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OPERATION PLUMBBOB OFF-SITE RADIOLOGICAL SAFETY REPORT. NEVADA --ETC(U)
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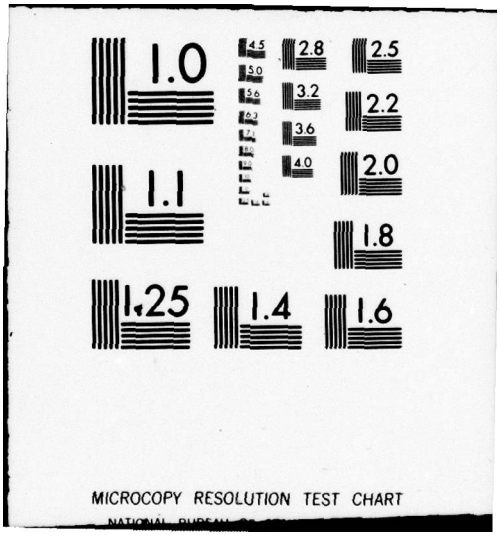
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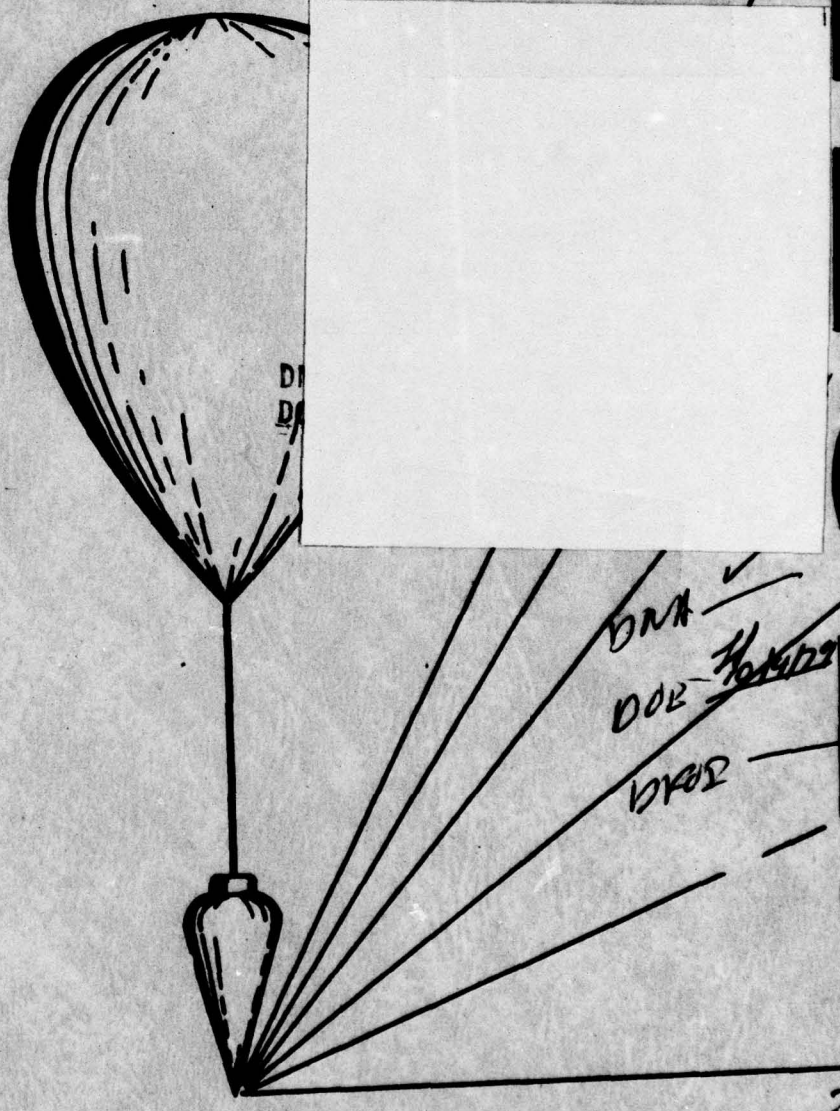
PLUMBBOB

OFF-SITE RAD-SAFETY REPORT



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OFF-SITE RADIOLOGICAL SAFETY ACTIVITIES
NEVADA TEST ORGANIZATION

NEVADA TEST SITE
MERCURY, NEVADA

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I
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AD A075357
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Operation Plumbbob
Off-Site Radiological Safety Report
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OPERATION PLUMBBOB

OFF-SITE RADIOLOGICAL SAFETY REPORT

NEVADA TEST SITE

1957

COMPILED AND EDITED

BY

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Albuquerque, New Mexico

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OPERATION PLUMBBOB

OFF-SITE RADIOLOGICAL SAFETY REPORT

Introduction

The purpose of this report is to present a concise summary of off-site rad-safe activities during Operation PLUMBBOB and to serve as a source of information to interested AEC and health agency personnel. All pertinent data necessary to evaluate the off-site exposure effects of the operation in populated areas are included. In the interests of brevity, selected data only are given for non-populated areas and for certain other items, such as shielding and weathering. Complete monitoring logs and detailed film badge results covering these areas are, however, available from the files of the Las Vegas Branch, AEC. Also available from this office are the detailed data from which certain of the summaries were compiled. Throughout the entire report, maps, tables, graphs, and diagrams have been used extensively for brevity and for clarity. Except in the chapter on individual shot summaries, tables, graphs, etc., are placed at the end of the chapter to which they refer and in the sequence of referral in the chapter.

* FORWARD *

This report is concerned solely with the activities of the PHS-AEC Off-Site Rad-Safety Organization. A committee, "The Test Manager's Committee for the Evaluation of Radiation Doses", has been delegated to consider all information from all available sources and the results of their deliberations will constitute the only official evaluation of dosages to off-site communities.

Every effort has been made to eliminate errors. It is appreciated, however, that in a document containing so many individual items of data, it is virtually impossible to eliminate all errors, typographical or otherwise. If any anomalies are detected, it would be appreciated if they were called to the attention of the Off-Site Rad-Safety Organization for checking against the base data.

INDEX

LIST OF FIGURES

CHAPTER I

AEC RADIOLOGICAL SAFETY CRITERIA FOR THE PROTECTION OF THE PUBLIC

1.1 The Division of Biology and Medicine is the agency responsible for establishing such criteria for the Atomic Energy Commission deemed necessary to protect the health and welfare of the general populace from consequences of weapons tests conducted at the Nevada Test Site. The operational procedures adopted during Operation PLUMBBOB to meet these criteria were the responsibility of the Test Manager under the direction of the Division of Military Application. These procedures were carried out by the Off-Site Rad-Safe organization under the general supervision of the AEC Support Director.

1.2 The official criteria, discussed below, did not apply to domestic or wild animals since it is felt that levels of radiation which would be significant to them would have to be higher than those adopted.

1.2.1 Figure 1.1 shows the approximate gamma dose rates versus times after detonation to produce one roentgen effective biological dose. This graph (which incorporates particular factors of weathering, shielding, and biological repair into a single curve) was used in conjunction with the tabular data below to determine the feasibility of large scale population evacuation.

Effective Biological Dose	*Minimum Effective Biological Dose that must be saved by* act of evacuation (otherwise evacuation will not be indicated).
Up to 30 roentgens	(No evacuation indicated).
30 to 50 roentgens	15 roentgens
50 roentgens and higher	(Evacuation indicated without regard to quantity of dose that might be saved, providing adequate shelters are not available and the estimated hazards concomitant with the evacuation are acceptable).

The only population evacuation was at Lincoln Mine, Nevada and occurred late in the series. On several of the more sensitive shots, the entire population of Lincoln Mine was evacuated according to prior arrangements between the AEC and Wah Chang Mining Corp., operator and owner of the mine. These evacuations took place on the day prior to the scheduled detonation and were made for convenience rather than because of concern regarding excessive doses of the order of those stated above.

1.2.2 Figure 1.2 (Gamma Dose Rates Versus Times After Detonation When Personnel Be Advised to Remain Indoors) was used to determine when off-site inhabitants would be requested to remain indoors. The gamma dose rates were obtained using survey instruments held three feet above ground.

Following the "Smoky" event, Mr. Butler (the owner of the Butler Ranch located approximately 30 miles south of Alamo, Nevada on U.S. 93) was requested to remain indoors for several hours during and immediately following fallout. An off-site monitor was present at the ranch during this period.

1.2.3 Figure 1.3 (Gamma Dose Rates Versus Times After Detonation When Decontamination of Personnel is Recommended) was used to determine the advisability of personnel decontamination. The values found in this graph were multiplied by certain factors dependent upon the size of the areas of the exposed body which were contaminated or if only the exterior surface of the clothing was contaminated.

No personnel contamination situation warranted the use of this Graph during the PLUMBBOB Operation.

1.2.4 Figure 1.4 (Gamma Dose Rates Versus Times After Detonation When Decontamination of Motor Vehicles is Recommended) was used to determine the advisability of decontaminating motor vehicles. The gamma dose rate was obtained by holding the sensitive part of the survey instrument four inches from any readily accessible surface.

No vehicle contamination problems called for the use of this Graph during the PLUMBBOB Operation.

1.2.5 Contamination of water, air, and foodstuffs called for no restrictive action unless the fallout exceeded that calling for evacuation. However, in areas where the infinite dose equalled or exceeded ten roentgens, monitoring of air, food, and water were deemed advisable.

During the operation, water, milk, and air sampling were an integral part of the off-site program. Foodstuffs were sampled only when deemed necessary or when specific questions were raised. (The results of these sampling activities are presented in other parts of this report).

1.2.6 The basic criterion for the PLUMBBOB Operation was that the whole-body gamma Estimated Dose for off-site populations should not exceed 3.9 roentgens resulting from the Operation. This total dose may result from a single exposure or series of exposures. Figure 1.5 (Approximate Gamma Dose Rates Versus Times After Detonation to Produce One Roentgen Estimated Dose) was used operationally to calculate the gamma dose received by people living in the off-site area. This graph incorporates certain assumptions regarding weathering and shielding of fallout material in the environment.

In those cases where film badges were worn properly by personnel, the values recorded may be accepted as the estimated dose.

The detailed criteria, including background material, are contained in the document, "Atomic Energy Commission Radiological Safety Criteria During Nuclear Weapons Testing at the Nevada Test Site", dated April 1957.

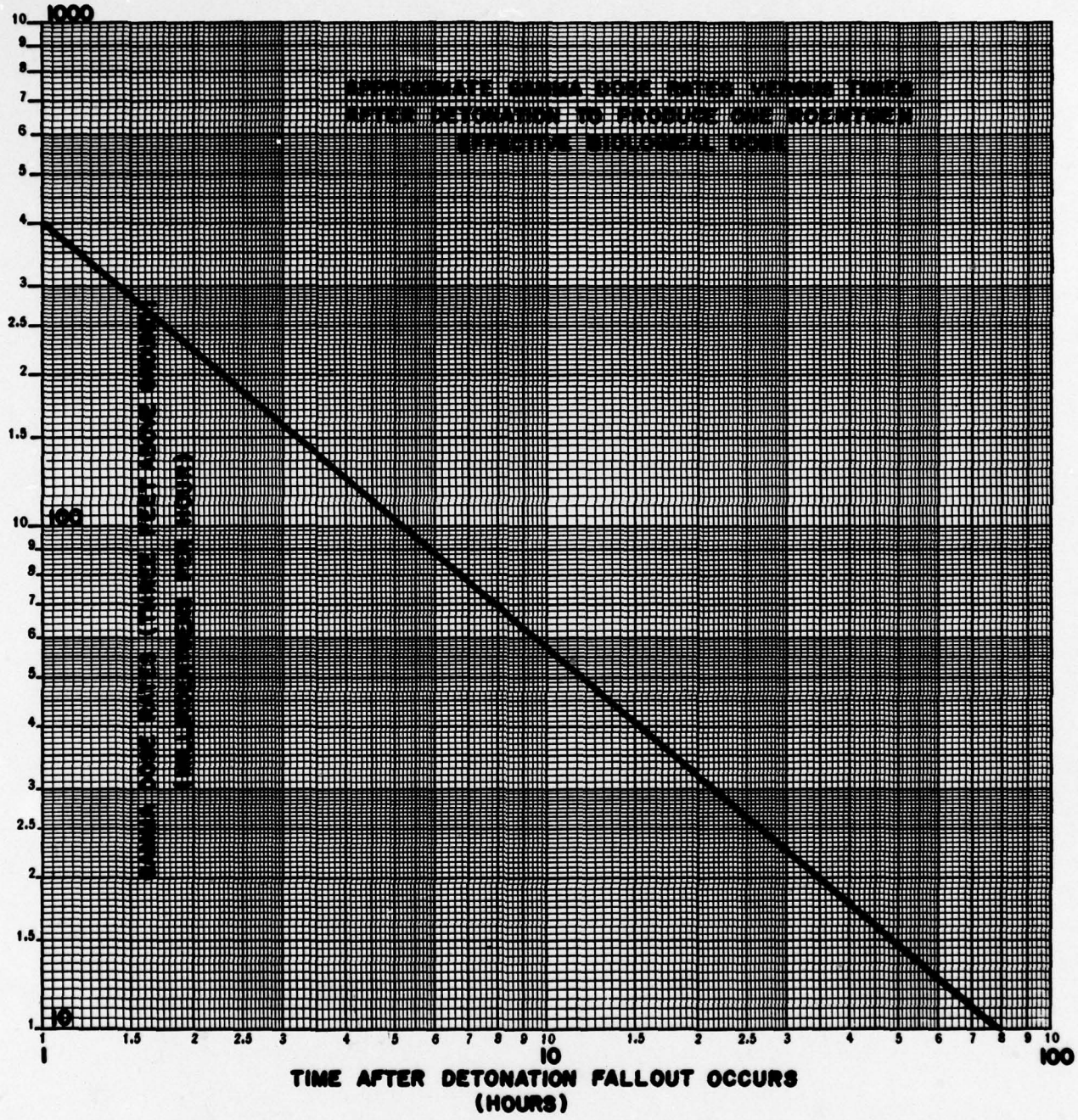

APPROXIMATE GAMMA DOSE RATE VERSUS TIME
AFTER DETONATION TO PRODUCE ONE ROENTGEN
EFFECTIVE BIOLOGICAL DOSE
1000
100
10
1
10
100
TIME AFTER DETONATION FALLOUT OCCURS
(HOURS)

