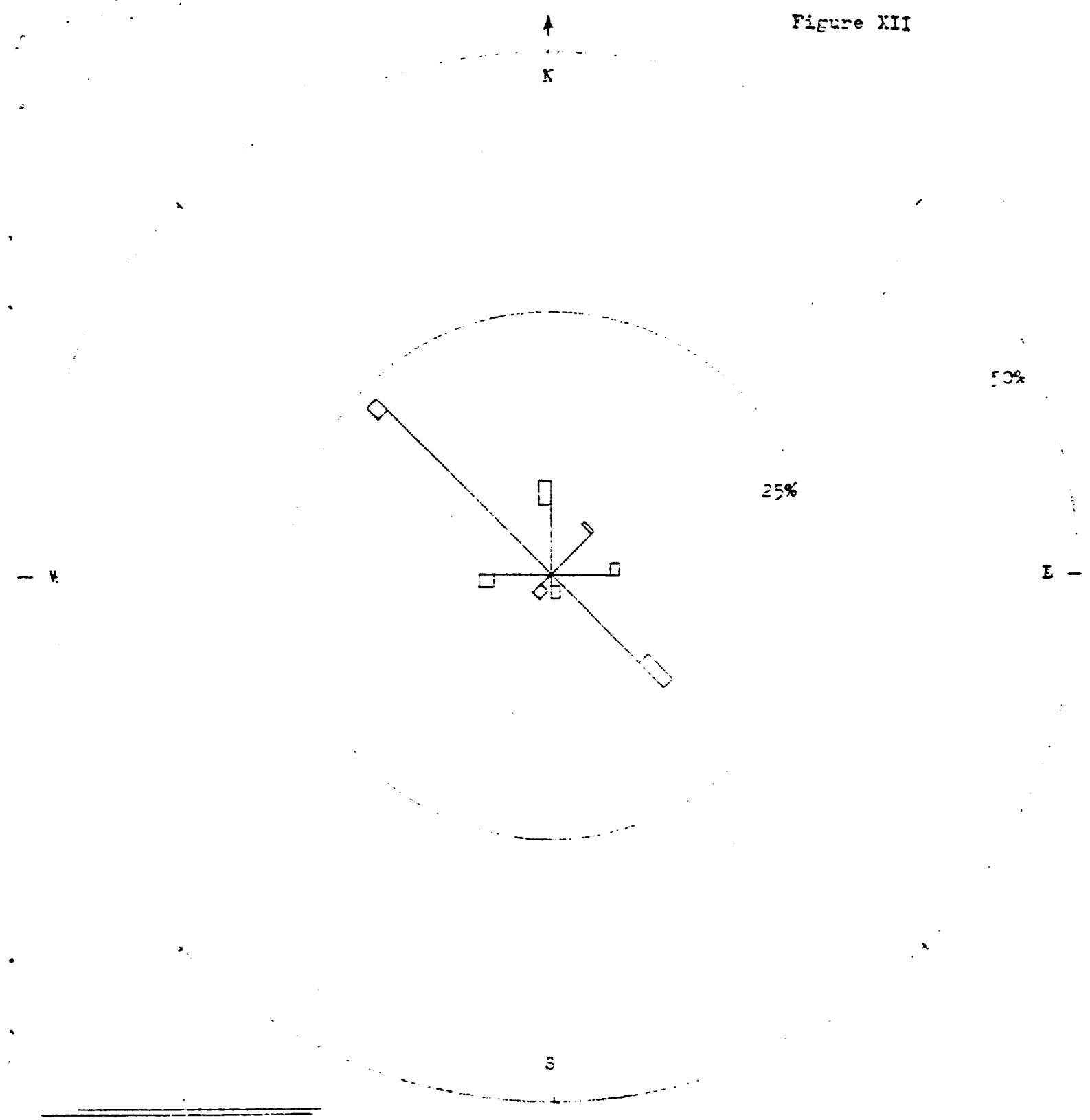
Figure XI

Annual Average Daily Temperature at the SRE



SRE - Annual 1959

Figure XII



LEGEND:

0-15 15-31 31+

Windspeed
in miles per hour

Calm 0-3 MPH 14%

This data represents 43% of the total possible observations.