Figure 1.1

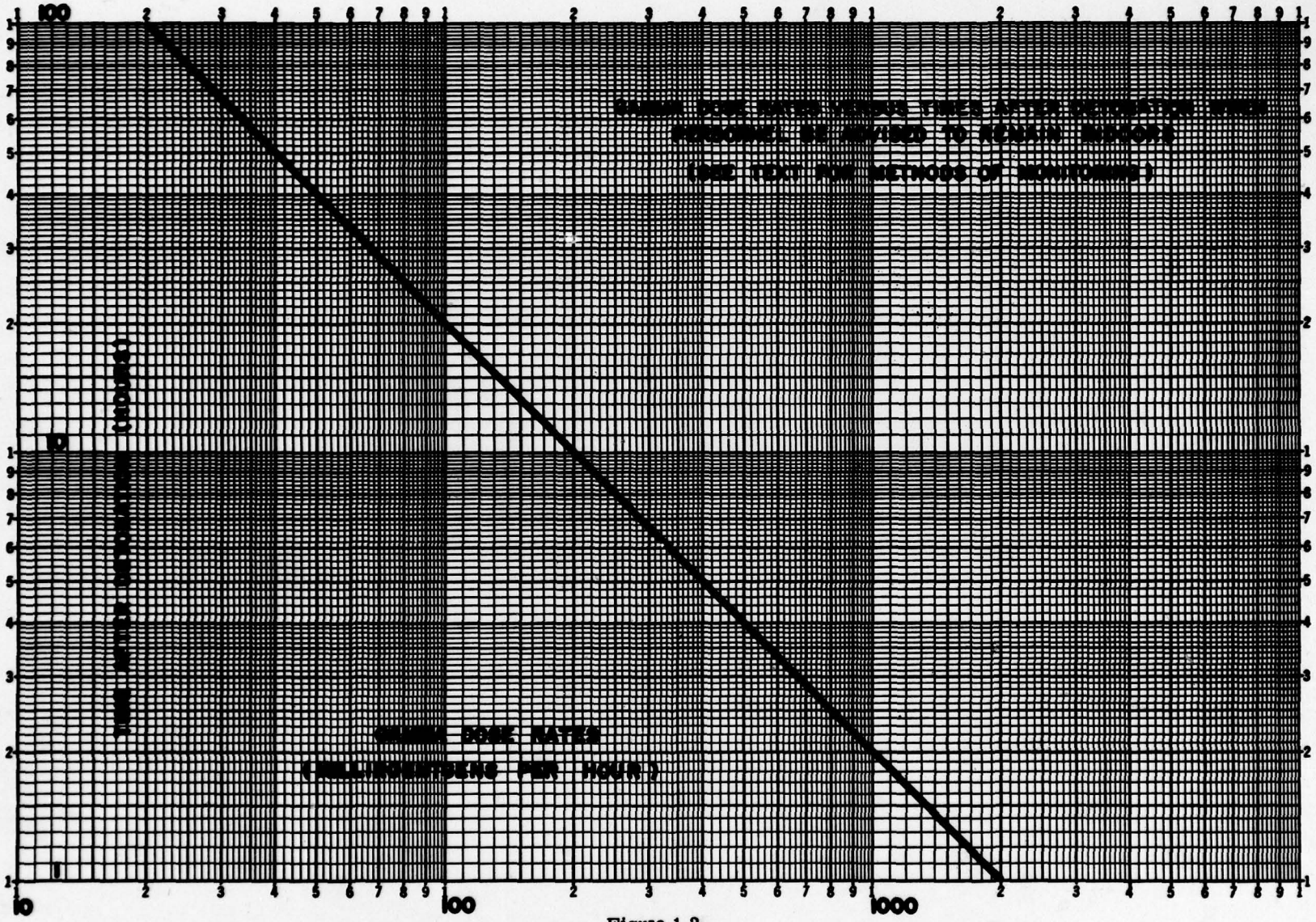


Figure 1.2

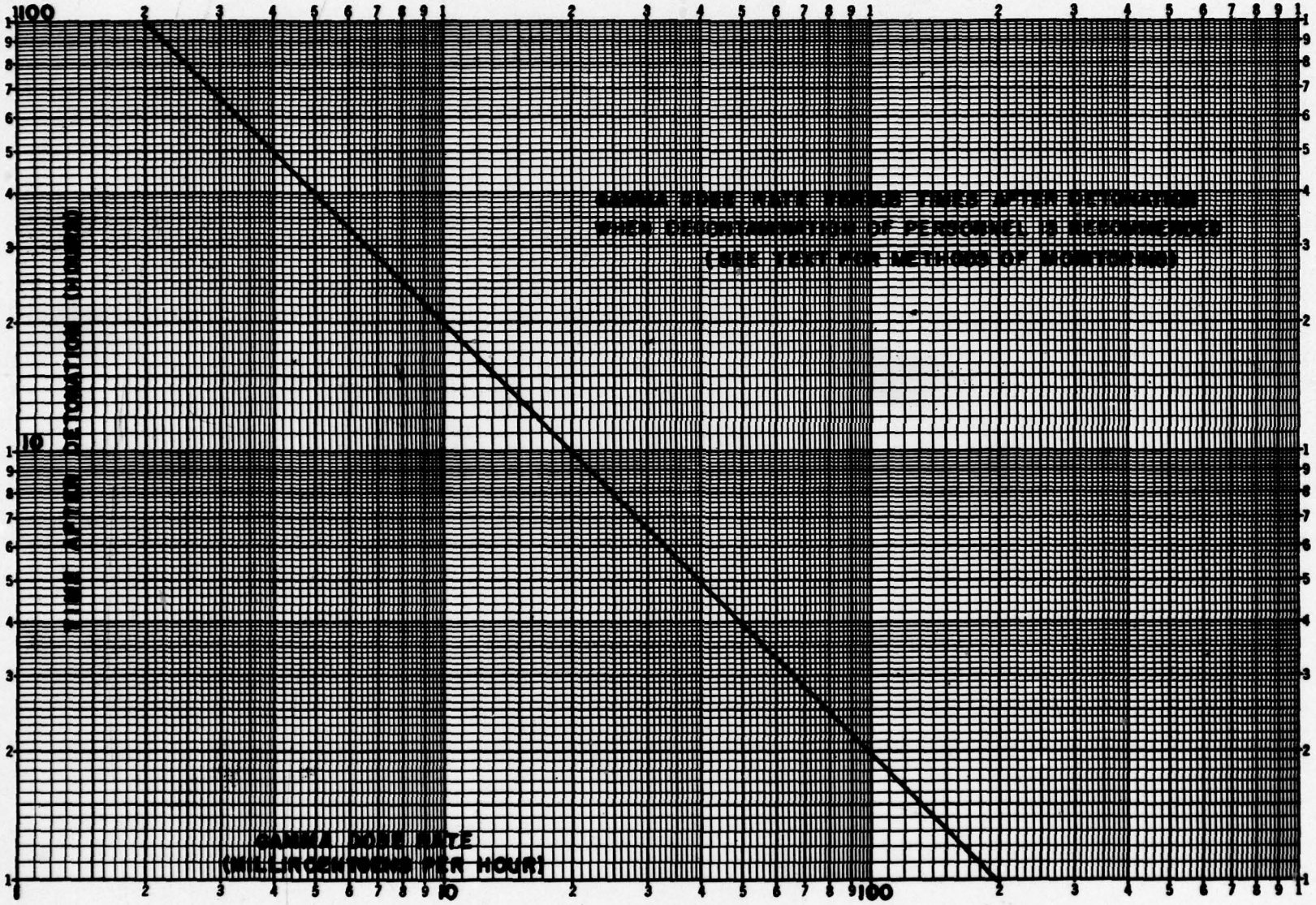


Figure 1.3

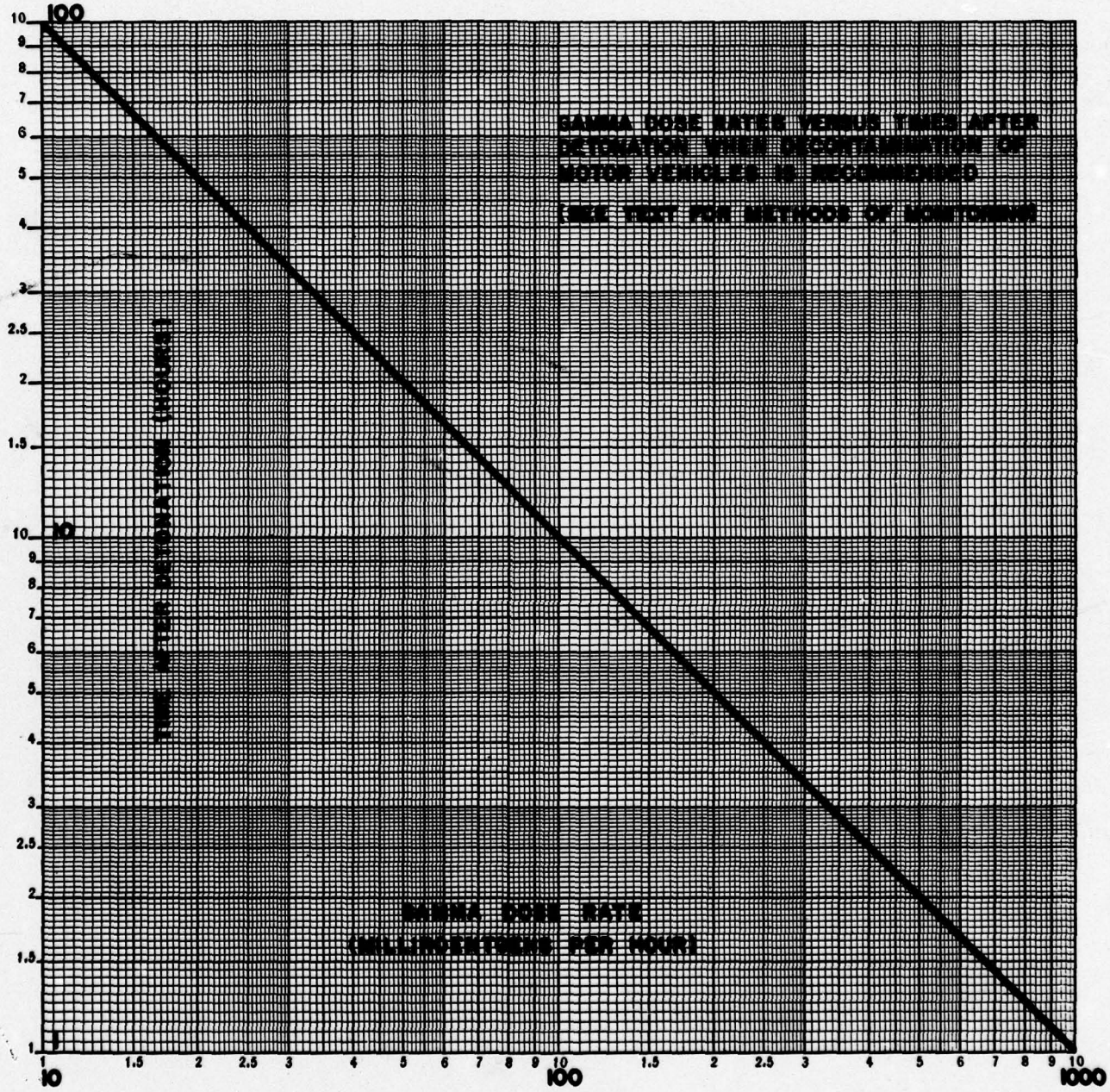

GAMMA DOSE RATES VERSUS TIMES AFTER DETONATION WHEN DECONTAMINATION OF MOTOR VEHICLES IS RECOMMENDED
(SEE TEXT FOR METHOD OF DETERMINING
TIME AFTER DETONATION (HOURS)
GAMMA DOSE RATE (MILLIROENTGENS PER HOUR)

Figure 1.4

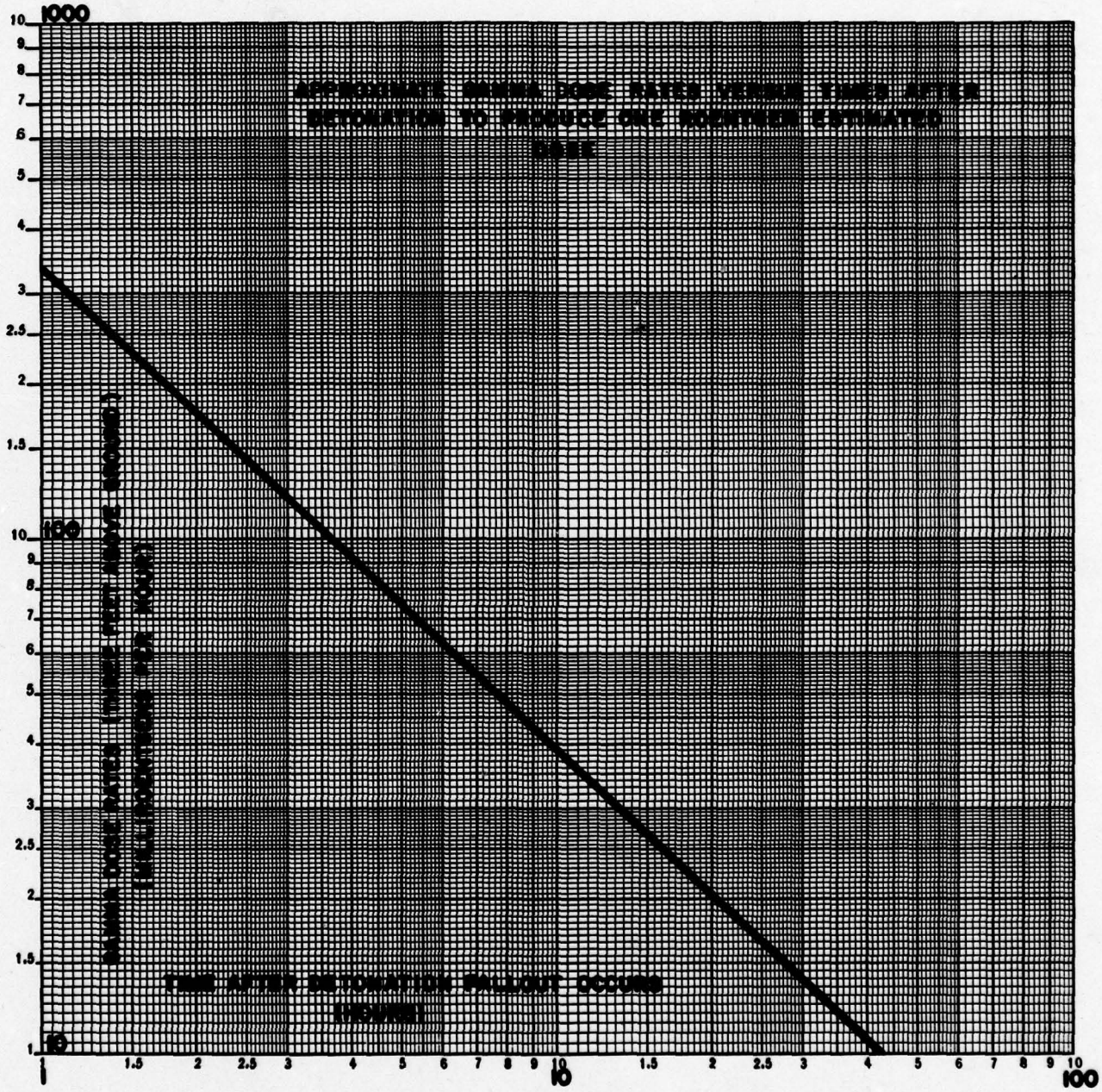

APPROXIMATE GAMMA DOSE RATES VERSUS TIMES AFTER DETONATION TO EXPOSURE ONE HOUR'S ESTIMATED DOSE
TIME AFTER DETONATION FALLOUT OCCURS (HOURS)
1000
100
10
1

Figure 1.5

CHAPTER II

OFF-SITE RAD-SAFETY ORGANIZATION

2.1 Scope of Program.

The Public Health Service and the Atomic Energy Commission in a memorandum of understanding agreed that the Public Health Service would provide trained personnel and other services to operate the off-site program during active test periods and to provide continuity during interim periods.

The off-site area of interest was that area outside the Nevada Test Site but within a 250-mile radius from the Control Point. Although within Nevada Test Site, Watertown was considered to be in the off-site area. This definition is used to restrict the geographical area covered. However, the off-site organization could and did function outside this arbitrary boundary whenever the fallout situation warranted.

The basic purpose and primary mission of the off-site program was to provide a monitoring service and to conduct public relations. This original purpose was expanded to include the collection of certain data which were of particular interest to the Division of Biology and Medicine.

2.2 Responsibilities of Various Agencies.

2.2.1 The Atomic Energy Commission is the agency responsible for control of hazards due to radioactivity in all phases of the Atomic Energy Program. Overall administration of the program including policy decisions, budget requirements, procurement of materials and supplies, and all other support requirements were functions of the Atomic Energy Commission. The actual operational control of the off-site program was delegated by the Support Director to the Off-Site Radiological Safety Officer.

2.2.2 The operational group (Public Health Service), in order to accomplish rad-safety control within the off-site area and for documentary purposes, had to:

(a) Verify the off-site radiological situation associated with each full-scale nuclear test to insure public safety.
(b) Hold trained personnel in readiness to effectuate emergency measures should an unacceptable situation develop.
(c) Obtain a comprehensive record of the radioactivity caused by full-scale tests in the off-site area.
(d) Establish and maintain public confidence that all reasonable safeguards were being employed to preserve public health and property free of radiation hazards.
(e) Establish and maintain liaison with various local and state officials concerning fallout within their administrative areas.
(f) Investigate reports of incidents attributed to radioactivity which could result in claims against the Government.
(g) Accumulate data regarding the behavior of fallout patterns once they are established to gain a better understanding of cumulative dose to populations.
(h) Record, map, and report the data obtained.

2.2.3 The Reynolds Electrical and Engineering Company was responsible for providing support services including maintenance of electronic and automotive equipment, dosimetry for film badges, engineering services, communications network operation, procurement of supplies, reproduction services, housekeeping, etc.

2.2.4 The AEC Health and Safety Laboratory was responsible for furnishing seventeen Eversheds Continuous Recorder Units. They also provided maintenance service for the units by assigning a man part time as required.

2.2.5 Joint Task Force Seven. Furnished the Eversheds recorders. These recorders were equipped with a detection unit by LASL.

2.2.6 The United States Weather Bureau at Mercury furnished predicted cloud trajectory maps following each detonation. These maps were used for general information purposes and to brief pertinent state health department personnel.

2.2.7 Carco furnished a plane and pilot for part-time use by Off-Site. Extensive use was made of this service for courier duty in four states.

2.3 Organization.

Operational supervision of the Off-Site Program was delegated by the Support Director to the Off-Site Radiological Safety Officer.

Off-Site personnel were all Public Health Service regular and reserve corps officers trained for this particular job. A two-week training course, attended by 75 potential off-site monitors, was held in Mercury during February. Background material in radiological health and specific monitoring techniques were presented at this course. Also included as subject topics were communications, and the medical, veterinary, legal, and public relations aspects of an off-site operation.

The off-site area was divided into fifteen zones with two of these having sub-zones. Zone headquarters were located at Kingman, Arizona; Barstow and Bishop, California; Beaver, Cedar City, and St. George, Utah; and at Tonopah, Ely (sub-zone at Eureka), Pioche, Caliente, Alamo, Lincoln Mine, Mercury, Las Vegas, and Overton (sub-zone at Mesquite), Nevada. Zone personnel lived in each of these places and were responsible for all off-site activities within their zones. The towns designated as zone and sub-zone headquarters are shown on Figure 2.1.

These people were recruited on a country-wide basis from various health and teaching jobs. They brought with them a wide background of experience in the public health-public relations field. The technical aspects of the off-site program were covered in the training course and during their first few day's orientation after reporting to Mercury.

After a tour-of-duty with the off-site program, these personnel were in a much better position to evaluate the effects of weapons tests, to set up programs of environmental sampling, and to discuss from a practical standpoint the continental testing of weapons. In other words, they were able to disseminate much valuable information and contribute materially to programs sponsored by their parent organizations. This practical experience could also be put to use in local FCDA groups.

The dissemination of useful information, on a wide geographical scale, is probably one of the most important aspects of Public Health Service participation in continental weapons tests.

Figure 2.2 indicates the number of personnel used, their wide-spread geographical distribution, and normal job affiliation. Appendix I is a complete list, by name and state, of off-site personnel used during PLUMBBOB. Normal work affiliation is also shown in this tabulation.

The off-site headquarters was located in Warehouse 6 at Mercury. Personnel assigned to Mercury were used in a dual capacity. They served as mobile monitors after each detonation and also performed laboratory work; such as chemical processing and counting of samples, as well as calculating and compiling data. Administrative services were provided from this headquarters.

Assigned to the Off-Site Radiological Safety Officer's staff, were medical and veterinary officers. During the first part of PLUMBBOB, two doctors and two veterinarians were used, while only one of such was utilized later on.

The PHS Radiological Health Program in Washington performed many administrative services in support of off-site activities. Recruitment of personnel, transportation, budget matters, etc., were handled primarily from that office.

A simplified line diagram showing the major components of the off-site organization is presented as Figure 2.3.

2.4 Communications.

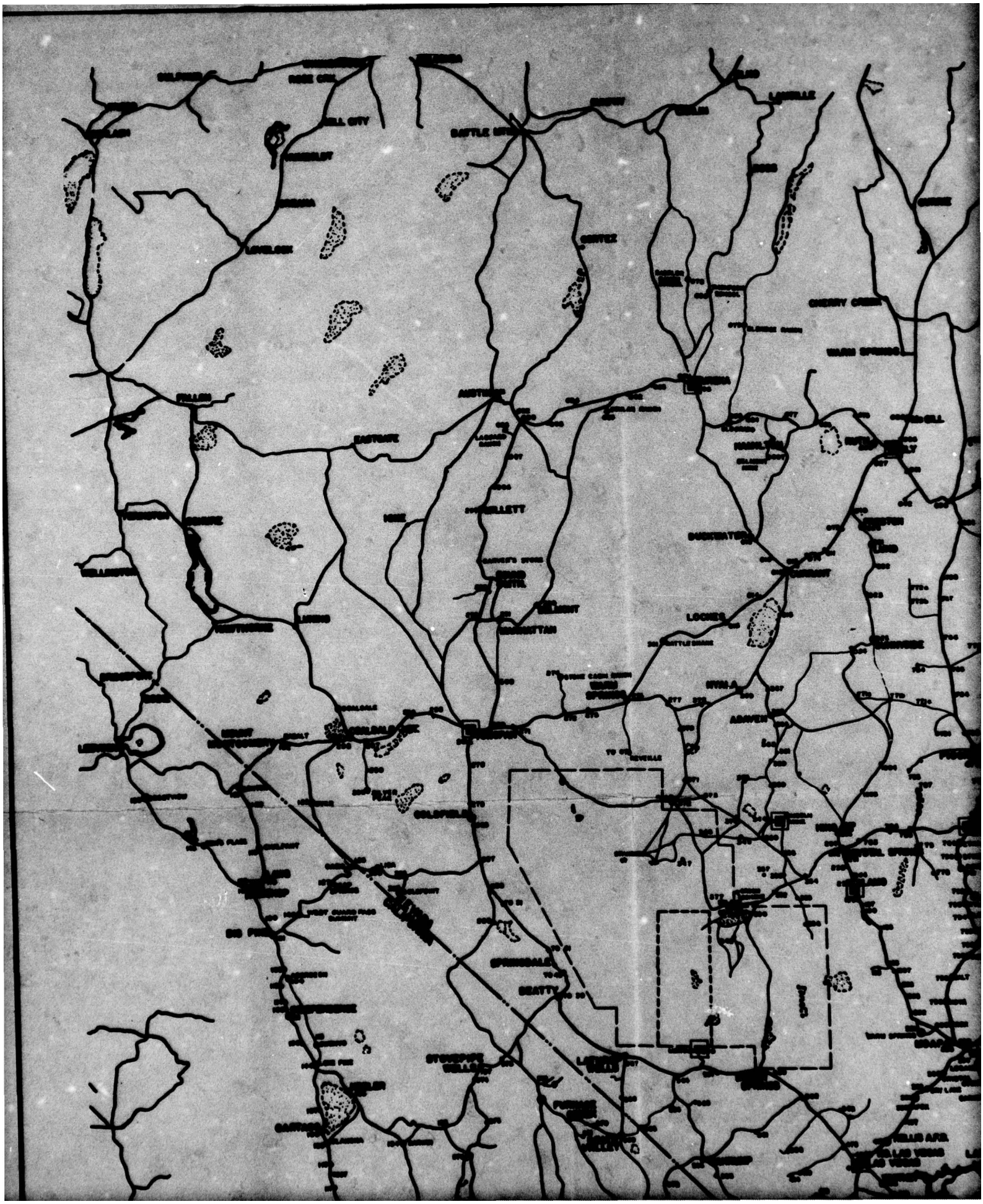
Off-Site communications were primarily by an off-site radio net which was established for this purpose. The net consisted of mobile units placed in each off-site vehicle, several automatic repeater stations, a net control station located in Building 101, and a monitor in Warehouse 6.

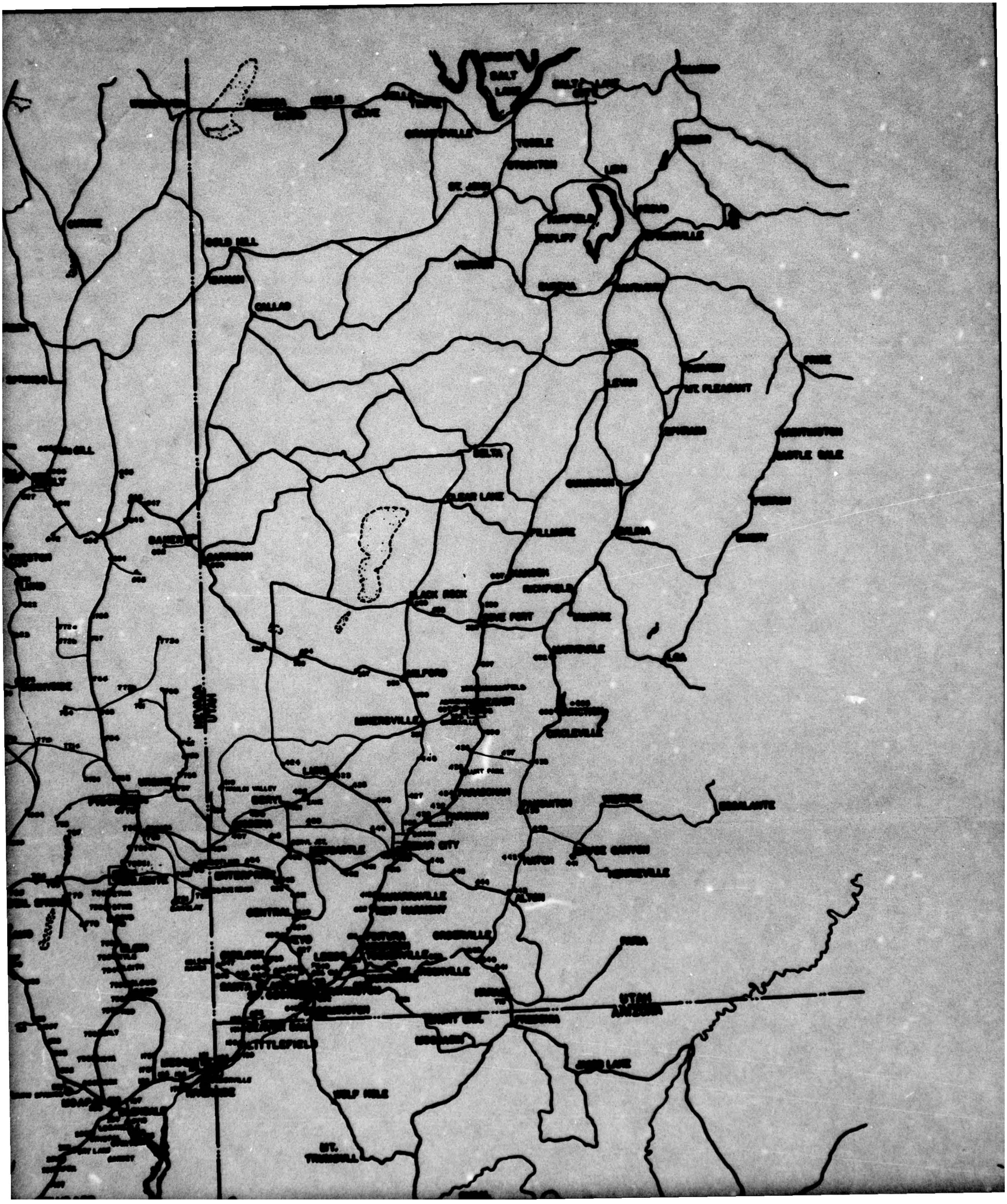
Automatic repeater stations were located at White Mountain (near Bishop), California; at Iron Mountain (near Cedar City), Utah; and at Ely, Pioche, and Angel's Peak (near Las Vegas), Nevada. Another base station was located at Lincoln Mine, Nevada for the use of the Air Weather Service.

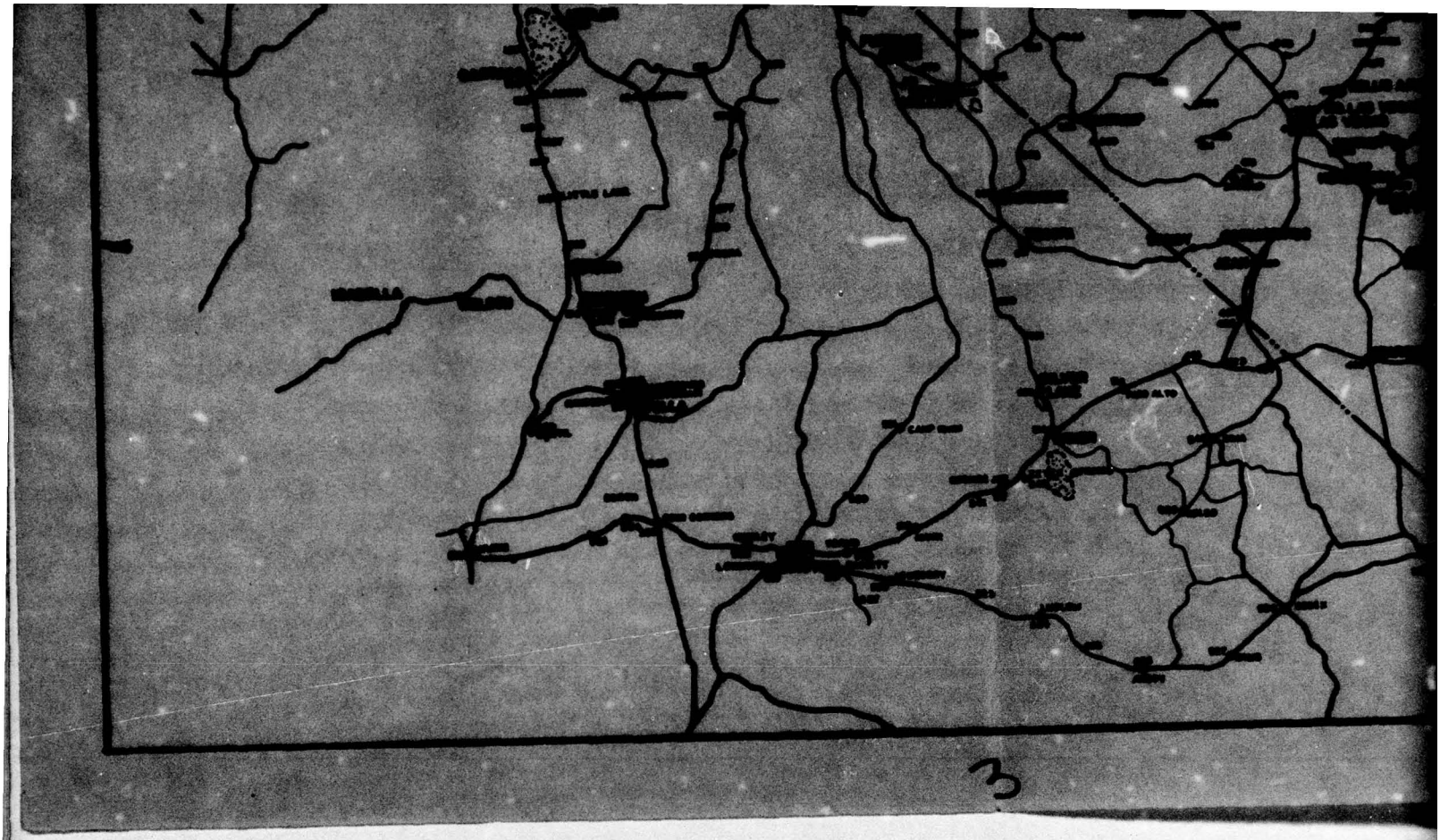
In addition to Lincoln Weather, the off-site net was used by Mercury Weather, microbarograph, seismograph, radio repair, and certain AEC communications personnel.

The radio net call sign was KMG 317, with each mobile unit given a three digit identification number.

Although the repeater stations were automatic, communications personnel were on duty shot days for relay work or repair should electronic or mechanical problems develop. Since the net was low band VHF, line-of-sight communication was possible between mobiles. Thus, should a repeater station go out of service, it was usually possible to use the radio operator's vehicle as a relay station.




SALT LAKE
SALT LAKE CITY
GRANTSVILLE
TOOELE
STOCKTON
ST. JOHN
VERNON
GOLD HILL
CALLAO
LEVAN
MT. PLEASANT
EPHRAIM
HUNTINGTON
CASTLE DALE
DELTA
CLEAR LAKE
FILLMORE
SALINA
RICHFIELD
BLACK ROCK
MILFORD
MINERSVILLE
CIRCLEVILLE
ESCALANTE
CEDAR CITY
BRYCE CANYON
HENRIEVILLE
ALTON
BERYL
CENTRAL
LITTLEFIELD
WOLF HOLE
ST. THOMAS
JACOB LAKE
UTAH
ARIZONA
NEVADA
UTAH



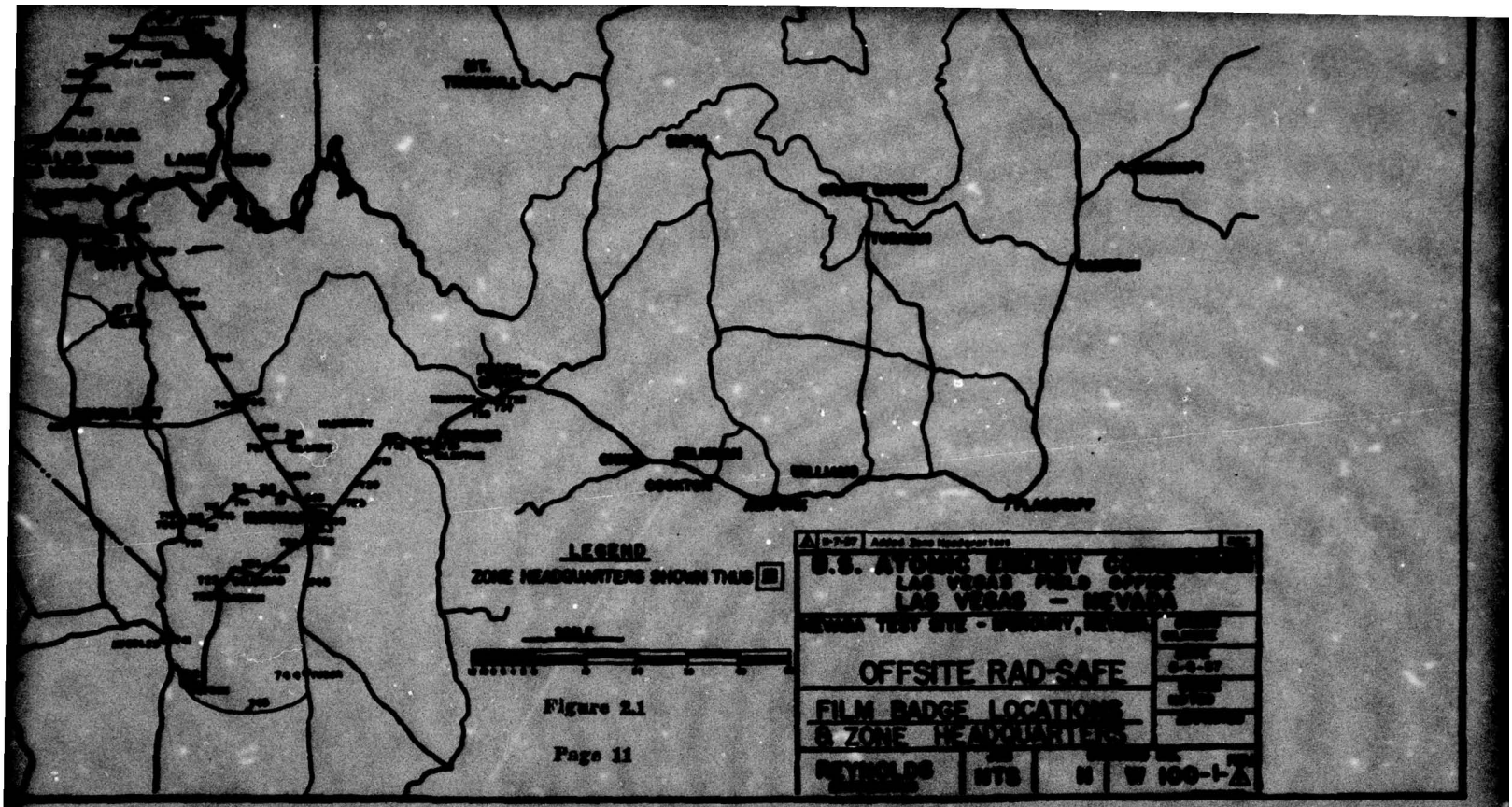

LEGEND
ZONE HEADQUARTERS SHOWN THUS
U.S. ATOMIC ENERGY COMMISSION
LAS VEGAS FIELD OFFICE
LAS VEGAS — NEVADA
OFFSITE RAD-SAFE
FILM BADGE LOCATIONS
& ZONE HEADQUARTERS
NTS
W 100-1-A

Figure 2.1

OFF-SITE RAD-SAFE PERSONNEL

State	No. of Persons	Health Dept.		Normal Work Affiliation			
		Local	State	PHS	Teacher	Industry	Other
Alabana	2				1	1	
Arizona	2				1	1	
Arkansas	2		1			1	
California	10	2	3	2		1	2
Colorado	5	1	3	1			
Connecticut	2	1			1		
Florida	3				1	1	1
Georgia	2		1	1			
Idaho	4	2		1			1
Illinois	5	2		1	2		
Indiana	2				2		
Kansas	2				1	1	
Louisiana	1		1				
Maryland	2	1				1	
Massachusetts	2	1					1
Michigan	1				1		
Minnesota	4	1	2	1			
Mississippi	1		1				
Missouri	5	1		2	1	1	
Montana	1					1	
Nebraska	2	1			1		
Nevada	1				1		
New Mexico	2	1	1				
New York	5	1	1	1	1	1	
North Carolina	2	1					1
Ohio	15			11	3	1	
Oklahoma	3				2	1	
Oregon	2	1					1
Pennsylvania	4				2		2
South Dakota	2		1		1		
Tennessee	10		5	2		2	1
Texas	5			2	2	1	
Utah	7		1	4	2		
Virginia	2				1		1
Washington	7	3	1		3		
Wisconsin	4	1	1		1		1
Wyoming	1		1				
Hawaii	1		1				
Washington, D.C.	19			18	1		
TOTALS	152	21	25	47	32	15	12

Figure 2.2

OFF-SITE RAD-SAFE ORGANIZATION

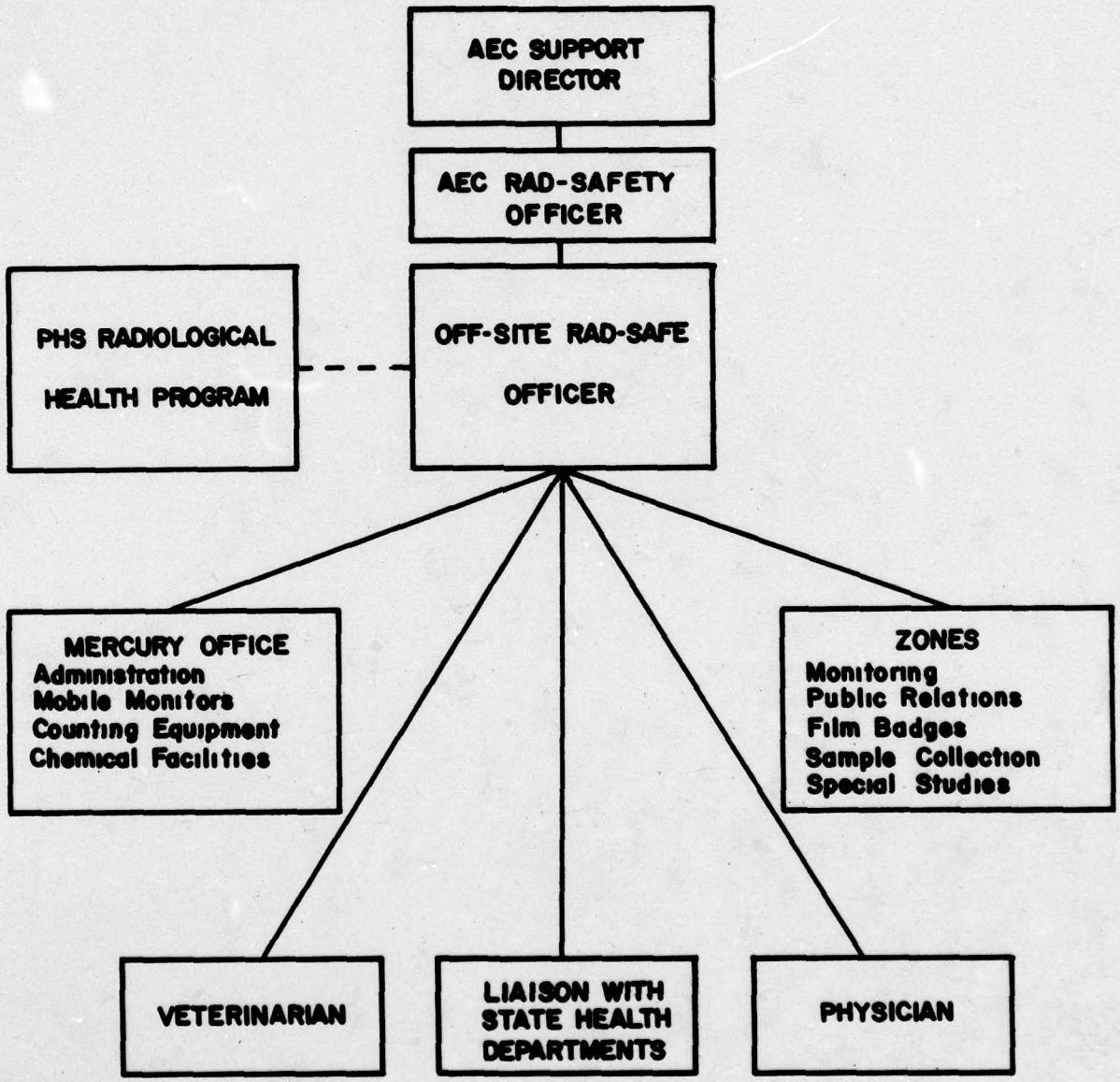


Figure 2.3

CHAPTER III

EQUIPMENT AND METHODS

3.1 General Procedures.

Equipment was selected, located and operated in such a manner as to insure maximum effectiveness in the collection of physical data pertaining to:

(a) Surface levels of activity (normally, three feet above ground level), as determined by the use of survey meters and continuous recorders.
(b) Concentration of airborne activity.
(c) External gamma dose received by persons and places by the use of film badges.
(d) Beta activity contained in milk and water.

Figure 3.1 indicates the amounts of field equipment and its distribution. The sampling locations for fixed equipment are also shown.

The equipment and procedures for sampling fallout and measuring radiation intensity are described in some detail below. A complete description may be found in the document "*Off-Site Radiological Safety Plan for Operation PLUMBBOB*", dated May 1, 1957. Detailed operating procedures along with "data" forms were prepared and distributed to all personnel during their briefing and orientation period. These written instructions contained general background information which augmented their usefulness as routine operational guides.

3.2 Surface Radiation Levels.

3.2.1 Portable monitoring (surface type) instruments were used to measure radiation intensity. These rates, along with other pertinent data, were then used to calculate the gamma dose received at a particular point. Each monitoring vehicle was supplied with four survey instruments, two Beckman Mx-5's (geiger type) and two AN/PDR-39 instruments (ionization chamber type) having intensity ranges from 0 to 20 mr/hr. and 0 to 50 r/hr., respectively. For general monitoring purposes, gamma readings were made at hip height above the terrain (approximately three feet).

The Mx-5 has an adjustable external beta shield which could be used to differentiate gamma intensities from beta plus gamma intensities. All beta-gamma ratios were determined using this particular instrument. Toward the end of the operation, several Precision Model 111 Scintillators became available and were used for the determination of low level gamma intensities (range 0 to 5 mr/hr.).

All instruments were checked and calibrated before issue and as frequently as deemed necessary. Cobalt-60 sources were used for calibration both at Mercury and in the field.

During monitoring readings, the instruments in use were left "on" and monitoring was performed from inside the vehicle as long as background only was encountered. When the level reached twice background, monitoring was done outside and at least 25 feet from the vehicle. Readings were recorded at about 10-mile intervals although in populated places or when intensities varied considerably with distance more frequent readings were made.

In general, it was possible to have at least one monitoring team in an area during fallout. Such being the case, the time of fallout at this particular point could then serve as a basis for estimating time of fallout in other areas. This data is necessary to accurately calculate a radiation dose using intensity values obtained from survey meters.

Intensive monitoring was conducted during the early stages of fallout to determine as soon as possible the pattern and the intensities in populated areas and at strategic places such as major highways. Remonitoring was performed to be sure fallout was complete, and to obtain additional measurements using different instruments operated by different individuals. Monitoring activities were continued until it was thought no further useful data could be collected or because another detonation was imminently scheduled. It was necessary in a few instances to compromise slightly between completing today's shot activities and the necessary preparation for tomorrow's shot.

Survey instruments were also used in shielding, weathering, and time-intensity studies. Readings were made inside and outside various structures and these readings along with structural characteristics were used to determine shielding properties. For weathering studies, stakes were driven into the ground and readings were taken at these stakes over a period of time. The radioactive decay at each of these stations could then be compared with theoretical fission product decay. Time-intensity measurements are similar to weathering readings except these readings were taken during fallout build-up and initial decay until a net decrease in activity took place.

3.2.2 Continuous Evershed Recorders connected to a geiger chamber were used to continuously record gamma intensities at selected locations. These units produced a permanent record whenever fallout occurred at their locations. The records were used to determine times of arrival, fallout build-up characteristics, and decay features.

Another important use was to provide a visual presentation of gamma intensities for public view. They were useful from a public relations standpoint even when recording background.

3.3 Airborne Radioactivity Concentrations.

Staplex high volume air samplers fitted with an 8 by 10-inch sampling head were used with a glass fiber filter to collect airborne contaminants. The effective sampling area was 63 square inches and the rate of flow was in the range of 0.5 to 2.0 cubic meters per minute. The standard sampling period was 76 hours beginning at shot time. This period included seven filter changes ranging from time periods of 2 to 24 hours. More frequent filter changes were made when fallout occurred or when the flow rate decreased appreciably. Background samples were generally run prior to each detonation.

All filter samples were returned to Mercury for gross beta (and infrequently alpha) counting. Proportional counters using methane gas in conjunction with Sr-90 + Y-90 (or FU-239) standards were used for laboratory counting. For purposes of calculation, activity measured was extrapolated to mid-collection time. The method of calculation resulted in a visual presentation of airborne activity during each incremental sampling period. Air activity concentrations were finally expressed as total microcuries per cubic meter of air averaged over a specific sampling period. In the case of long-lived alpha activity, the results were expressed as disintegrations per minute per cubic meter.

Although the number of sampling stations operated per shot varied slightly, approximately 185 individual filter samples were collected and counted following each detonation.

3.4 Film Badges.

DuPont film packet type 559 film badges, consisting of two film components (type 502 and type 606), were used. The badges were placed in communities, along highways at 10 to 30-mile intervals, in strategic desert locations, on representative people in various towns and ranches, and in schools in the off-site area with the exception of the Las Vegas school system. At schools, badges were placed inside the building, outside, and usually on at least one member of the faculty. The people in the town of Alamo were essentially all badged in an effort to determine the problems involved in placing and collecting film badges from a relatively small "non-captive" group of several hundred individuals.

Badges worn by representative people were normally attached to the outer clothing, while the "area" badges were mounted with either masking tape or placed in glassine envelopes which were tacked to a post, tree, or building. The film packs in either case, were sheathed in a water-tight plastic envelop.

Film badges were placed prior to the first event and were changed at approximately monthly intervals. The last change was made several weeks after the last event. This latter set of badges were thus used to measure residual fallout. The collected badges were returned to Mercury and the dosage calculated by comparing their net optical density to that of similar badges exposed to a CO-60 standard.

About 2,700 film badge stations were established. This meant that 2,700 film badges were in place to monitor fallout at the various stations before, during, and following the test series. Using this procedure, data are available on incremental additions of activity; overall exposure during the time period covered; the effect of certain structures on reducing gamma radiation intensities; and, by comparison with dosages calculated from monitoring readings, the effectiveness of survey meters for obtaining information from which gamma dosages are calculated.

3.5 Activity Contained in Milk and Water.

Milk samples were collected from selected herds in each zone, from retail stores, from processing plants in the off-site area, and from any herd which was thought to be in the fallout area. Such a program will reveal the maximum gross activity contained in milk as well as the average levels to which the general population consuming the milk would be exposed. Samples were collected periodically with enough flexibility in sampling to insure adequate samples to define any given situation.