Figure XIII

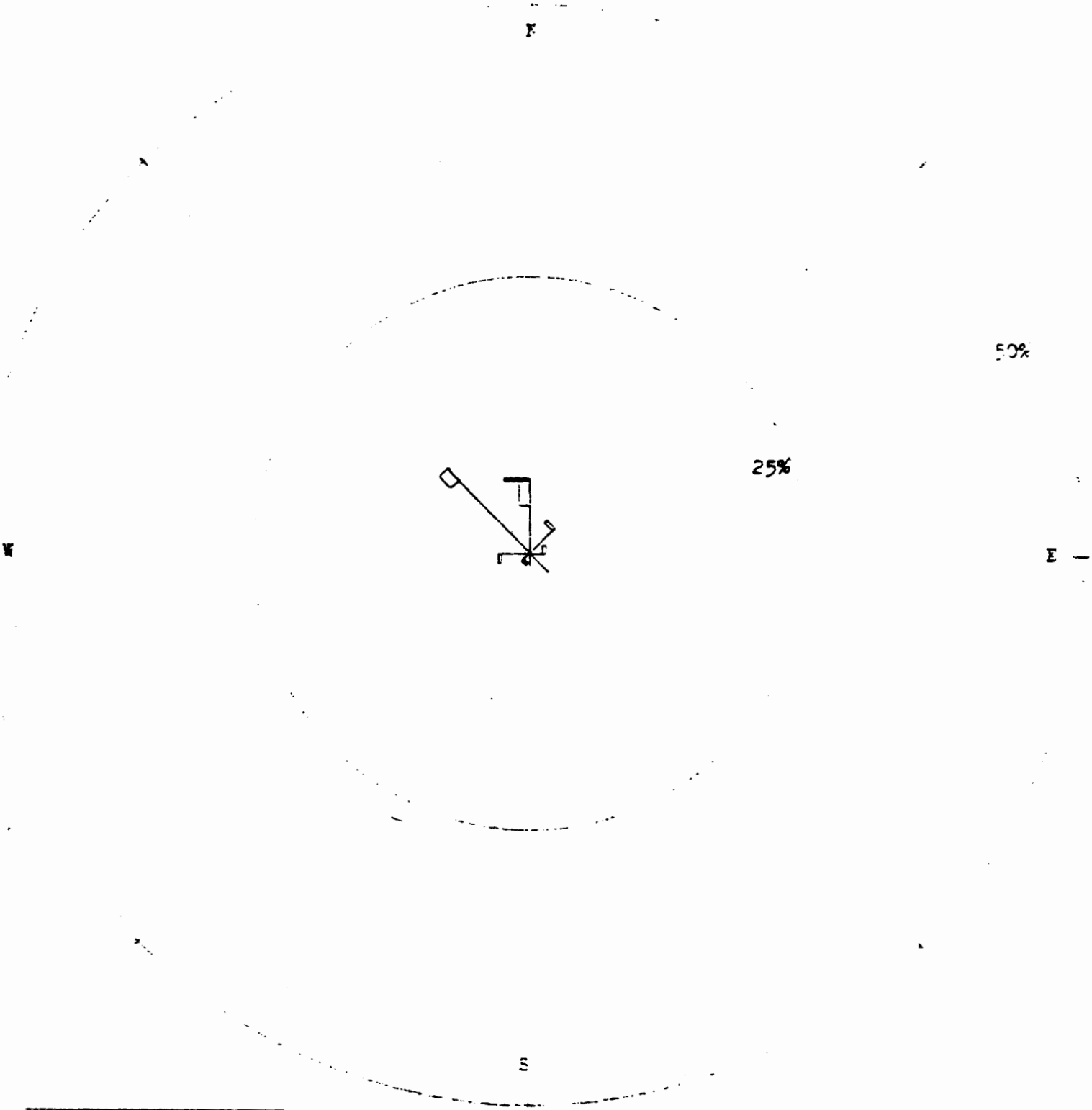