Water samples were collected from surface and sub-surface water supplies, irrigation canals, and stock watering ponds. Specific sampling stations were established and sampled routinely. Here again, samples were taken from any given point which could possibly be affected by fallout.

The first sets of water and milk samples were collected prior to the start of the series. After assay, these data were used as the normal background radiation level. It could then be determined if the series produced contamination and if so, the relative magnitude.

Milk and water samples were sent to Mercury for assay. Sample preparation was accomplished by wet ashing procedures using nitric acid and hydrogen peroxide. Residues were transferred to counting dishes; a wetting agent added; dried under infra-red lamps; and were counted in proportional counters. Sr-90 + Y-90 standards were used for instrument calibration. The results are expressed as microcuries per milliliter.

3.6 Personnel Monitoring.

Each person actively engaged in the off-site program was supplied with a DuPont type 559 film packet and a 0-5 roentgen Bendix dosimeter. The dosage recorded by the film badge was used as the official exposure record as required by the SOP-NTO. The dosimeter was to be used for individual information and not as a part of the official record.

3.7 Laboratory Equipment.

The chemical laboratory was equipped to perform simple chemical procedures. Samples could be processed for counting and some radioisotope separations could be made.

The counting room contained several proportional counters connected to either scalers or through count rate meters to Esterline-Angus recorders. Methane was used as the counting gas. The probes and sample housings were specifically designed to accommodate the type samples collected. The counting equipment was obtained from Los Alamos Scientific Laboratory and by purchase from commercial sources.

DISTRIBUTION OF FIELD EQUIPMENT

Zone Headquarters	Air Sampling Station	No.	Continuous Recorder Locations	Radio Equipped Vehicle	Number of Personnel
Alamo, Nevada	Alamo, Nevada	1	3	2	3
Beaver, Utah	Beaver, Utah	1		1	2
Bishop, California	Bishop, California	1		1	2
Barstow, California	Barstow, California	1		1	2
Caliente, Nevada	Caliente, Nevada	1	1	1	2
Cedar City, Utah	Cedar City, Utah	1	1	1	2
Ely, Nevada	Ely, Currant, & Lund, Nevada	3	1***	2	3
*Eureka, Nevada	Eureka, Nevada	1		1	1
Kingman, Arizona	Kingman, Arizona	1	1	1	2
Las Vegas, Nevada	Las Vegas & Nellis AFB, Nevada	2	1***	1	1
Lincoln Mine, Nevada	Lincoln Mine, Nevada	1	1	2	2
Mercury, Nevada	Mercury & Indian Springs, Nevada	2	1***	1	1
Overton, Nevada	Overton, Nevada	1	2****	1	2
*Mesquite, Nevada	Mesquite, Nevada	1	1	1	1
Pioche, Nevada	Pioche, Nevada	1	1	1	2
St. George, Utah	St. George, Utah	1	1	1	2
Tonopah, Nevada	Tonopah, Nevada	1	1	1	2
**Watertown, Nevada	Watertown, Nevada	1	1	1	1
TOTALS		22	17	21	33

* Sub-zones

** Special assignment from Mercury

*** Located at zone headquarters

**** One located at Warm Springs Ranch, Nevada

NOTE: All vehicles were equipped with suitable monitoring instruments.

Figure 3.1

CHAPTER IV

PUBLIC RELATIONS

4.1 General Procedures.

It was recognized that adequate public understanding is essential to the successful operation of the Nevada Test Site. The off-site program was designed to establish and maintain good public relations in those areas adjacent to NTS. This program was accomplished by contacts and talks prior to the series, by the system of zone personnel living in various off-site communities and having responsibility for activities within a specified area, by answering all questions and by immediately following up each incident reported. This program, on a more local and personal basis, closely paralleled the general program carried out by the Office of Test Information.

Personnel (see Figure 2.2) recruited for off-site duty were generally those having a background in public health work. Such work inherently involves contacts with the general public. There are many similarities between "selling" continental weapons tests with their resultant fallout and "selling" a milk control program or mosquito abatement program. The major difference in such activities is one of terminology. About thirty percent of the personnel were recruited from state and local health departments, thirty-one percent from the Public Health Service, and thirty-nine percent from industry, colleges, and other sources such as highway programs and agricultural activities.

The public relations program during the operation laid the general groundwork for a continuing program, on a more limited scale, during the interim period. This continuing program includes formal talks and showing of pertinent films as well as individual contacts.

Even with reduced fallout during this series, good public relations in the off-site area were more difficult to maintain than during Operation TEAPOT. Many circumstances undoubtedly contributed to this situation. Among these reasons would be the increased publicity given to radioactive fallout, the length of the operation and the total number of detonations.

The single fact that off-site monitors (many with families) lived in communities went a long way in establishing good public relations. Since they and their families were willing to live in these areas, the public felt that any potential hazard from fallout must not be too bad. In addition, monitors were available 24 hours a day to render service to the people in their zones. Such service went far beyond the problem of fallout and its effects. For example, a window pane was purchased and installed by monitors at one ranch to replace one broken by blast.

The public relations program conducted by Off-Site may be divided into several general categories. These categories, selected by type of presentation, are discussed below.

4.2 Movies.

The off-site program had available seven films for showing to off-site inhabitants. Several copies of some of the films were placed in service. The titles of the films were: "A is for

Atom", "Atomic Energy", "Atomic Tests in Nevada", "Bikini Radiological Laboratory", Fundamentals of Radioactivity", "Power Unlimited", and "Primer on Monitoring". Wide use was made of this film service. The films pertained to fallout or radioactivity and were, in general, suitable for general attendance or for special groups such as engineering or science classes. Figure 4.1 presents a summary of the films shown and the numbers of people that attended while Appendix II is a complete tabulation of the films shown, the location and date of the viewing, the type group, and the attendance. It should be noted that the seven films were shown a total of 269 times to an audience of more than 11,000 people.

This service is continuing in several ways. First, films are used during the interim period when meetings are scheduled in the off-site area. Second, off-site participants request the use of these films for meetings at which they are asked to prepare a program. This second use is extensive and disseminates radiological safety information on a small scale on a nation-wide basis. Probably 20 percent of the off-site participants (monitors) have made use of this service. These meetings are generally presented to professional or service organizations.

4.3 Talks.

All zone personnel were encouraged to present talks at every opportunity. A large number of persons were reached through this means. A complete tabulation of these meetings is not available as many of the smaller meetings were not recorded. However, the figures which are available are included as Figure 4.2. These data indicate the type group, date of talk, and the attendance. A total of 32 talks were given to an audience of approximately 1,000. These talks were primarily concerned with the off-site program and the PLUMBBOB Operation, although not limited to these subjects. Radioactivity and its effects were subjects that received major consideration. To indicate the interest of off-site residents in the specialized knowledge of our monitors, one talk on insect control was requested and presented.

4.4 Radio and Television Programs.

Off-Site personnel participated directly in one television and twelve radio programs. These normally took one of two forms. Either they were a statement of the off-site operations and a discussion of equipment, methods, and results or were of the interview (question and answer) type. Other programs, which did not involve direct participation, were based on off-site operations. Material for such programs was obtained by interview and photographs. The number of people reached by these media would be difficult to calculate.

4.5 Formal Demonstrations.

Several demonstrations, including displays at two fairs, were presented. At the Tri-County Fair and Rodeo held at Bishop, California for four days starting August 30, it was estimated that 2,500 people observed the display of equipment and official Test Site photographs. A similar exhibit, but including a uranium and thorium mining and processing layout which depicted the attending health problems, was presented at the fair held in Las Vegas in September. Although a count is not available, a conservative number of 15,000 could be made for the number of people that saw the exhibit.

On an informal basis, monitoring instruments and other equipment were loaned to selective people, such as science class teachers, for their use in classroom demonstration.

Every opportunity to demonstrate sampling equipment and methods of operation to groups and individuals was utilized.

4.6 Information Booklets.

The green book, "Atomic Tests in Nevada", was used on an extensive scale. Approximately 30,000 copies of this book were distributed to groups, to individuals, and to various contacts for secondary distribution. Such contacts included state and national park personnel, service station operators, motel owners, post offices, stores, schools, etc.

In response to written inquiries concerning nuclear weapons tests, fallout, and related subjects, many questions could be answered by sending a copy of "Atomic Tests in Nevada".

Good public relations were aided by the widespread use of this book. It was well received in all quarters.

4.7 Personal Public Relations.

Although thousands of people were contacted by formal means such as public meetings and film showings, many thousands of others were contacted on an individual "personal" basis. Since zone personnel lived in the off-site area, they were available to be of service to off-site inhabitants on a day-to-day basis. Also, between shots, visits were made to smaller communities and individual ranches. It was the rule, rather than the exception, for off-site personnel to drop by isolated ranches or farms to discuss fallout over a cup of coffee.

Many services, not related to test operations, were performed by off-site personnel. Among these services could be listed fixing flat tires, towing vehicles, installing window glass, driving cars, fixing electric generators, milking cows, carrying messages, etc. Such services tended to make each monitor an integral part of the community, "someone who could be turned to for information and whose judgment could be relied upon".

This type of approach probably did more real good than the more formal type, although both are useful and necessary. Since most problems are personal, the best approach would appear to be along the same line. Persons opposed to nuclear testing changed their views while many others became less adverse in their way of thinking.

4.8 Liaison with States.

Prior to PLUMBBOB, the state health departments of California, Nevada, Utah, and Arizona were contacted by visit or telephone. They were briefed on the coming test series with emphasis on the off-site program within their respective states. Procedures, methods, general expected results, and location of off-site personnel were presented. They were encouraged to contact field personnel or Mercury headquarters concerning any problems or questions that might arise as a result of test operations. Furthermore, they were asked to cooperate with field personnel in making their job easier. Up-to-date lists of off-site

personnel with their addresses and telephone numbers were furnished periodically to each health department. Many data were obtained from health department personnel pertaining to water supplies, milk sheds and processors, locations of ranches and farms, and population figures.

Following each detonation, the pertinent state health departments were contacted by telephone and briefed as to fallout and predicted cloud trajectories. California requested and was placed on a special Test Manager's shot notification teletype. In turn, the health departments contacted the off-site organization on several occasions concerning fallout or related problems.

As a part of this liaison program, several officials from each of the four pertinant state health departments were invited to Nevada Test Site to witness a detonation, tour Mercury and the forward area, and receive orientation regarding the test program conducted by AEC and its contractors. The state health officers from Arizona and Nevada and the state sanitary engineer from Nevada visited NTS for these purposes. The state sanitary engineers from Utah and Arizona attended the PHS training course held at NTS in February. Several off-site participants were recruited from the state health departments of Utah and California.

4.9 Cooperation with Newspapers and Periodicals.

Many helpful articles appeared in various newspapers and national periodicals covering the operation of the off-site program. The background material for such articles was obtained through contact with zone personnel. These contacts included interviews and still photography. The photographs were usually of zone personnel in their normal routine of placing film badges, collecting water and milk samples, or air sampling and monitoring duties. All personnel were requested to cooperate to the fullest extent with all news media representatives.

4.10 Training Film.

During August, a three-man PHS film crew made a movie of off-site operations. This involved work at Mercury, the forward area, and in several communities in the off-site area. Many off-site inhabitants appeared in the film and were most cooperative.

The film has been released for training and public relations purposes. It should be very useful for orientation, for recruitment of off-site personnel, and for public relations, in areas adjacent to NTS.

4.11 Visit of Ranchers to Nevada Test Site.

Several ranchers and their families were invited to visit NTS and witness a nuclear detonation from the forward observation point. Those that attended were gratified with the opportunity and satisfied with the results of their visit. During their stay at Mercury, they were briefed on test activities, given a tour of Mercury facilities (including several meals and a night spent in the dormitory), observed past test effects in Frenchman and Yucca flats, and witnessed a nuclear detonation.

From their remarks, it appeared that much good will was obtained from this visit. It is certain that all their friends were told of the trip to Mercury and what had been heard and seen there.

SUMMARY OF FORMAL PUBLIC RELATIONS PRESENTATIONS USING FILMS

Title of Film	Number of Showings	Total Number of Viewers
A is for Atom	65	2,746
Atomic Energy	32	1,178
Atomic Tests in Nevada	140	6,133
Bikini Radiological Laboratory	13	327
Fundamentals of Radioactivity	1	23
Power Unlimited	8	568
Primer on Monitoring	10	218
TOTALS	269	11,193

Figure 4.1

SUMMARY OF FORMAL PUBLIC RELATIONS TALKS

Location	Date	Group	Attendance
Alamo, Nevada	5/10	Alamo High School Faculty and Students	45
Beaver, Utah		LDS Church	60
Beaver, Utah		LDS Church	20
Beaver, Utah		LDS Church	60
Beaver, Utah		LDS Church	80
Big Pine, California	5/9	Big Pine Unified School Science Class	15
Bishop, California	5/10	Bishop High School	45
Bishop, California	5/13	Bishop Chamber of Commerce	25
Bishop, California	5/13	Bishop City Council	5
Bishop, California	7/21	Owens Valley Cattlemen's Assoc.	70
Bishop, California	7/24	State Highway Department	25
Bunkerville, Nevada	5/20	Boy Scout Council	12
Caliente, Nevada	5/17	Caliente Rotary Club	13
Caliente, Nevada	7/25	Caliente Rotary Club	15
Cedar City, Utah	5/14	College of Southern Utah Faculty	20
Ely, Nevada	5/8	City & County School Principals	20
Ely, Nevada	8/11	LDS Church	27
Independence, Calif.	5/8	Inyo County Court Personnel	15
Kimberly, Nevada	6/12	Kimberly Residents	65
Kingman, Arizona	7/31	Local Civil Defense Group	20
Kingman, Arizona	9/13	LDS Church	40
Kingman, Arizona	9/15	LDS Church	45
Las Vegas, Nevada	8/1	Rotary Club	50
Lincoln Mine, Nevada	5/8	PTA Group	44
Lincoln Mine, Nevada	5/10	Community Meeting	15
Mercury, Nevada (near)	6/15	Cold Creek Boy Scout Camp Staff	9
Mojave, California	6/11	Mojave Lions Club	35
Pioche, Nevada	6/26	Pioche Lions Club	22
Pioche, Nevada	8/14	Pioche Lions Club	25
Tonopah, Nevada	5/7	Tonopah Rotary Club	20
Tonopah, Nevada	5/8	Tonopah High School Faculty	14
Warm Springs, Nevada	7/27	Ranchers Group	8

Total Meetings: 32
Total Attendance: 984

Figure 4.2

CHAPTER V

MEDICAL PROGRAM

5.1 One or more full-time physicians, with specific training in the field of radiological health, were on the staff of the Off-Site Rad-Safe Officer. They were responsible for establishing and maintaining liaison with local physicians, investigating all cases of alleged radiation injury to people, answering questions on the medical effects of radiation, and conducting meetings for various groups on the subject of biological effects of nuclear radiation.

Prior to the start of PLUMBBOB, these medical officers visited all the physicians within the off-site area. The visits were used to get acquainted with the local doctors and to orient them on the biological effects of radiation. These trips served to familarize them with the geographical off-site area and presented an opportunity for them to become versed in some of the local medical problems.

All investigations were made by working with local doctors. This procedure eliminated any chance of criticism about professional ethics, increased the patients' confidence in the examination and medical opinion, and did much to familiarize the local physicians in regard to radiation matters.

5.2 General Procedures and Activities.

The general procedure was to have the patient brought to his own physician's office and have the off-site physician available on request for consultation. If necessary, off-site monitors provided the transportation. The costs for such examinations were paid by the AEC through Reynolds Electrical and Engineering Company, Inc.

During the test series, the off-site physician saw 59 cases, of which six were reported first by the attending physician. The cases may be divided into four general categories: according to symptoms which primarily are referable to the skin, eyes, long-term effects, and those of a generalized nature. The results of such a breakdown by zones are presented as Figure 5.1.

It should be pointed out that Figure 5.1 is a list of complaints, and as such should not be interpreted as a list of valid cases of injury. Actually, only one case was directly attributed to the test series. This case involved a rancher who injured himself as a result of the startling effect due to blast. He was treated by his attending physician and released from medical care.

In the Currant, Nevada area there was an outbreak of enteritis which the people attributed to fallout. With the cooperation of two internists from other services and the doctors and facilities of the Steptoo Clinic in Ely, it was determined that these patients had an infectious enteritis. The State Board of Health was alerted and requested to do bacteriological examination of water and milk in the Currant-Duckwater area. There were at least 11 persons in two families who were affected, with the possibility of more cases in two additional families. The 11 known cases were from a ranch where the only water supply was an open dug well in which the water level varied with the amount of irrigation done in the fields immediately upstream from the well.

The skin conditions observed by the medical officers in most cases were typical of allergic dermatitis. In one case, there was the question raised of a self-induced thermal burn. This case had a lesion most closely resembling a beta burn, but had healed like a themal burn and was diagnosed as such by the attending physician.

There were several cases of sunburn which the patients thought were due to radiation; but the size, distribution, and time-sequence of events would not substantiate the diagnosis of nuclear radiation inflicted burns.

Two types of eye conditions were seen. One was flash blindness, and the other was itching, lacrymation, and reddening of the conjunctiva over a prolonged period of time. There were two cases of flash blindness in the off-site area which were attributed to nuclear detonations. The remaining cases all had the appearance of chemical irritation or of allergic reactions.

Other cases were those of people who just "didn't feel well", or who had generalized malaise, or cases of enteritis. In most of these cases it was sufficient for the medical officer to discuss the possible biological effects of radiation with them and they would realize that the symptoms which they had could not be due to fallout.

Of all the cases seen by the off-site physician, only four were referred to other physicians with the Test Organization agreeing to pay the doctor's fees. The four cases included the blast injury previously mentioned while the other three cases were related to eye effects and were referred to an opthalmologist.

There was one case of leukemia in the immediate off-site area which has been referred to many times as being caused by fallout. This patient died in 1956. In discussions with the Nevada State Board of Health, they indicated that the reported incidence of leukemia for the year 1956 in Nevada was identical with the reported incidence for 1956 for the United States as a whole. Also, the Nevada state incidence of leukemia each year since the first test series has very closely paralleled the national incidence of leukemia.

The off-site physician presented nine public relations talks including one television and two radio programs. The other six programs were presented to civic clubs and medical meetings.

LIST OF CASES SEEN BY OFF-SITE PHYSICIAN

Location (Off-Site Zone)	Symptoms Referrable to The:				Examination Requested by Attending Physician	Total Each Zone
	Skin	Eyes	Long-Term Effects	Generalized		
	(Some had symptoms in more than one system)					
Alamo	8	1		4	1	11
Caliente	2					2
Ely	1			6	2	7
Eureka	2					2
Las Vegas	4	1		4		8
Lincoln Mine	16	5	1		2	21
Mesquite	1			1		1
Overton			1			1
Pioche	1				1	1
St. George	4		1			4
Tonopah	1		1			1
TOTALS	40	7	1	18	6	59

Figure 5.1

CHAPTER VI

VETERINARY PROGRAM

6.1 One or more full-time veterinarians, with specific training in the field of radiation, were on the staff of the Off-Site Rad-Safe Officer. They were responsible for establishing and maintaining liaison with local veterinarians, investigating all cases of alleged radiation injury to animals, answering questions on the effects of radiation on animals, and conducting meetings for various interested groups on the effects of nuclear radiation on animals.

6.2 General Procedures and Activities.

To accomplish these objectives, the following steps were taken:

(1) Individual ranchers were contacted and in particular those who had previously made claims of fallout damage or exhibited concern but had not filed formal claims. An attempt was made in each instance to explain the effects of radiation to animals and the relationship of these effects to the fallout encountered in the off-site area. The radiation effects that had been found were also discussed. Ranchers were told that if they experienced animal damage or loss which they thought might be caused by radiation, veterinary diagnostic service would be provided by the AEC in order to give as complete an answer as possible to their problem.
(2) Similar discussions were held with all of the County Agricultural Agents of southern Nevada and southwestern Utah, the Bureau of Land Management, personnel of the Nevada Fish and Game Commission, local U. S. Fish and Wildlife Service, local National Park Service, and all the practicing veterinarians of the off-site area.
(3) Veterinary diagnostic, regulatory, and teaching facilities, both state and federal, at Reno, Nevada; Logan, Provo, and Salt Lake City, Utah; and Davis and Sacramento, California were visited and the veterinary activities of the test organization explained.

After these contacts, a series of investigations were started covering the following subjects in order to establish animal "normals" for the area: community disease history, nutrition, toxic elements, toxic and injurious plants, parasites, meterological conditions, management practices of ranchers and wildlife officials, and radiation effects on off-site animals.

Prior to PLUMBBOB, 78 animal cases were opened in which the above categories are being studied. Also, veterinary assistance was given to the U.S. Fish and Wildlife Service, Nevada Fish and Game Commission, and the University of Nevada research group engaged in nutrition studies of range cattle. These studies are in progress on a continuing basis.

Public relations contacts were made with 18 individuals, 21 agencies or groups, and two veterinary practitioners. These contacts consisted essentially of discussing some basic concepts of radioactivity fallout from continental weapons test, effects of radiation on animals, types of radiation and levels encountered, studies in progress and those planned.

A total of 36 cases were opened of which 14 were classified as inquiries, 20 as complaints, and 1 as a formal claim. This claim was originally opened in March of 1955 and later the same year denied. The case was reopened in June 1957 and again denied.

These activities are summarized in Figure 6.1, Veterinary Activities.

In addition to the continuation of these activities, a program for Field Investigations in Off-Site Animals has been approved. The basic purposes for this program are:

(1) to enhance the NTS-Off-Site Rancher relationships through an active investigative program in their interests and

(2) to provide further information as to the actual effect on animals living in an area of potential contamination by radioactive fallout. This program will continue for five years.

VETERINARY ACTIVITIES

Type Activity	Pre-Operational Period	During PLUMBBOB
Public Relations Contacts:		
Individuals	Not Known	18
Agencies or Groups	26	21
Veterinary Practitioners	11	2
TOTAL	37+	41
Cases Opened:		
Inquiries	77	14
Complaints	0	20
Claims	1	
Substantiated	(0)	(1)
Denied	(1)	(1)
TOTAL	78	36

Figure 6.1

CHAPTER VII

RESUME OF INDIVIDUAL SHOTS

This section contains a brief summary for each detonation which produced some effect off-site. Effect is defined as positive monitoring readings or air sampling results even though these were of minor magnitude. Several safety shots are thus excluded from this discussion. While only condensed highlights are presented here, complete data are contained in the files of the Las Vegas Branch.

Each shot summary includes general information, direction of fallout, maximum beta air concentration measured, liaison activities with state health departments, maps depicting gamma dosage in terms of infinite and estimated dose, and a table of doses in populated places when the infinite dose exceeded 10 mr.

In some cases, all the above-mentioned items are not available. For example, not enough fallout was measured to construct a map or perhaps there were no gamma doses exceeding 10 mr. in any populated place. On one occasion, two detonations occurred several hours apart and the results from these shots are combined into one set of maps.

Maps are not presented for certain balloon shots due to the uncertainty of differentiating the minor (from the standpoint of population dosage) incremental additions of radioactive materials from substantial residuals from previous tower shots having the same general pattern.

A word of caution regarding the meaning and usefulness of fallout maps is in order. Such a map is a convenient pictorial method of illustrating general direction and area intensities. They are not suitable for determining the intensity or dosage at a given point and at best could be only semi-quantitative for this purpose. To determine dosage at a specific location, one should use the closest monitoring or film badge reading.

Figure 7.1, Shot Schedule, includes the name of the detonation, date and time (standard Pacific time) fired, type shot, the firing area, and an assigned number used for our record purposes. "Wheeler" and "Coulomb B" produced results off-site and are assigned the number 18. This table is complete in that it includes all regular nuclear detonations as well as the safety tests. The five safety shots were "Coulomb A", "Pascal A", "Saturn", "Pascal B" and "Coulomb B". There were no off-site effects from "Pascal A", "Saturn" and "Pascal B".

7.1 "Boltzmann" Summary.

Shot number 1, "Boltzmann", was a 500-foot tower detonation which was fired at 4:55 A.M. on May 28, 1957. The cloud proceeded generally in a northwesterly direction with fallout occurring in the vicinity of Tonopah, Belmont, Round Mountain, Millett, Austin, Eureka, Warm Springs, Lockes, Currant, Preston, Lund, Ely, Goldfield, Manhattan, McGill, Kimberly, and New Ruth, Nevada.

The "Boltzmann" cloud mass, specifically the 30,000 foot portion, moved northwest, then west, out over the Pacific north of San Francisco, back over the coast north of Santa

Barbara, east to northern Arizona, north to the Salt Lake City area, did a loop around Salt Lake, and then proceeded east. This atypical movement in conjunction with rain in the downwind direction caused fallout or rainout in the Reno, Wadsworth, Fernley, Hazen, Fallon, Schurz, Hawthorne, Mina, and Basalt, Nevada areas as well as in the vicinity of Portola, Blairsden, Spring Garden, and Quincy, California.

SHOT SCHEDULE

Name	Detonated Date-1957	Time	Type	Area	Number
Boltzmann	5/28	4:55 AM	500-foot Tower	7C	1
Franklin	6/2	4:55 AM	300-foot Tower	3	2
Lassen	6/5	4:45 AM	500-foot Balloon	9A	3
Wilson	6/18	4:45 AM	500-foot Balloon	9A	4
Priscilla	6/24	6:30 AM	700-foot Balloon	B-F	5
Coulomb A	7/1	10:30 AM	Safety Shot	S-3h	6
Hood	7/5	4:40 AM	1,500-foot Balloon	9A	7
Diablo	7/15	4:30 AM	500-foot Tower	2b	8
John	7/19	7:00 AM	Air-to-Air Rocket	Yucca	9
Kepler	7/24	4:50 AM	500-foot Tower	4	10
Owens	7/25	6:30 AM	500-foot Balloon	9A	11
Pascal A	7/26	1:00 AM	Safety Shot	U-3e	-
Stokes	8/7	5:25 AM	1,500-foot Balloon	7b	12
Saturn	8/9		Safety Shot	UG-U-12c	-
Shasta	8/18	5:00 AM	500-foot Tower	2a	13
Doppler	8/23	5:30 AM	1,500-foot Balloon	7b	14
Pascal B	8/27	3:35 PM	Safety Shot	U-3d	-
Franklin Prime	8/30	5:40 AM	750-foot Balloon	7b	15
Smoky	8/31	5:30 AM	700-foot Tower	2c	16
Galileo	9/2	5:40 AM	500-foot Tower	1	17
Wheeler	9/6	5:45 AM	500-foot Balloon	9	18
Coulomb B	9/6	1:05 PM	Safety Shot	S-3g	"
La Place	9/8	6:00 AM	750-foot Balloon	7	19
Fizeau	9/14	9:45 AM	500-foot Tower	3b	20
Newton	9/16	5:50 AM	1,500-foot Balloon	7b	21
Rainier	9/19	10:00 AM	Underground	12	-
Whitney	9/23	5:30 AM	500-foot Tower	2	22
Charleston	9/28	6:00 AM	1,500-foot Balloon	9	23
Morgan	10/7	5:00 AM	500-foot Balloon	9A	24

Figure 7.1

Beta activity in the air was reported from Phoenix, Arizona and Salt Lake City, Utah. This resulted from the unusual cloud path as outlined above.

Monitoring runs, which indicated activity substantially above background, were made on U.S. 95 between Beatty and Tonopah, Nevada; on U.S. 6 between Tonopah and Ely, Nevada; on Nev. 8A between U.S. 6 and Austin, Nevada; in the McGill and Lund, Nevada areas; along Nev. 69 near Manhattan, Nevada; along Nev. 82 in the Belmont area; along the desert roads between Nevada Test Site and U.S. 6 to the northwest; and due to rain-out, highways in the general vicinity of Fallon and Reno, Nevada and Quincy, California. Numerous other monitoring runs were made with negative results on other highways and in other areas.

The maximum air concentration found was 3.14×10^{-2} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 28.5-hour sample period starting at H + 0.6 hours.

The state health officers of Nevada and Utah were informed immediately after the shot as to the probable cloud direction and possible consequences. Due to the unexpected direction of the cloud and to rain-out, numerous contacts were made with Utah, Nevada, and Arizona Civil Defense and State personnel. The Bishop monitoring team was sent to Quincy to monitor and to explain the significance of the small fallout in that area. Later, at the request of the PHS Regional Office, this team monitored and talked to personnel in Yosemite Park. Public Health Service doctors were sent to Reno to talk to state and other personnel in that area.

The Radiological Health Program, PHS, Washington, was informed as to the results of the shot and fortunately were thus in a position to answer numerous inquiries.

The State Sanitary Engineer of Nevada was briefed so that he might answer queries regarding milk and water supplies in that area and the Off-Site Rad-Safe officer agreed to run water and milk sample analyses for him.

7.2 "Franklin" Summary.

Shot number 2, Franklin, was a 300-foot tower detonation which was fired at 4:55 A.M. on June 2, 1957. The higher portion of the cloud moved slowly to the east while the lower portion traveled slowly to the north.

Monitoring activities were performed in all zones with specific mobile monitoring runs made from Gate 385 north to the road to Kawich Valley, west through Kawich Valley past the Tonopah Ballistics Range to Highway U.S. 6, west to Tonopah, then southeast on U.S. 95 to Mercury. The Watertown and Warm Springs, Nevada areas were also monitored. No activity, substantially above background and not resulting from "Boltzmann", was found on any of these monitoring runs. Therefore, no fallout map or table of estimated doses is included.

The maximum air concentration found was 6.19×10^{-3} uc/m^3 at Beaver, Utah. This represents the average air concentration of beta activity for a 28.1-hour sample period starting at shot time.

Air sampling results at each off-site station indicate beta activity in the air substantially above normal background. Without detailed study, it is thought that this activity is a result of "Boltzmann", or the British tests, or possibly "Franklin", or a combination of the above tests.

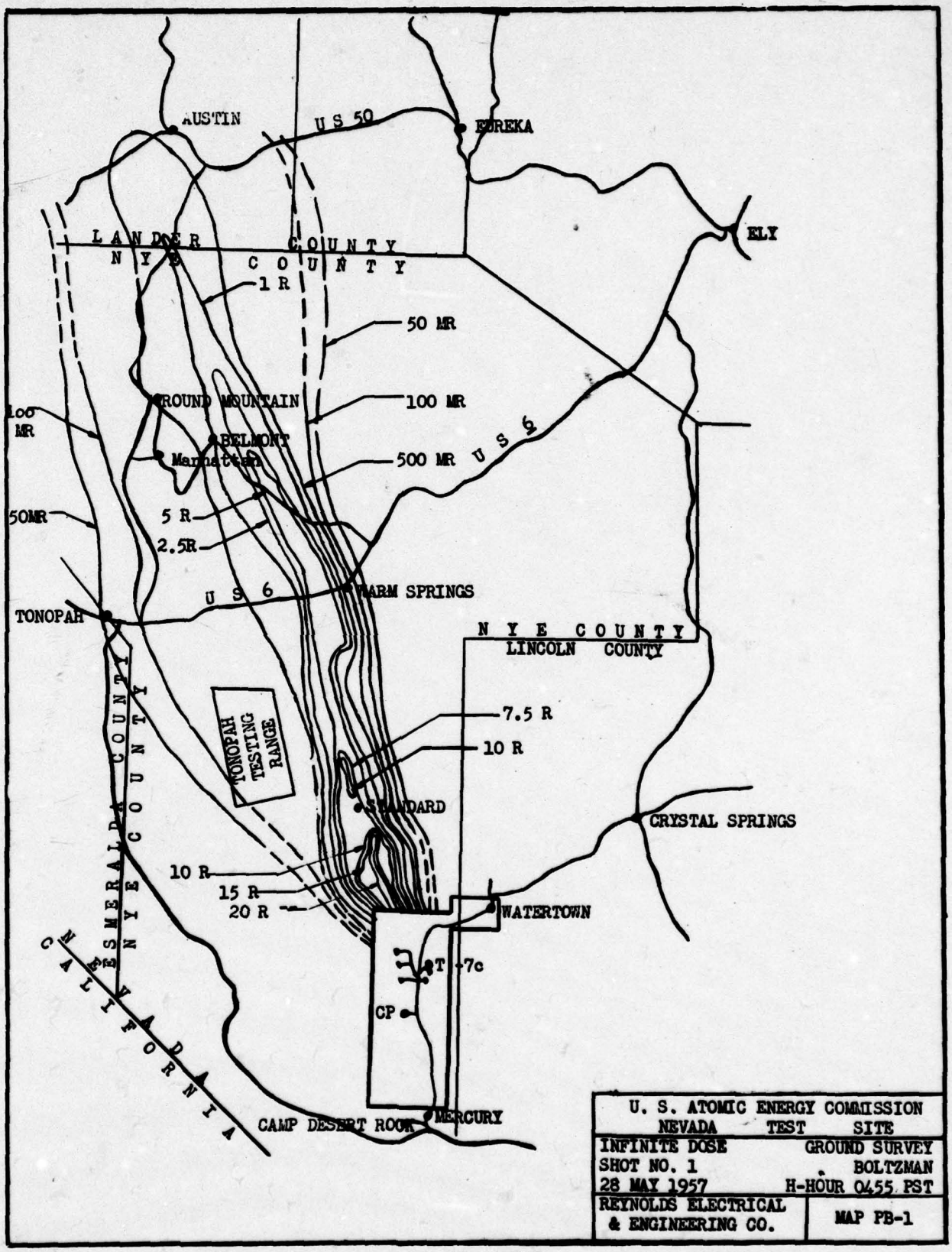

AUSTIN
U S 50
EUREKA
ELY
L A N D E R C O U N T Y
N Y E C O U N T Y
1 R
50 MR
100 MR
GROUND MOUNTAIN
100 MR
BELMONT
Manhattan
500 MR
U S 6
50MR
5 R
2.5R
U S 6
WARM SPRINGS
TONOPAH
N Y E C O U N T Y
LINCOLN COUNTY
TONOPAH TESTING RANGE
7.5 R
10 R
STANDARD
CRYSTAL SPRINGS
10 R
15 R
20 R
WATERTOWN
T -7c
CP
E S M E R A L D A C O U N T Y
N Y E C O U N T Y
C A L I F O R N I A
N E V A D A
CAMP DESERT ROCK
MERCURY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 1
28 MAY 1957
GROUND SURVEY
BOLTZMAN
H-HOUR 0455 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-1

Figure 7.2

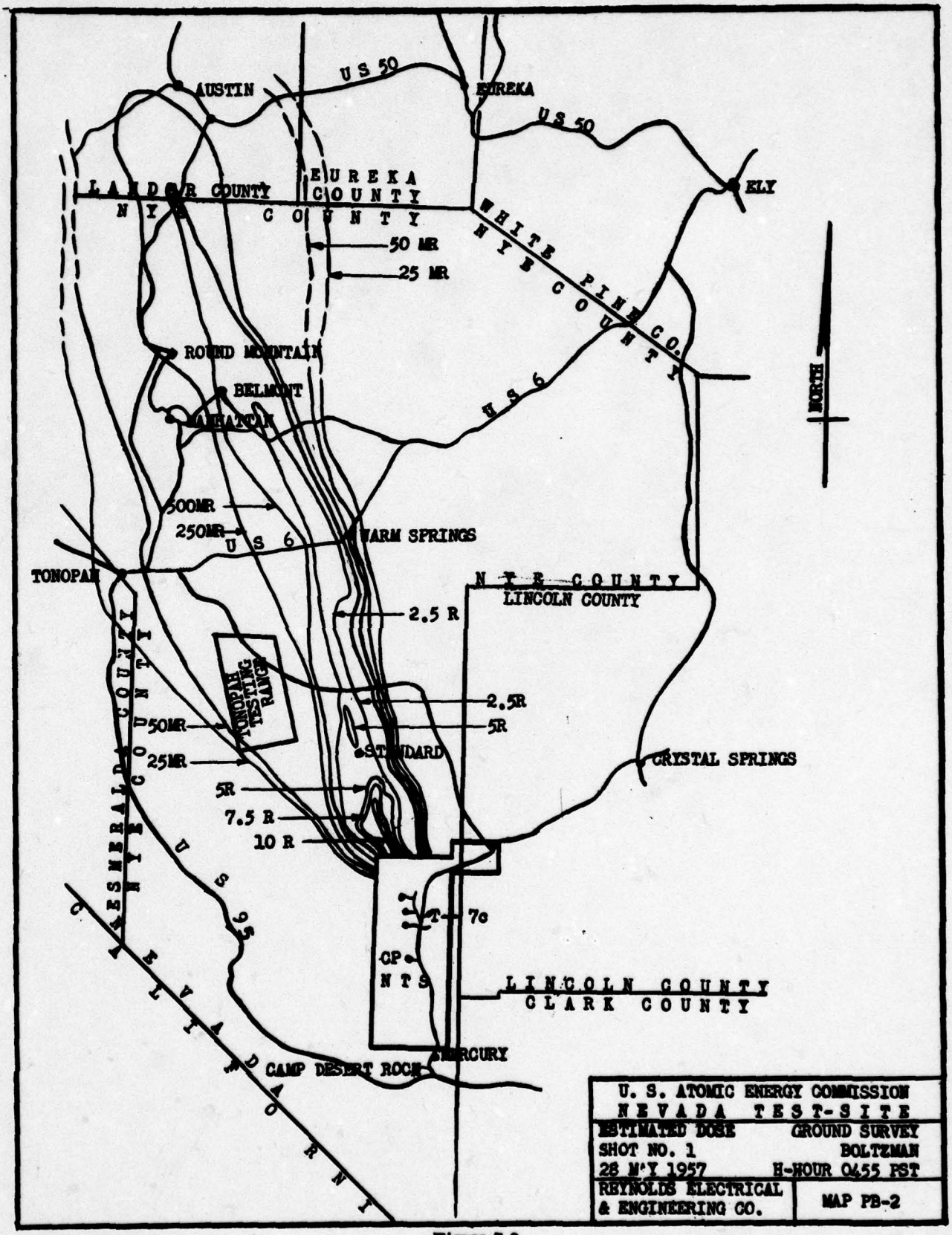

AUSTIN
US 50
EUREKA
US 50
ELY
LANDER COUNTY
EUREKA COUNTY
NYE COUNTY
WHITE PINE CO.
50 MR
25 MR
ROUND MOUNTAIN
BELMONT
MANHATTAN
US 6
NORTH
500MR
250MR
US 6
WARM SPRINGS
TONOPAH
NYE COUNTY
NTS COUNTY
LINCOLN COUNTY
2.5 R
2.5R
5R
50MR
25MR
5R
7.5 R
10 R
STANDARD
CRYSTAL SPRINGS
ESMERALDA COUNTY
US 95
7c
CP
NTS
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
GROUND SURVEY
SHOT NO. 1
BOLTZMAN
28 MAY 1957
H-HOUR 0455 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-2

Figure 7.3

DOSES IN POPULATED PLACES - BOLTZMANN

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 hrs. mr/hr.	I.D. mr.	E.D. mr.
A and B Mine, Nevada	4	5.3	8.5	90.0	60.0	4,200	2,270
Austin, Nevada	520	10.1	37.0	1.0	4.0	240	120
Basalt, Nevada	8	7.6	42.0	0.8	3.7	235	120
Belmont, Nevada	6	6.0	7.7	30.0	17.5	1,210	650
Cove, Nevada	20	7.5	30.0	0.25	0.75	64	35
Currant, Nevada	75	6.8	14.5	1.3	1.6	122	65
Ely, Nevada	3,558	9.2	28.1	0.4	1.1	69	35
Eureka, Nevada	500	9.6	40.2	0.2	0.9	53	25
Fallon, Nevada	2,600	12.4	40.0	1.0	4.3	254	125
Fernley, Nevada	418	13.8	39.0	0.8	3.3	193	95
Goldfield, Nevada	220	4.5	31.0	0.1	0.31	22	10
Hawthorne, Nevada	1,860	10.0	41.0	0.9	4.0	240	120
Hazen, Nevada	175	13.2	39.0	0.8	3.3	185	90
Kimberly, Nevada	120	9.2	36.0	0.1	0.38	23	10
Lockes, Nevada	4	5.8	13.6	1.5	1.75	122	65
Lund, Nevada	250	7.0	15.5	1.1	1.5	101	50
Manhattan, Nevada	42	6.7	6.7	4.5	2.2	150	80
M and M Mine, Nevada	2	5.3	8.5	90.0	60.0	4,200	2,270
McGill, Nevada	2,297	9.6	33.7	0.1	0.35	24	10
Millett, Nevada	5	8.5	35.7	2.5	9.4	615	310
Mine, Nevada	450	7.9	42.0	0.8	3.7	233	120
Montgomery Pass, Nevada	3	7.6	42.0	0.8	3.7	235	120
New Ruth, Nevada	1,200	9.2	36.1	0.1	0.38	23	10
Parmon's Ranch, Nevada	8	5.7	10.7	22.0	19.0	1,340	710
Preston, Nevada	60	7.9	15.2	1.1	1.5	95	50
Reno, Nevada	35,000	14.5	26.0	0.6	1.5	87	45
Reveille Mill, Nevada	6	4.0	10.7	80.0	70.0	5,200	2,850
Round Mountain, Nevada	200	7.3	9.9	6.0	4.8	314	160
Schurz, Nevada	100	11.2	41.0	1.0	4.5	264	130
Stone Cabin Ranch, Nevada	8	4.7	8.7	14.0	9.2	660	355

Figure 7.4

DOSES IN POPULATED PLACES - BOLTZMANN

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 hrs. mr/hr.	I.D. mr.	E.D. mr.
Stone House Ranch, Nevada	4	6.1	9.7	45.0	35.0	2,400	1,270
Tonopah, Nevada	1,375	5.5	5.8	2.5	1.1	74	40
Tonopah Ballistics Range, Nevada	30	3.1	3.6	2.0	0.5	36	20
Wadsworth, Nevada	200	14.0	38.0	0.8	3.2	190	95
Warm Springs, Nevada	5	4.5	5.7	7.0	2.9	209	110
Blairsden, California	700	17.3	28.0	1.0	2.7	156	75
Portola, California	2,000	16.8	27.0	2.0	5.4	294	145
Quincy, California	200	18.3	29.0	1.2	3.3	192	95
Spring Garden, California	60	18.0	29.0	1.0	2.9	162	80

Figure 7.4

In accordance with previous agreements, the various State Health Officers were not called on this shot as no detectable fallout was expected off-site. Due to the Quincy episode on the "Boltzmann" shot, the California Civil Defense Organization Duty Officer was called at 4:45 A.M. At this time, he was informed that no fallout was expected and that, to maintain liaison in the future, his organization had been placed on the list of addresses for the Test Manager's shot notification teletype.

On June 3, telephone conversations were held with Dr. Soffe, Acting Utah State Health Officer, and Mr. Lang of the Arizona State Health Department regarding the atypical movement of the "Boltzmann" cloud and the significance of beta activity detected in the air in Salt Lake City, Utah and Phoenix, Arizona, respectively.