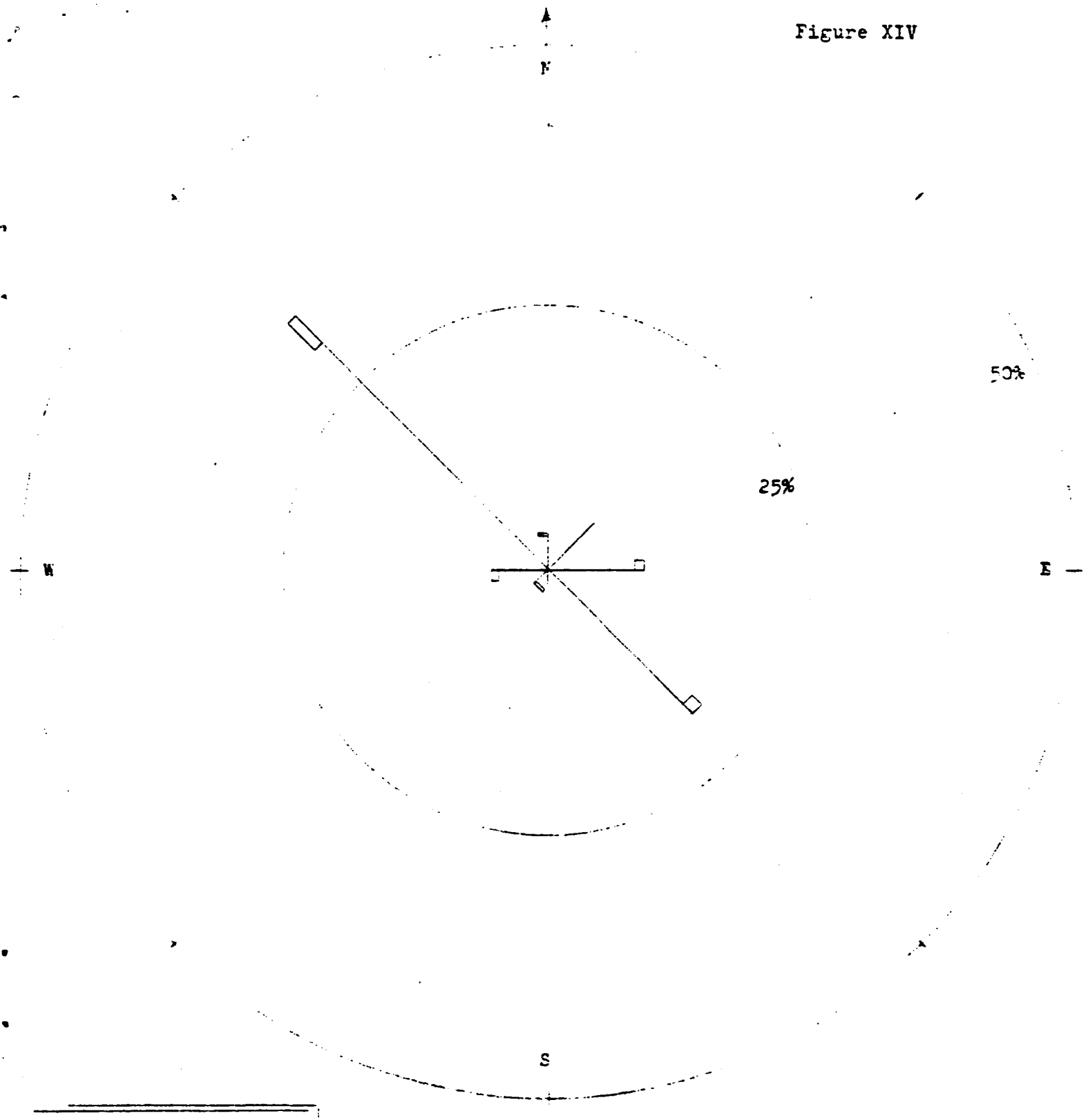
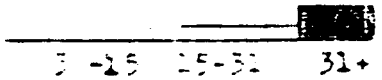