Discussed with the Radiological Health Program, PHS, Washington, D.C., their findings of beta activity in the air at several of the national surveillance network air sampling stations.

7.3 "Lassen" Summary.

Shot number 3, Lassen, was detonated at a 500-foot altitude from a tethered balloon at 4:45 A.M. on June 5, 1957. The low cloud proceeded slightly to the east of north.

No inhabited community, including Watertown and Groom Mine, had any monitoring readings above background. The only fallout detected by survey instruments occurred between Gate 385 and a point 10.2 miles west of Watertown, With a maximum gamma intensity of 0.5 mr/hr. recorded at H + 2.6 hours.

Off-Site fallout maps, a table of estimated doses to populated places, and a public relations section are not pertinent and are not included in this report.

Air sampling results at each off-site station indicate beta activity in the air substantially above normal background. Without detailed study, it is not possible to specify the source of this air activity. However, in all probability, it is not due to "Lassen".

7.4 "Wilson" Summary.

Shot number 4, "Wilson", was a 500-foot balloon detonation which was fired at 4:45 A.M. on June 18, 1957. The higher portion of the cloud traveled slowly to the northeast with fallout occurring in the vicinity of Watertown, Groom Mine, Hiko, Alamo, Crystal Springs, Ash Springs, and Pioche, Nevada. The lower part of the cloud moved slowly to the southwest with fallout occurring in the vicinity of Lathrop Wells, Beatty, Rhyolite, and Springdale, Nevada and Stovepipe Wells and Furnace Creek, California.

Monitoring runs, which indicated activity substantially above background, were made on Groom Road between Gate 385 and Nevada 25; along Road B from eighteen miles south of Gate 400 to nine miles northwest of Groom Lake; along Nevada 25 between eight miles southeast of Lincoln Mine, Nevada and the junction with U.S. 93; on U.S. 93 between Ash Springs, Nevada and a point 20 miles west of Caliente, Nevada; in the vicinity of Pioche, Nevada on U.S. 93; along Delamar Road north and slightly south of U.S. 93; on U.S. 95 between Lathrop Wells and just south of Goldfield, Nevada; on Nevada 58 (and California 190) between Beatty, Nevada and Stove Pipe Wells, California; on California 190 between the junction near Stove Pipe Wells, California and Death Valley Junction, California; and along California 127 (and Nevada 29) between Death Valley Junction, California and Lathrop Wells, Nevada.

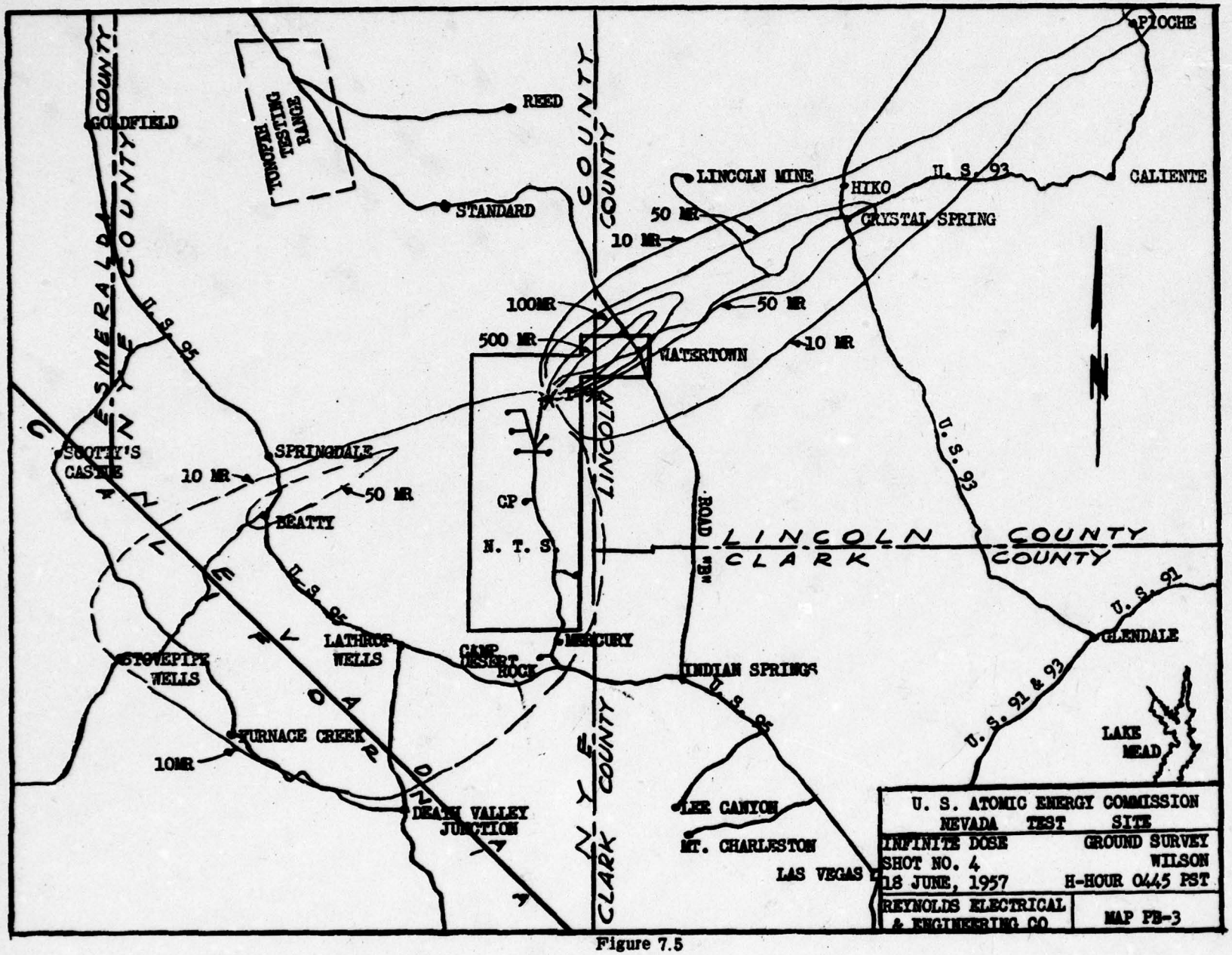

PIOCHE
REED
GOLDFIELD
NYE COUNTY
ESMERALDA
TONOPAH TESTING RANGE
STANDARD
LINCOLN COUNTY
LINCOLN MINE
HIKO
U. S. 93
CALIENTE
50 MR
10 MR
CRYSTAL SPRING
100MR
50 MR
500 MR
WATERTOWN
10 MR
U. S. 95
SCOTTY'S CASTLE
SPRINGDALE
10 MR
50 MR
BEATTY
CP
N. T. S.
U. S. 93
LINCOLN COUNTY
CLARK COUNTY
U. S. 95
LATHROP WELLS
CAMP DESERT ROCK
MERCURY
INDIAN SPRINGS
GLENDALE
U. S. 91
U. S. 91 & 93
STOVEPIPE WELLS
FURNACE CREEK
10MR
DEATH VALLEY JUNCTION
LAKE MEAD
LEE CANYON
MT. CHARLESTON
LAS VEGAS
CLARK COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
GROUND SURVEY
SHOT NO. 4
WILSON
18 JUNE, 1957
H-HOUR 0445 PST
REYNOLDS ELECTRICAL & ENGINEERING CO
MAP FB-3

Figure 7.5

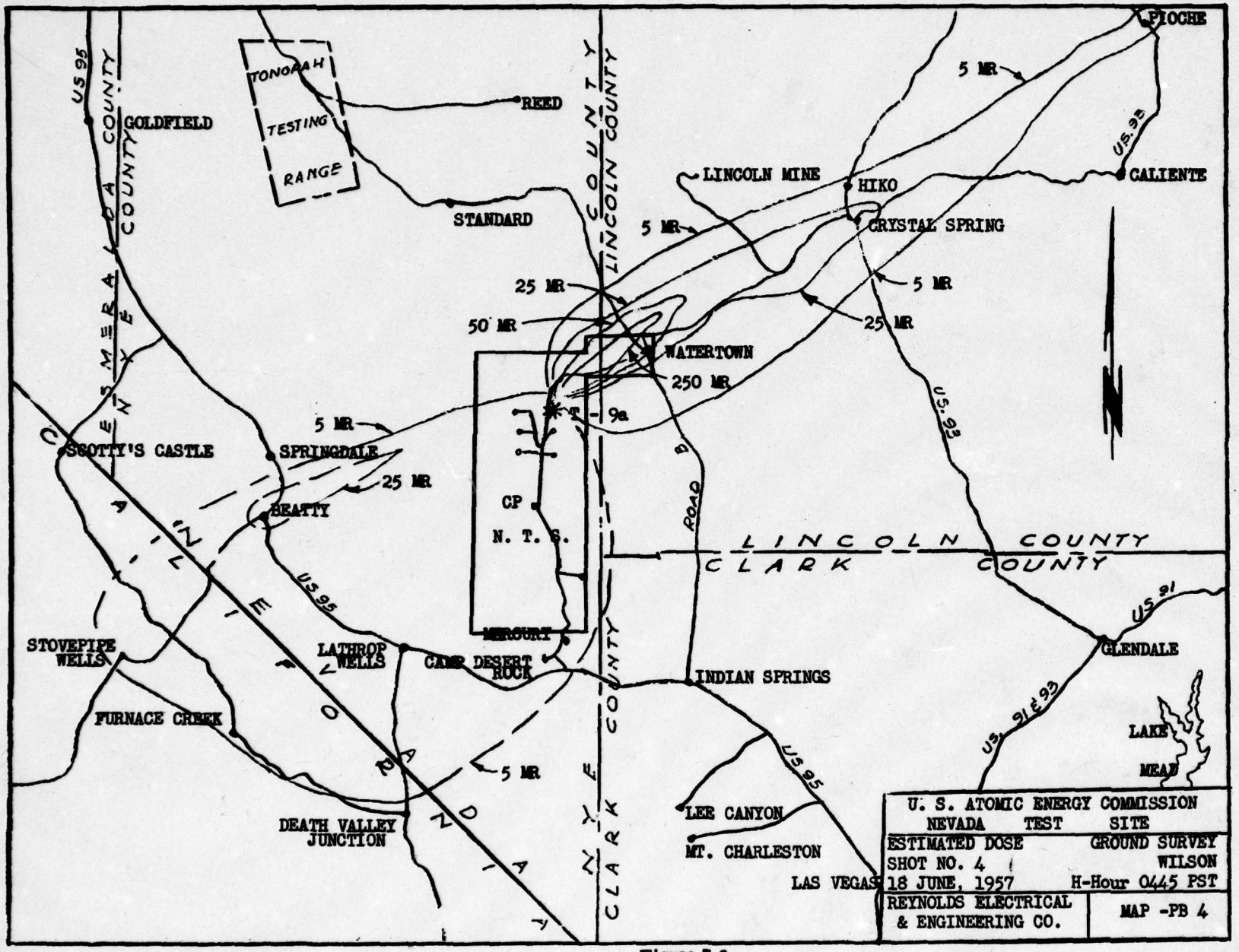

PIOCHE
5 MR
US 93
CALIENTE
LINCOLN MINE
HIKO
CRYSTAL SPRING
5 MR
5 MR
25 MR
50 MR
25 MR
WATERTOWN
250 MR
T - 9a
US 95
GOLDFIELD
TONOPAH
TESTING
RANGE
REED
STANDARD
NYE COUNTY
LINCOLN COUNTY
5 MR
SCOTTY'S CASTLE
SPRINGDALE
25 MR
BEATTY
CP
N. T. S.
ROAD D
US 93
LINCOLN COUNTY
CLARK COUNTY
US 91
GLENDALE
MERCURY
US 95
STOVEPIPE WELLS
LATHROP WELLS
CAMP DESERT ROCK
INDIAN SPRINGS
FURNACE CREEK
US 91 & 93
LAKE MEAD
5 MR
US 95
DEATH VALLEY JUNCTION
LEE CANYON
MT. CHARLESTON
LAS VEGAS
CLARK COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE GROUND SURVEY
SHOT NO. 4 WILSON
18 JUNE, 1957 H-Hour 0445 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP -PB 4

Figure 7.6

DOSES IN POPULATED PLACES - WILSON

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs mr/hr.	I.D. mr.	E.D. mr.
Amargosa Hot Springs, Nevada	5	3.6	6.5	0.7	0.34	25	14
Ash Springs, Nevada	5	6.5	9.2	0.3	0.22	15	8
Beatty, Nevada	550	3.8	7.2	2.0	1.1	71	39
Crystal Springs, Nevada	5	7.0	9.7	0.8	0.61	45	22
Gate 400 (Near Watertown)	1	2.4	5.6	13.5	5.4	615	350
Groom Mine, Nevada	0	2.7	8.1	0.7	0.44	37	21
Lathrop Wells, Nevada	15	3.8	12.9	0.4	0.43	33	18
Phipps Residence (2miles south of Crystal Springs, Nevada)	4	6.4	13.1	0.7	0.80	55	29
Pioche, Nevada	1,392	12.0	12.4	0.25	0.26	16	8
Rhyolite, Nevada	7	4.1	5.6	0.8	0.32	26	14
Watertown, Nevada	30	2.0	10.1	0.8	0.66	53	31
Furnace Creek, California	0	5.3	11.6	0.2	0.19	14	7
Stovepipe Wells, California	2	6.2	10.5	0.5	0.43	26	14

Figure 7.7

The maximum air concentration found was 1.85×10^{-2} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting at shot time.

On June 18, the Acting State Health Officer in Utah was called and informed of the direction of movement of the Wilson cloud.

Mr. W. W. White, Nevada State Sanitary Engineer, was called and informed of the "Wilson" shot, the expected fallout in Nevada, and the predicted cloud trajectories. Mr. White stated he had just come from a meeting with the Governor regarding "Boltzmann" fallout. He expressed his thanks for the call and was to relay the "Wilson" information to the Governor along with information regarding fallout in general. (Dr. Hurley, the State Health Officer, was out of town).

7.5 "Priscilla" Summary.

Shot number 5, "Priscilla", was a 700-foot balloon detonation which was fired at 6:30 A.M. on June 24, 1957. The detonation occurred over Frenchman dry lake. The cloud proceeded generally in a northeasterly direction with fallout occurring in the vicinity of Carp, Nevada and a number of communities in southern Utah. Surface winds, during the day, carried low level dust southwest and south into the Mercury and Desert Rock areas.

Monitoring runs, which indicated activity substantially above background, were made on Road B north of Indian Springs, Nevada; on Road C southwest of Alamo, Nevada; along U.S. 93 south of Alamo, Nevada; on the road through Carp and Elgin, Nevada; on the road southeast of Carp, Nevada; along U.S. 91 between Beaver Dam, Arizona and Cedar City, Utah; along the road through Gunlock, Utah; on Utah 18 between St. George, Utah and Utah 56; on Utah 98 between Beryl, Utah and Utah 56; along Utah 56 between the junction with Utah 18 and Cedar City, Utah; on Utah 14 between Cedar City, Utah and Long Valley Junction, Utah; on U.S. 89 between Long Valley Junction and Mt. Carmel Junction, Utah; along Utah 15 between Mt. Carmel Junction and U.S. 91; on Utah 17 between U.S. 91 and La Verkin, Utah; on the desert roads northeast of Nevada Test Site; and in the vicinity of Mercury and Desert Rock, Nevada.

The maximum air concentration found was 9.8×10^{-3} uc/m^3 at St. George, Utah. This represents the average air concentration of beta activity for a 28-hour sample period starting at H + 20 minutes.

Dr. Soffe, Acting Director of Public Health for Utah, and Mr. White, State Sanitary Engineer for Nevada, were called regarding expected fallout within their respective states and cloud trajectories. Mr. Marx, State Sanitary Engineer for Arizona, was informed of the predicted cloud trajectories which could possibly affect his state. These discussions took place on June 24, 1957.

On June 25, 1957, Mr. Lynn Thatcher (State Sanitary Engineer of Utah) called to inform Off-Site Rad-Safe personnel that Dr. Kesler had been named as Utah Director of Public Health. Mr. Thatcher was given preliminary estimated doses for populated places in his state. He inquired as to the procedure for obtaining all doses (total for all operations) to populated places in Utah. It was suggested that Dr. Kesler write to the Test Manager to obtain the desired information.

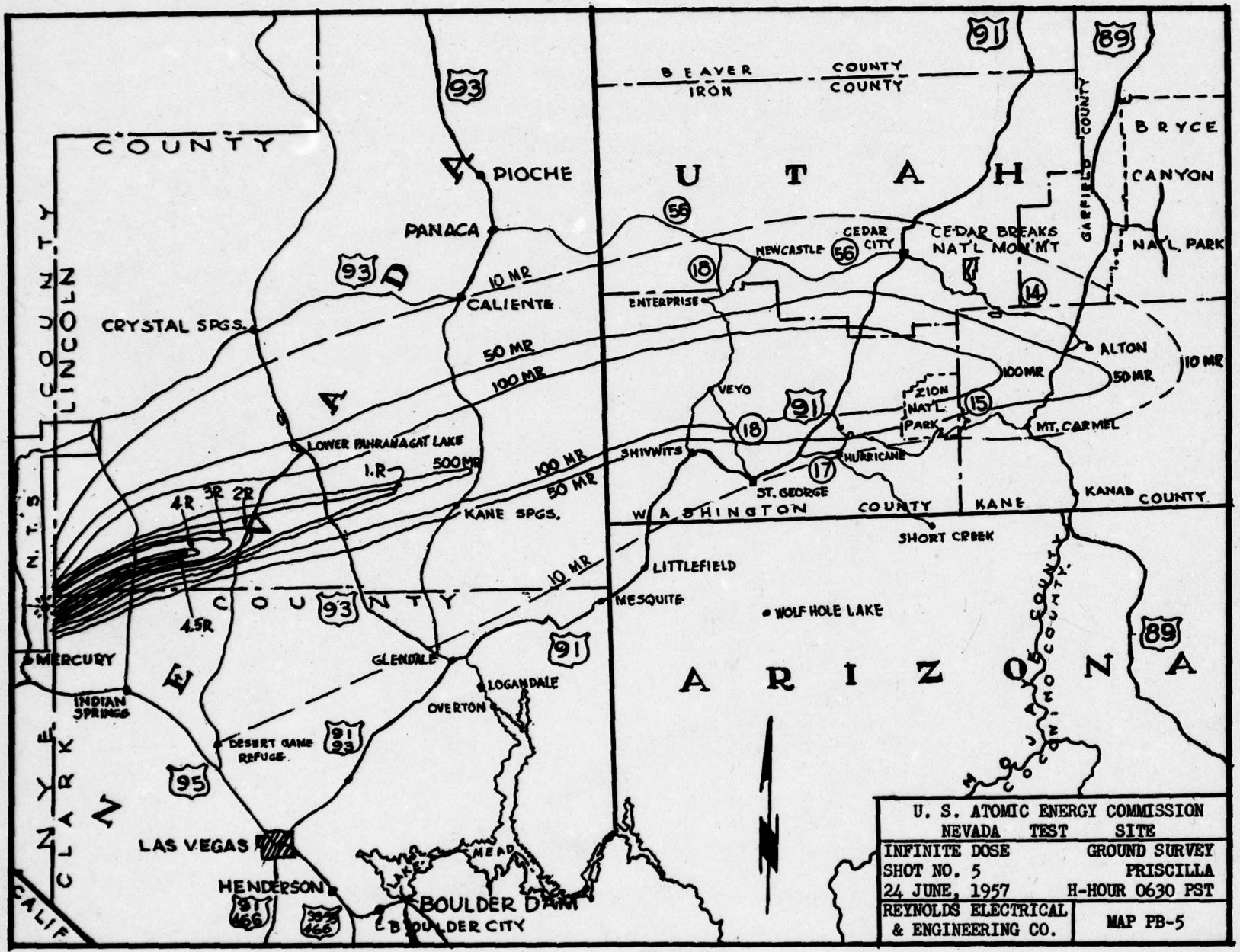

COUNTY
LINCOLN
93
PIOCHE
PANACA
CALIENTE
CRYSTAL SPGS.
10 MR
50 MR
100 MR
LOWER FURNANAGAT LAKE
1.R
500 MR
4R 3R 2R
4.5R
KANE SPGS.
N. T. S.
COUNTY
MERCURY
INDIAN SPRINGS
DESERT GAME REFUGE
95
LAS VEGAS
HENDERSON
91
466
CALIF
CLARK
NEVADA
GLENDALE
LOGANDALE
OVERTON
91
93
BOULDER DAM
BOULDER CITY
MEAD
BEAVER COUNTY
IRON COUNTY
UTAH
56
NEWCASTLE
CEDAR CITY
18
ENTERPRISE
CEDAR BREAKS NAT'L MON'MT
GARFIELD COUNTY
BRYCE CANYON NAT'L. PARK
14
ALTON
100 MR
50 MR
10 MR
VEYO
91
ZION NAT'L PARK
15
MT. CARMEL
SHIVWITS
HURRICANE
17
ST. GEORGE
WASHINGTON COUNTY
KANE COUNTY
KANAB
SHORT CREEK
LITTLEFIELD
MESQUITE
WOLF HOLE LAKE
ARIZONA
89
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE GROUND SURVEY
SHOT NO. 5 PRISCILLA
24 JUNE, 1957 H-HOUR 0630 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-5

Figure 7.8

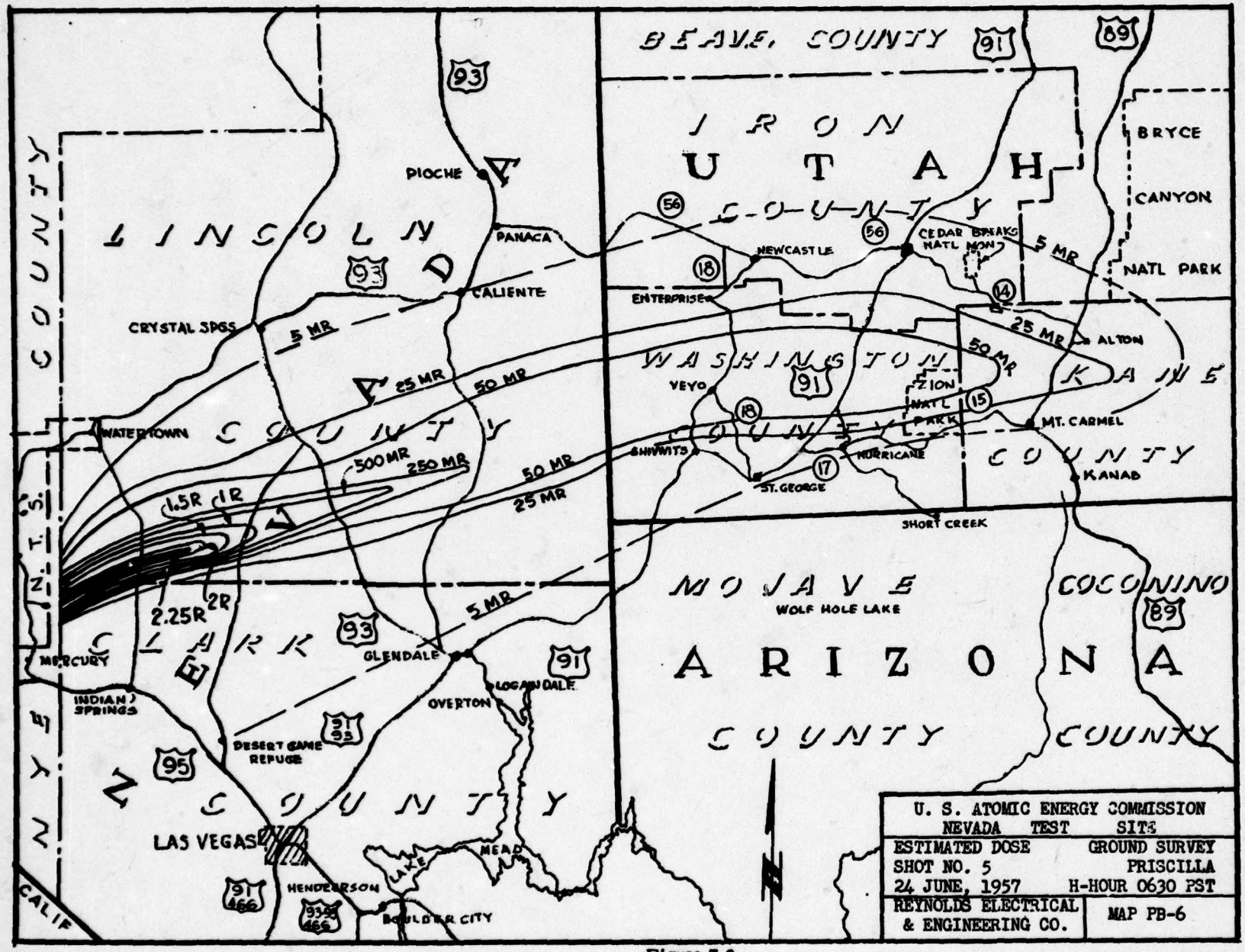

BEAVER COUNTY
IRON COUNTY
UTAH
BRYCE CANYON NATL PARK
LINCOLN COUNTY
NEVADA
PIOCHE
PANACA
CALIENTE
CRYSTAL SPGS
WATERTOWN
NEWCASTLE
CEDAR BREAKS NATL MON
ENTERPRISE
ALTON
WASHINGTON COUNTY
KANE COUNTY
VEYO
ZION NATL PARK
MT. CARMEL
SHIVWITS
HURRICANE
ST. GEORGE
KANAB
SHORT CREEK
MOJAVE COUNTY
COCONINO COUNTY
WOLF HOLE LAKE
ARIZONA
CLARK COUNTY
NYE COUNTY
MERCURY
INDIAN SPRINGS
GLENDALE
LOGANDALE
OVERTON
DESERT GAME REFUGE
LAS VEGAS
HENDERSON
LAKE MEAD
BOULDER CITY
CALIF
5 MR
25 MR
50 MR
250 MR
500 MR
1.5R
1R
2R
2.25R
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 5
24 JUNE, 1957
GROUND SURVEY
PRISCILLA
H-HOUR 0630 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-6

Figure 7.9

DOSES IN POPULATED PLACES - PRISCILLA

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Alamo, Nevada	250	8.5	8.4	0.7	0.45	30	15
Buckhorn Ranch, Nevada	12	8.0	11.0	1.2	1.0	68	35
Carp, Nevada	25	7.8	10.7	4.5	3.9	253	131
Desert Game Refuge Hdqs., Nevada	11	3.8	13.9	0.25	0.3	23	13
Elgin, Nevada	30	8.1	8.9	1.0	0.7	49	25
Leith, Nevada	6	7.9	10.2	3.5	2.7	190	99
Alton, Utah	154	16.1	30.9	0.25	0.75	40	20
Anderson Junction, Utah	17	12.2	15.2	2.0	2.6	158	79
Beryl Junction, Utah	8	10.4	11.7	0.4	0.39	25	13
Cedar City, Utah	6,106	13.9	16.0	0.5	0.7	42	21
Central, Utah	49	10.0	11.0	2.5	2.2	160	103
Enterprise, Utah	790	10.3	11.3	0.5	0.45	30	15
Glendale, Utah	226	15.4	31.3	0.36	1.0	60	29
Gunlock, Utah	127	10.0	11.0	2.0	1.8	115	58
Hamilton Fort, Utah	26	13.8	15.8	0.5	0.7	39	19
Harrisburg Junction, Utah	5	11.5	14.9	0.5	0.6	40	20
Hurricane, Utah	1,271	12.1	13.2	0.28	0.34	19	10
Kanarraville, Utah	263	13.1	15.7	0.8	1.1	63	31
La Verkin, Utah	387	12.3	35.2	0.10	0.37	21	11
Leeds, Utah	215	11.9	15.0	2.0	2.6	161	81
Mt. Carmel Junction, Utah	10	15.0	32.1	0.13	0.42	24	12
Newcastle, Utah	115	10.2	12.4	0.35	0.37	25	12
New Harmony, Utah	126	12.4	35.8	0.29	1.1	62	31
Orderville, Utah	371	15.1	31.5	0.20	0.6	30	15
Pintura, Utah	219	12.4	15.3	2.5	3.1	192	96
Santa Clara, Utah	319	10.7	13.6	0.15	0.18	10	5
Shivwits, Utah	95	10.1	10.4	0.40	0.34	21	11
St. George, Utah	4,562	10.7	13.6	0.15	0.18	11	5
Toquerville, Utah	219	12.3	12.9	1.0	1.2	68	34
Veyo, Utah	100	10.0	10.1	8.0	6.0	400	204
Virgin, Utah	147	12.6	35.0	0.05	0.18	11	5
Washington, Utah	435	11.2	14.7	0.18	0.23	14	7

Figure 7.10

7.6 "Coulomb A" Summary.

For "Coulomb A", the safety shot fired at 10:30 A.M. on July 1, 1957 in Area 3, Off-Site Rad-Safe activities were limited to the activation of all air sampling stations, dispatch of two mobile teams to Watertown prior to the event, and the standby of all off-site personnel. The teams sent to Watertown were equpped for both beta-gamma and alpha monitoring.

Filters containing the air samples collected were processed for alpha activity.

7.7 "Hood" Summary.

Shot number 7, "Hood", was a 1,500-foot balloon detonation which was fired at 4:40 A.M. on July 5, 1957. The main portion of the cloud proceeded generally in a northeasterly direction while smaller parts of the cloud travelled to the east and to slightly west of north. This shear resulted in light fallout to the north and northeast of Nevada Test Site. Fallout occurred in the vicinity of Lincoln Mine, Adaven, Nyala, Sunnyside, Lund, Geyser, and Baker, Nevada as well as Garrison, Utah.

Monitoring runs, which indicated activity substantially above background, were made along Nevada 38 between a point 17 miles south of Sunnyside, Nevada and the junction with U.S. 6; on Nevada 73 between the junction with U.S. 6 and the Nevada-Utah line; on Utah 21 between the Nevada-Utah line and a point 20 miles southeast of Garrison, Utah; along U.S. 93 between the junction with U.S. 6 and a point 34 miles north of Pioche, Nevada; in the vicinity of Lincoln Mine, Nevada; on Nevada 25 south and west of Lincoln Mine, Nevada; on U.S. 6 in the Currant, Nevada area; and along the desert roads north and northeast of Nevada Test Site.

The maximum air concentration found was 7.38×10^{-4} uc/m^3 at Lincoln Mine, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting at shot time.

Roadblocks, for the purpose of minimizing eye damage to off-site inhabitants, were established at the following locations: on the road to Willow Creek Boy Scout Camp; north of Beatty, Nevada on U.S. 95; west of Crystal Springs, Nevada on Nevada 25; Lincoln Mine, Nevada area; upper Pahranagat Lake, Nevada on U.S. 93; near Maynard Lake, Nevada on U.S. 93; and on U.S. 93 between Crystal Springs and Caliente, Nevada.

Ike Orr, Lincoln County Sheriff, was contacted when it became apparent that better liaison between test organization personnel and the law enforcement officials was desirable. As a result of this and contacts by zone personnel, these roadblocks functioned smoothly.

Nine off-site vehicles (with two-way radio) and their personnel were committed to these roadblocks. Other vehicles, on the off-site radio net, were used at other "blocks". No incidents were reported from any of these "blocks" as a result of the extremely bright flash from "Hood".

Extensive blast damage was noted and reported from Groom Mine and Watertown. Mr. Dan Sheahan was informed of the blast damage to Groom Mine as soon as possible. Lighter blast damage was reported from Hiko and Alamo, Nevada.

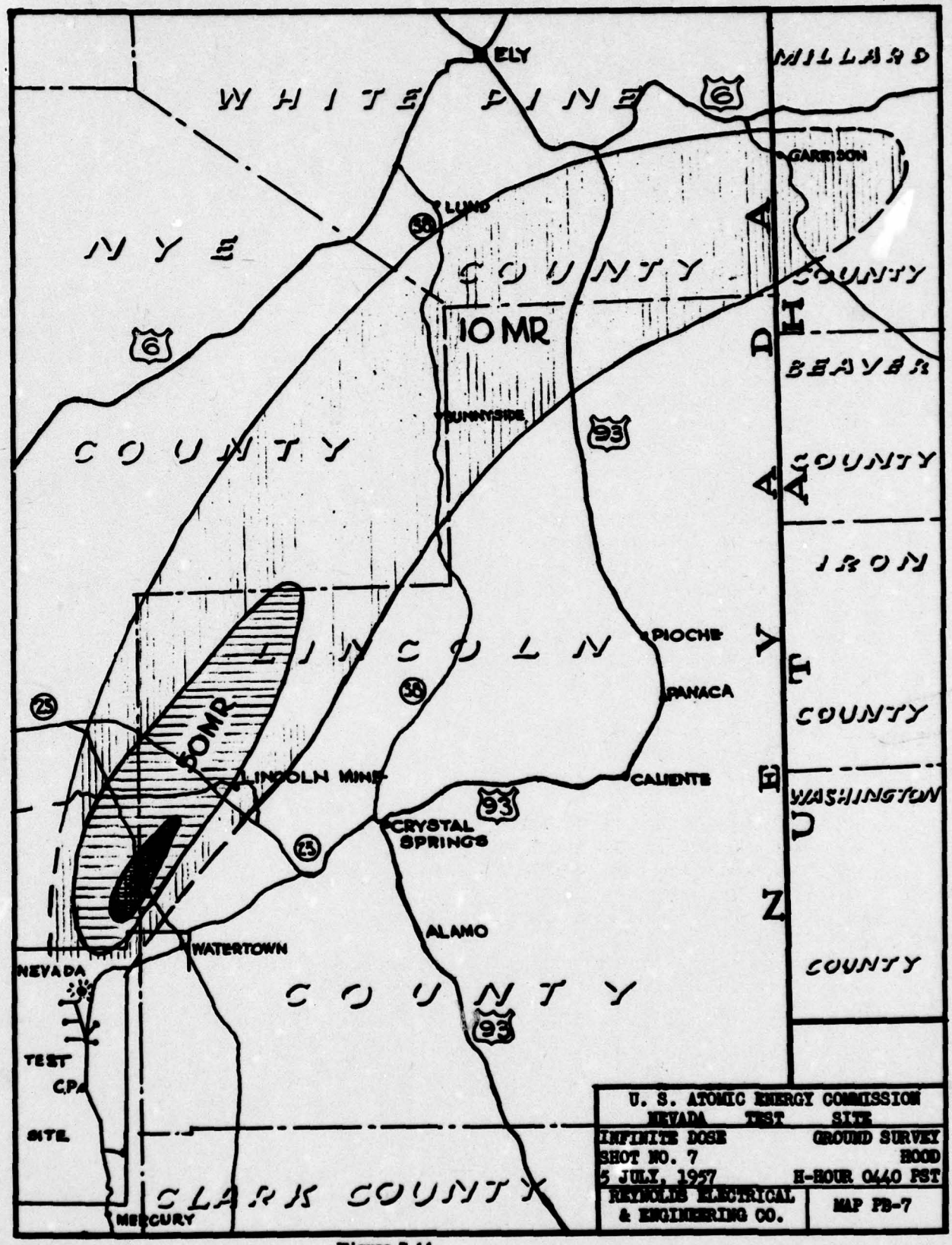

ELY
WHITE PINE
MILLARD
GARRISON
LUND
NYE
COUNTY
10 MR
SUNNYSIDE
COUNTY
BEAVER
COUNTY
IRON
COUNTY
LINCOLN
PIOCHE
PANACA
50MR
LINCOLN MINE
CALIENTE
WASHINGTON
COUNTY
CRYSTAL SPRINGS
ALAMO
WATERTOWN
NEVADA
COUNTY
TEST
C.P.
SITE
CLARK COUNTY
MERCURY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 7
5 JULY, 1957
GROUND SURVEY
HOOD
H-HOUR 0440 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-7

Figure 7.11

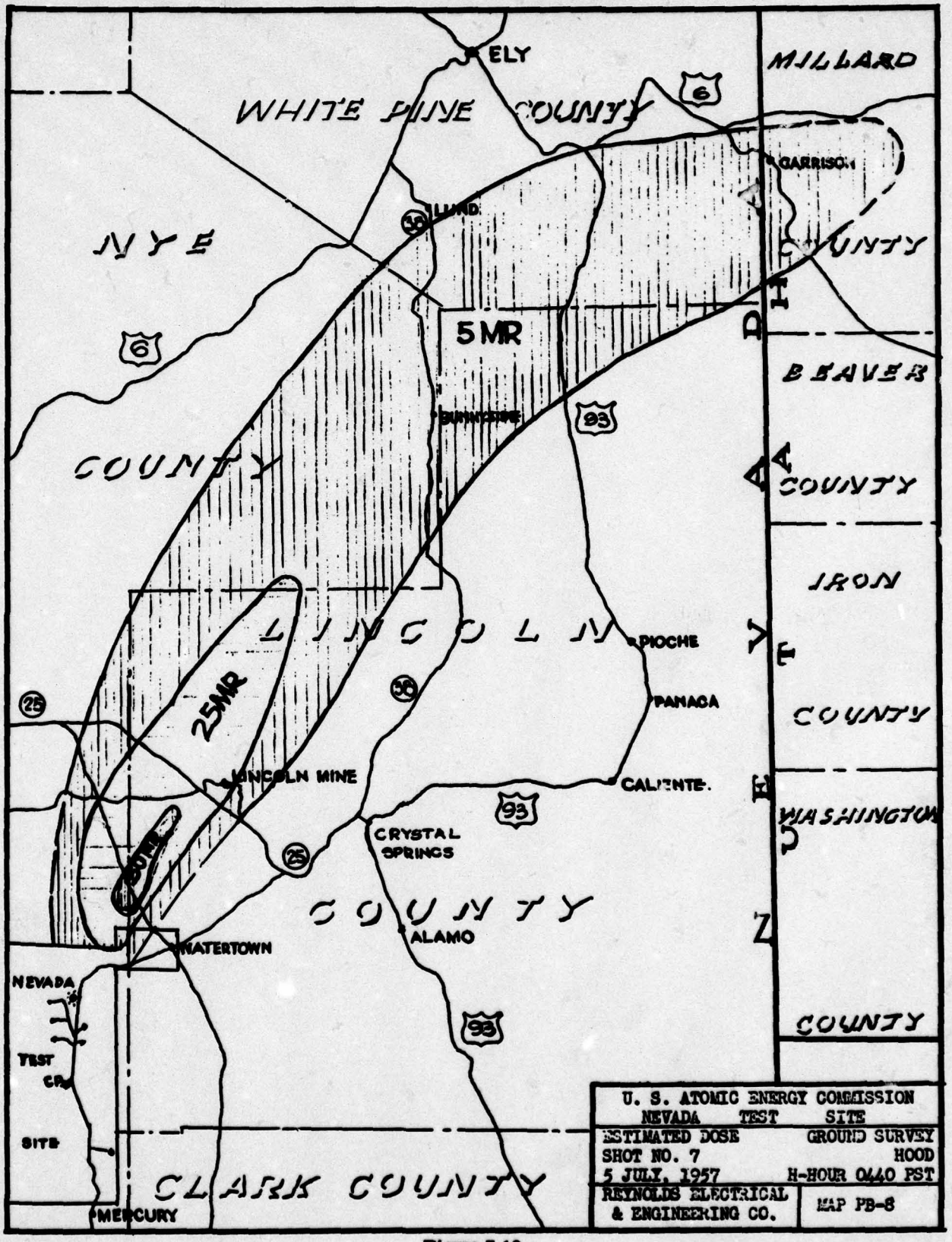

ELY
WHITE PINE COUNTY
MILLARD
GARRISON
LUND
NYE
COUNTY
5MR
BEAVER
COUNTY
BURNSIDE
93
6
25MR
LINCOLN
PIOCHE
PANACA
IRON
COUNTY
LINCOLN MINE
CALIENTE
WASHINGTON
COUNTY
CRYSTAL SPRINGS
ALAMO
COUNTY
WATERTOWN
NEVADA
TEST
CR
SITE
MERCURY
CLARK COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 7
5 JULY, 1957
GROUND SURVEY
HOOD
H-HOUR 0440 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-8

Figure 7.12

DOSES IN POPULATED PLACES - HOOD

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Baker, Nevada	60	9.9	12.3	0.23	0.24	15	8
Bardoli Ranch, Nevada	4	5.6	11.6	0.32	0.30	21	11
Dodge Construction Camp, Nevada (on Nevada 25)	175	2.7	3.2	5.0	1.0	81	46
Geyser Ranch, Nevada	5	8.7	9.2	0.37	0.26	17	9
Lincoln Mine, Nevada	500	2.9	3.1	4.5	0.90	87	49
Ranch (13miles north of Sunnyside, Nevada)	4	6.4	8.5	0.36	0.23	15	8
Sunnyside, Nevada	26	5.9	6.7	0.58	0.29	21	11
Uhalde Ranch, Nevada	5	5.0	10.0	0.25	0.20	14	8
Walch's Pine Creek Ranch, Nevada	4	4.7	5.2	0.40	0.15	11	6
Garrison, Utah	125	9.8	12.0	0.38	0.38	23	12

Figure 7.13

These incidents were reported from the field in less than one hour following the detonation. These blast damage reports were passed on to the proper test organization officials. Such prompt reports resulted in an early blast damage examination by the proper persons.

On July 5, 1957, Dr. Hurley (Nevada State Health Officer) and Dr. Kesler (Utah State Health Officer) were called and informed of the predicted fallout within their respective states and of the various cloud trajectories.

On July 8, 1957, the Radiological Health Program, PHS, Washington, D. C., was informed of the "Hood" fallout situation.

7.8 "Diablo" Summary.

Shot number 8, "Diablo", was a 500-foot tower detonation which was fired at 4:30 A.M. on July 15, 1957. The lower portions of the cloud travelled to the east of north while the higher parts of the cloud moved north of east and southeast. Fallout occurred in the vicinity of Watertown, Lincoln Mine, Ely, Sunnyside, Hiko, Geyser, and Baker, Nevada and Garrison, Utah.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 6 from 30 miles southwest of Currant, Nevada to Jct. Nev. 73; on Nev. 38 between Jct. 25 and Jct. U.S. 6; on U.S. 93 in the vicinity of Ash Springs, Nevada and between Pioche and Jct. U.S. 6; on Nev. 73 between Jct. U.S. 6 and Utah state line; along Utah 21 in the Garrison, Utah area; on Nev. 25 between Jct. U.S. 93 and Fallini Ranch, Nevada; on Groom Road between just north of Gate 385 and Jct. Nev. 25; on Road B between a point just south of Gate 400 and Jct. Nev. 25; and along many of the desert roads north and northeast of Nevada Test Site.

The maximum air concentration found was 9.1×10^{-2} uc/m^3 at Lincoln Mine, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting at shot time.