N
50%
25%
W
E
S
LEGEND
3 -15 15-31 31+
Windspeed
in miles per hour
Calm 0-3 MPH 4%
This data represents 23% of the total possible observations.

Figure XIV



LEGEND



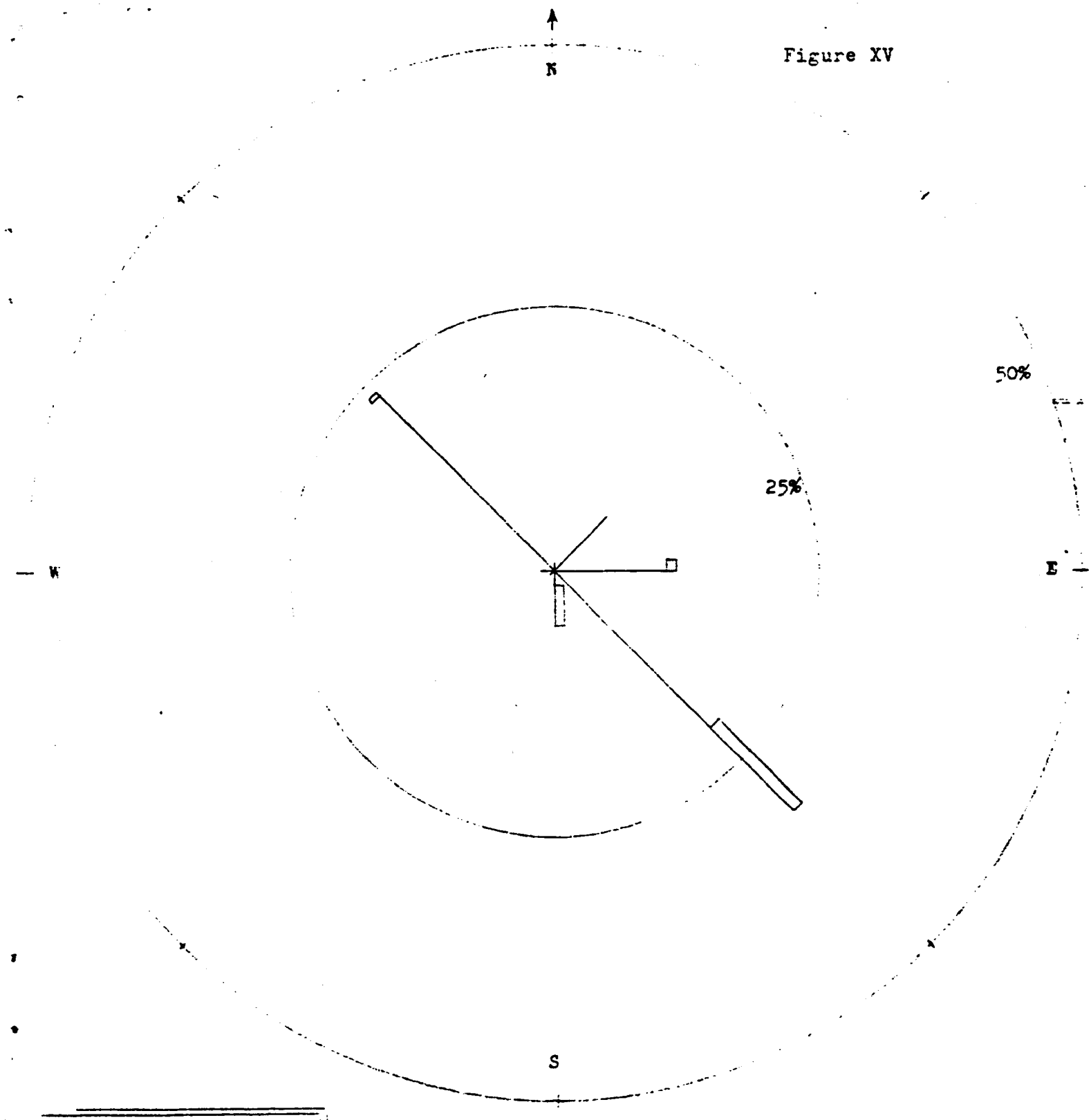
3 -15 15-31 31+

Windspeed
in miles per hour

Calm 0-3 MPH 20%

This data represents 79% of the total possible observations.

Figure XV



LEGEND

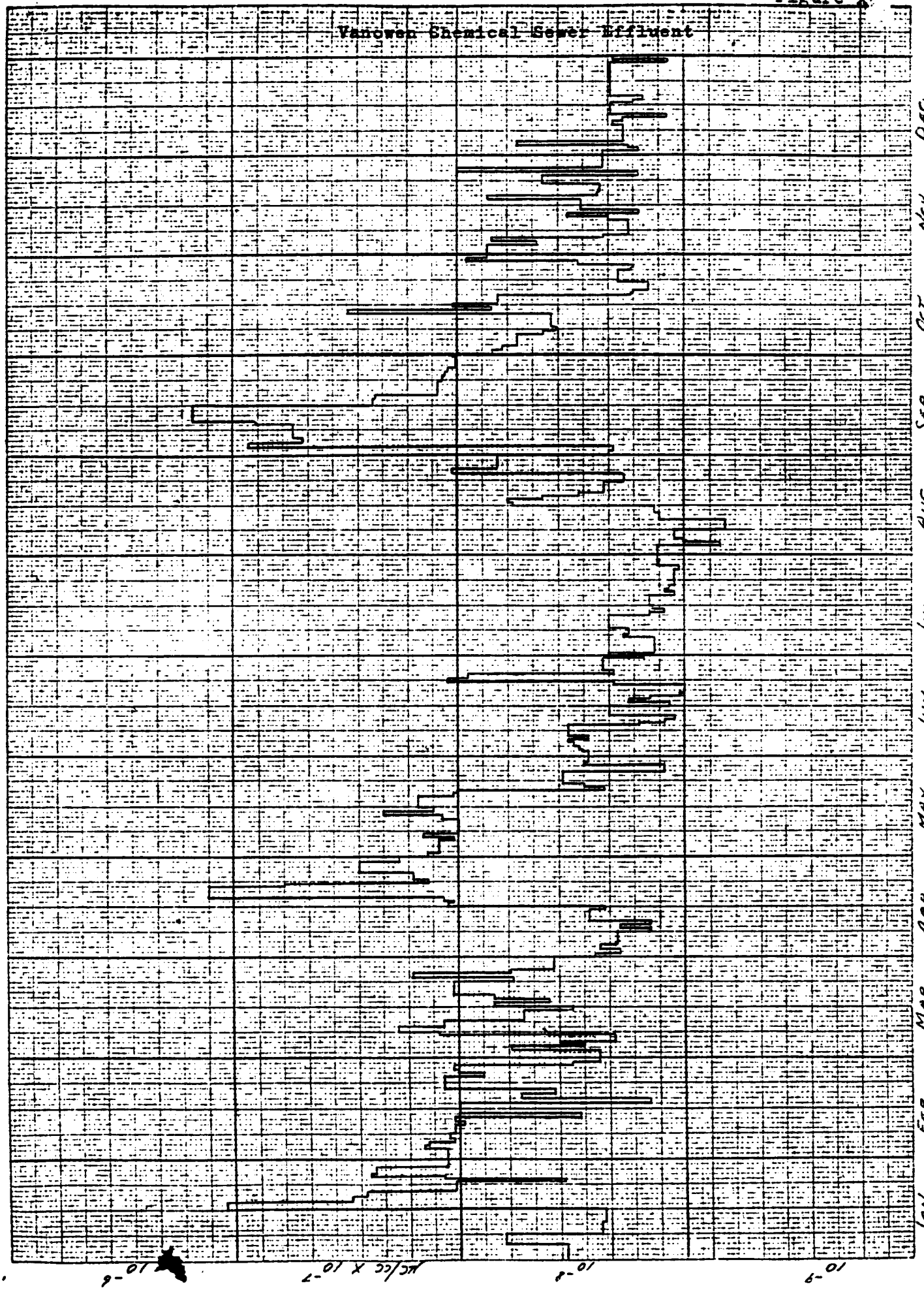
3 -15 15-31 31+

Windspeed
in miles per hour

Calm 0-3 MPH 19%

This data represents 32% of the total possible observations.

Figure X


Vanowen Chemical Sewer Effluent
DEC.
NOV.
OCT.
SEP.
AUG.
JUL.
JUN.
MAY
APR.
MAR.
FEB.
JAN.
10^{-6}
10^{-7}
10^{-8}
10^{-9}
μc/cc X 10⁻⁷