On July 15, 1957, Dr. Salsbury (Arizona State Health Officer) was called and informed of the 30,000-foot predicted wind trajectory into northern Arizona.

Dr. Hurley, State Health Officer of Nevada, was given the fallout situation and predicted trajectories which might possibly produce fallout in Nevada.

Mr. Thatcher, Utah State Sanitary Engineer, was called and briefed as to cloud trajectories and expected fallout in the Garrison, Utah area. The possibility of collecting beta activity in the air at Salt Lake City was also mentioned. (Dr. Kesler was not in.)

Mr. Anderson, PHS Radiological Health Program, was briefed on the "Diablo" fallout picture and predicted trajectories.

Mr. Hubert Welch (a brother of Mrs. W. E. Walch) provided Off-Site Rad-Safe with a rather complete tabulation of time-gamma intensity readings he obtained on July 15, 1957 at the Walch Pine Creek Ranch. These data are presented to indicate the detail with which off-site inhabitants are documenting fallout in their environment.

Time	Readings Outside Waist Level mr/hr	Readings Inside House mr/hr	Readings Outside Ground Level mr/hr
1115	3	1.5	
1125	3.5		
1140	3.5		
1220	5		
1230	5	3	
1240	6	3	
1255	4		
1305	7		
1310		3	
1325	7		
1345	8		10
1400	9		12
1415	10		13
1430	10		
1500	10		
1530	9		
1600	8.5		
1630	9		
1700	9		
1715	7.5		
1730	6		
1900	5		
1920	5		

Mr. Welch's instrument (Sears-Roebuck Tower Geiger Counter No. 6157) compared favorably as to calibration with those used by Off-Site. Mr. Welch has been sent a letter of appreciation for furnishing these data.

7.9 "John" Summary.

Shot number 9, "John", was a high altitude air burst which was fired at 7:00 A.M. on July 19, 1957. The cloud proceeded slightly east of north. Only a few isolated low readings were taken so maps of doses and a table of doses to populated places are not included in this report.

The maximum air concentration found was 2.59×10^{-3} uc/m^3 at Lincoln Mine, Nevada. This represents the average air concentration of beta activity for a 27.8-hour sample period starting a quarter of an hour after the detonation.

Dr. Kesler (Utah State Health Officer) was called on July 19, 1957 and informed of the detonation and predicted cloud trajectories. The possibility of detecting beta activity in the air in Salt Lake City was discussed.

Mr. White (Nevada State Sanitary Engineer) was informed of predicted cloud trajectories on July 19, 1957.

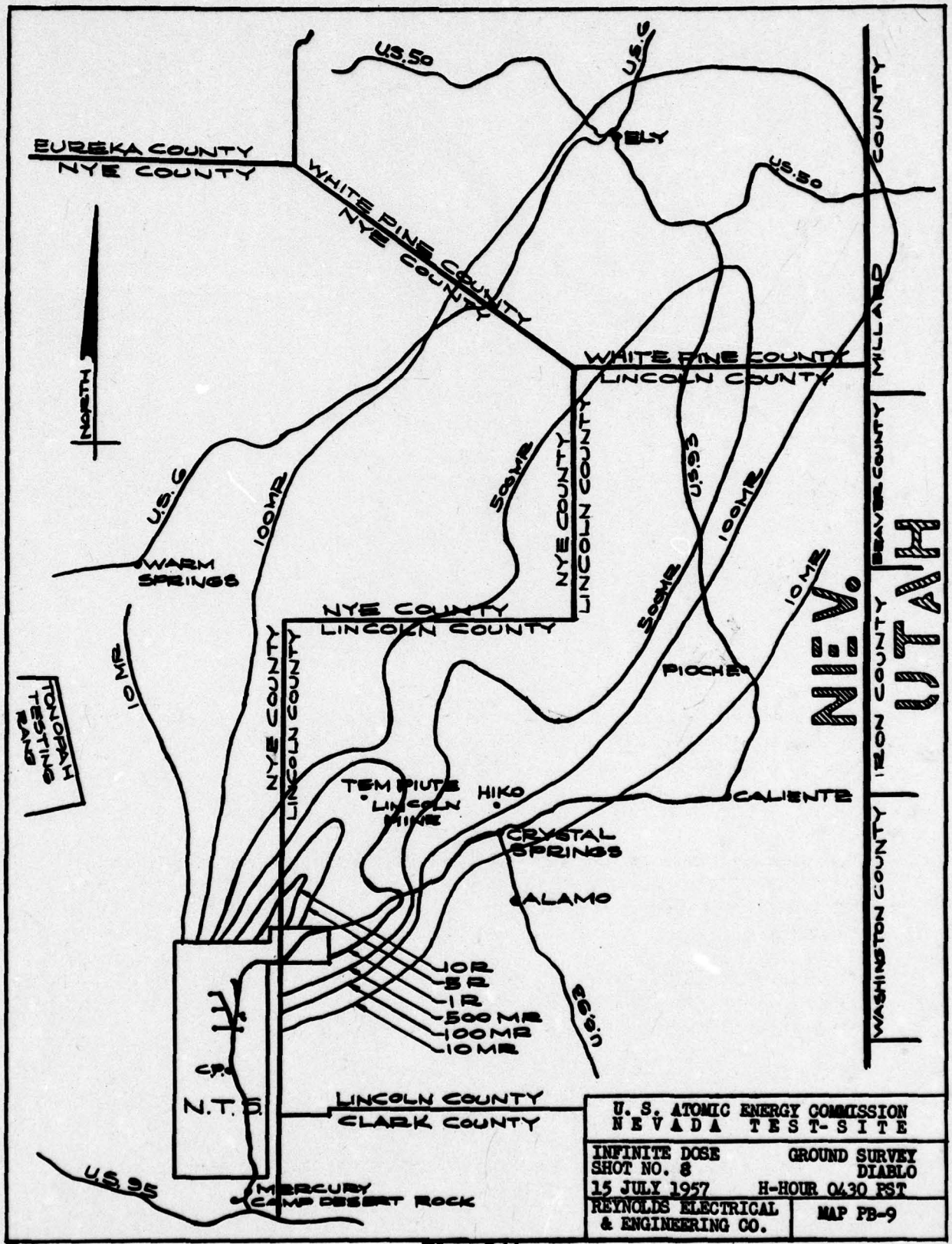

US.50
US.6
ELY
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
NYE COUNTY
US.50
MILLARD COUNTY
NORTH
WHITE PINE COUNTY
LINCOLN COUNTY
U.S.6
100MR
50MR
NYE COUNTY
LINCOLN COUNTY
U.S.93
100MR
WARM SPRINGS
50MR
10MR
BEAVER COUNTY
IRON COUNTY
WASHINGTON COUNTY
NEV.
UTAH
NYE COUNTY
LINCOLN COUNTY
10 MR
PIOCHE
NYE COUNTY
LINCOLN COUNTY
TONOPAH TESTING RANG
TEMPIUTE
LINCOLN MINE
HIKO
CALIENTE
CRYSTAL SPRINGS
CALAMO
10R
5R
1R
500 MR
100MR
10MR
U.S.93
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
U.S.95
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 8
GROUND SURVEY
DIABLO
15 JULY 1957
H-HOUR 0430 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-9

Figure 7.14

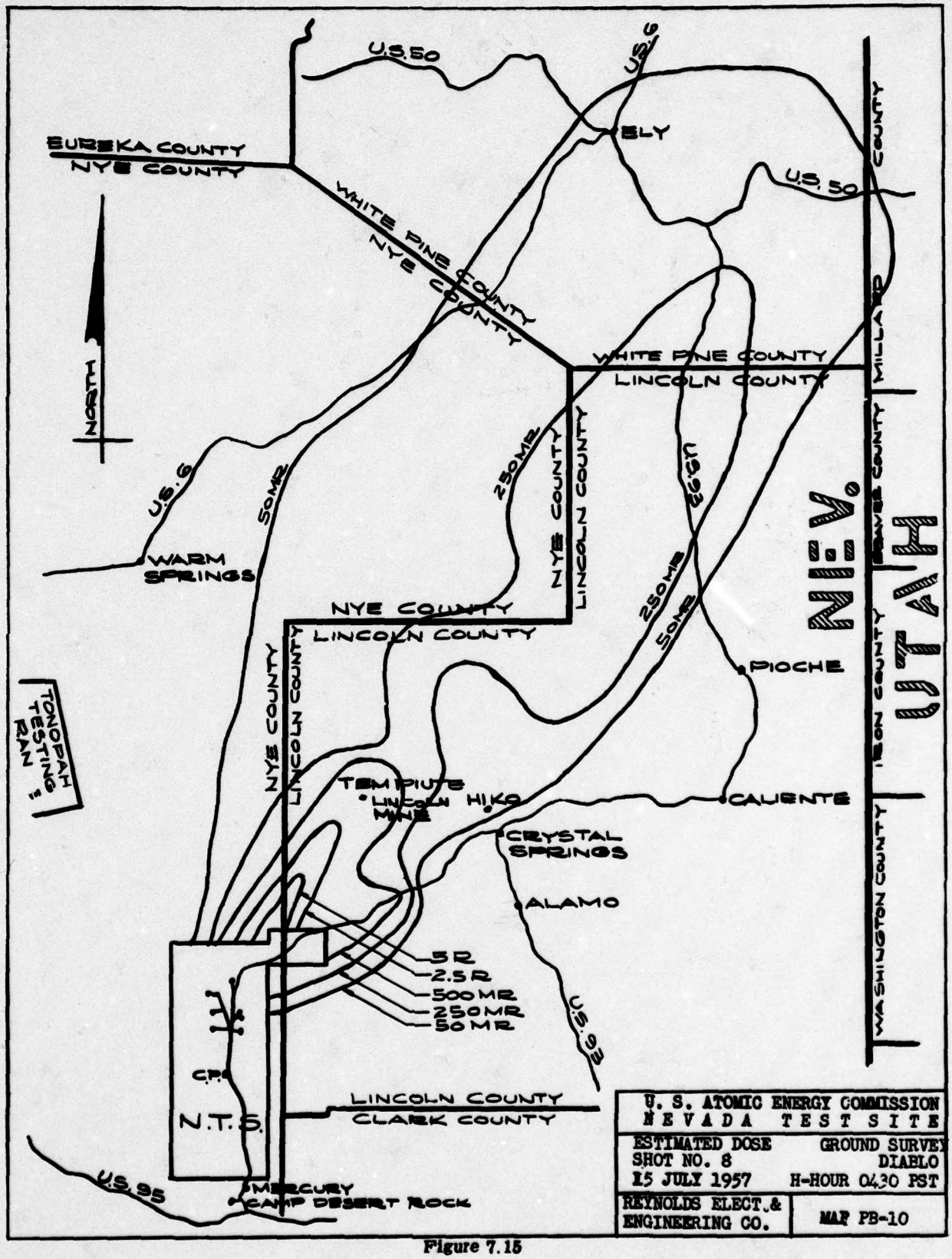

U.S. 50
U.S. 6
ELY
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
NYE COUNTY
U.S. 50
WHITE PINE COUNTY
LINCOLN COUNTY
MILLARD
BEAVER COUNTY
IRON COUNTY
WASHINGTON COUNTY
NORTH
U.S. 6
50MR
250MR
NYE COUNTY
LINCOLN COUNTY
250MR
50MR
NEV.
UTAH
WARM SPRINGS
NYE COUNTY
LINCOLN COUNTY
PIOCHE
TONOPAH TESTING RAN
NYE COUNTY
LINCOLN COUNTY
TEMPIUTE
LINCOLN MINE
HIKO
CALIENTE
CRYSTAL SPRINGS
ALAMO
5R
2.5R
500MR
250MR
50MR
U.S. 93
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
U.S. 95
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 8
15 JULY 1957
GROUND SURVEY
DIABLO
H-HOUR 0430 PST
REYNOLDS ELECT. & ENGINEERING CO.
MAP PB-10

Figure 7.15

DOSES IN POPULATED PLACES – DIABLO

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr	Intensity at H + 12 Hrs mr/hr.	I. D. mr.	E. D. mr.
Baker, Nevada	60	12.0	40.5	0.7	3.1	186	95
Bardoli Ranch, Nevada	4	8.0	12.3	2.5	2.6	165	85
Belew Ranch, Nev. (Adaven, Nev.)	3	8.0	11.5	8.5	8.0	520	270
Crystal Springs, Nevada	0	7.0	7.8	1.8	1.1	74	39
Currant, Nevada	75	10.2	11.4	1.3	1.25	76	38
Dodge Constr. Camp, Nevada	175	6.0	15.2	42.0	56.0	3,750	2,070
Ely, Nevada	3,560	12.0	14.4	3.7	4.7	270	136
Fallini Twin Springs Ranch, Nev.	15	10.0	13.3	0.6	0.7	43	22
Geyser Ranch, Nevada	5	10.3	16.7	7.0	8.0	720	365
Groom Mine, Nevada	0	2.95	8.15	75.0	48.0	3,760	2,100
Hiko, Nevada	55	7.0	8.3	1.7	1.1	81	43
Kimberly, Nevada	120	12.0	36.7	0.2	0.8	46	23
Lincoln Mine, Nevada	250	6.0	8.0	52.0	33.0	2,160	1,160
Lund, Nevada	250	10.8	13.0	4.4	4.9	297	152
McGill, Nevada	2,300	12.1	37.8	0.3	1.25	54	27
Pioche, Nevada	1,390	12.0	18.3	0.3	0.5	47	24
Preston, Nevada	60	10.8	13.2	4.2	4.8	286	145
South Paw Mine, Nevada	3	6.8	11.3	12.5	12.0	780	410
Sunnyside, Nevada	26	10.0	11.2	8.7	8.0	500	255
Uhalde Ranch, Nevada	5	8.0	8.4	11.0	7.9	480	250
Walch Pine Creek Ranch, Nevada	4	8.0	14.5	4.5	5.7	360	190
Watertown, Nevada	2	3.0	3.2	10.5	22.0	1,650	916
Whipple Ranch, Nevada	10	7.0	12.5	1.5	1.6	105	55
Garrison, Utah	125	12.0	40.7	0.6	2.7	180	90

Figure 7.16

7.10 "Kepler" Summary.

Shot number 10, "Kepler", was a 500-foot tower detonation which was fired at 4:50 A.M. on July 24, 1957. The upper part of the cloud travelled northeast while the lower portions of the cloud moved to the northwest. Fallout occurred in the vicinity of Lincoln Mine, Gold Point, Lida, Silver Peak, Fish Lake, Coaldale, Tonopah, Goldfield, Dyer, Basalt, Mt. Montgomery, and Watertown, Nevada; and Oasis, Deep Springs, Benton Station, Laws, and Bishop, California.

Monitoring runs, which indicated activity substantially above background, were made along U. S. 95 between a point south of Lida Jct. to Coaldale, Nevada; on U. S. 6 between Coaldale, Nevada to south of Bishop, California; on Nevada 3 and 3A between the junction with U.S. 95 and the junction with U.S. 6; along Nevada 47 between the junction with U. S. 95 and the junction with Nevada 3 (Nevada 47 to Silver Peak then the unnumbered road to near Oasis, California); along California 63 between Westgard Pass and Oasis, California; on Nevada 71 in the vicinity of Gold Point, Nevada; and in the vicinity of Lincoln Mine and Watertown, Nevada.

The maximum air concentration found was 7.45×10^{-2} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 25.7-hour sample period starting 0.3 of an hour after shot time.

Dr. Hurley (Nevada State Health Officer) was contacted on July 24, 1957 and informed of fallout within Nevada and cloud trajectories. The Utah State Health Officer was not in due to a state holiday.

The duty officer, California Civil Defense organization, was called and informed of fallout in California and predicted cloud trajectories.

Dr. Salsbury, Arizona State Health Officer, was visiting Nevada Test Site to witness the "Kepler" event.

7.11 "Owens" Summary.

Shot number 11, "Owens", was a 500-foot balloon detonation which was fired at 6:30 A.M. on July 25, 1957. The lower portions of the cloud travelled slightly wast of north while the higher parts of the cloud moved to the northeast. Fallout occurred in the vicinity of Lockes, Duckwater, Currant, Warm Springs, Eureka, Kimberly, New Ruth, Ely, McGill, Lund, Preston, Reveille Mill, Adaven, Nyala, and Lincoln Mine, Nevada.

Monitoring runs, which indicated activity substantially above background, were made along Nevada 20 in the Duckwater, Nevada area; on U.S. 6 from the Warm Springs, Nevada area to Ely, Nevada; on U.S. 50 between Ely, Nevada and 30 miles west of Eureka, Nevada; on Nevada 25 between Warm Springs, Nevada and west of Crystal Springs, Nevada; along Nevada; along Nevada 44 in the vicinity of New Ruth, Nevada; along U.S. 95 in the McGill, Nevada area; and on many of the desert roads north and northeast of Nevada Test Site.

The maximum air concentration found was 1.57×10^{-1} uc/m^3 at Currant, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting one hour after the detonation. (As Owens was fired the day after Kepler, the air data are gross values, in other words with no background correction).

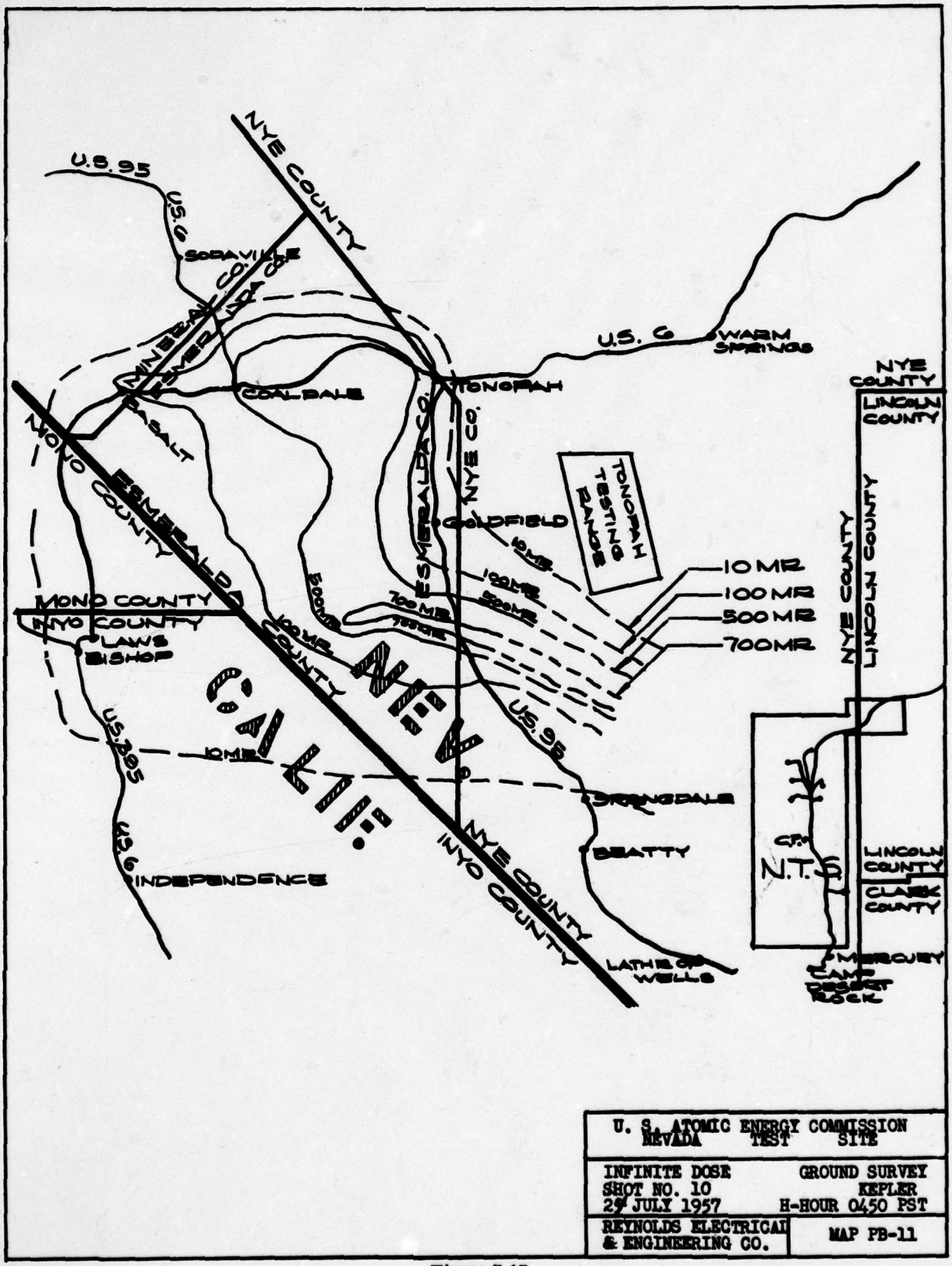

NYE COUNTY
U.S. 95
U.S. 6
SODAVILLE
MINERAL CO.
ESMERALDA CO.
U.S. 6
WARM SPRINGS
COALDALE
TONOPAH
NYE CO.
BASALT
MONO COUNTY
ESMERALDA
GOLDFIELD
TONOPAH TESTING RANGE
10 MR
100 MR
500 MR
700 MR
MONO COUNTY
INYO COUNTY
LAWS
BISHOP
CALIF.
NEV.
U.S. 395
INDEPENDENCE
U.S. 95
BEATTY
NYE COUNTY
INYO COUNTY
LATHROP WELLS
NYE COUNTY
LINCOLN COUNTY
LINCOLN COUNTY
C.P.
N.T.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 10
29th JULY 1957
GROUND SURVEY
KEPLER
H-HOUR 0450 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-11

Figure 7.17

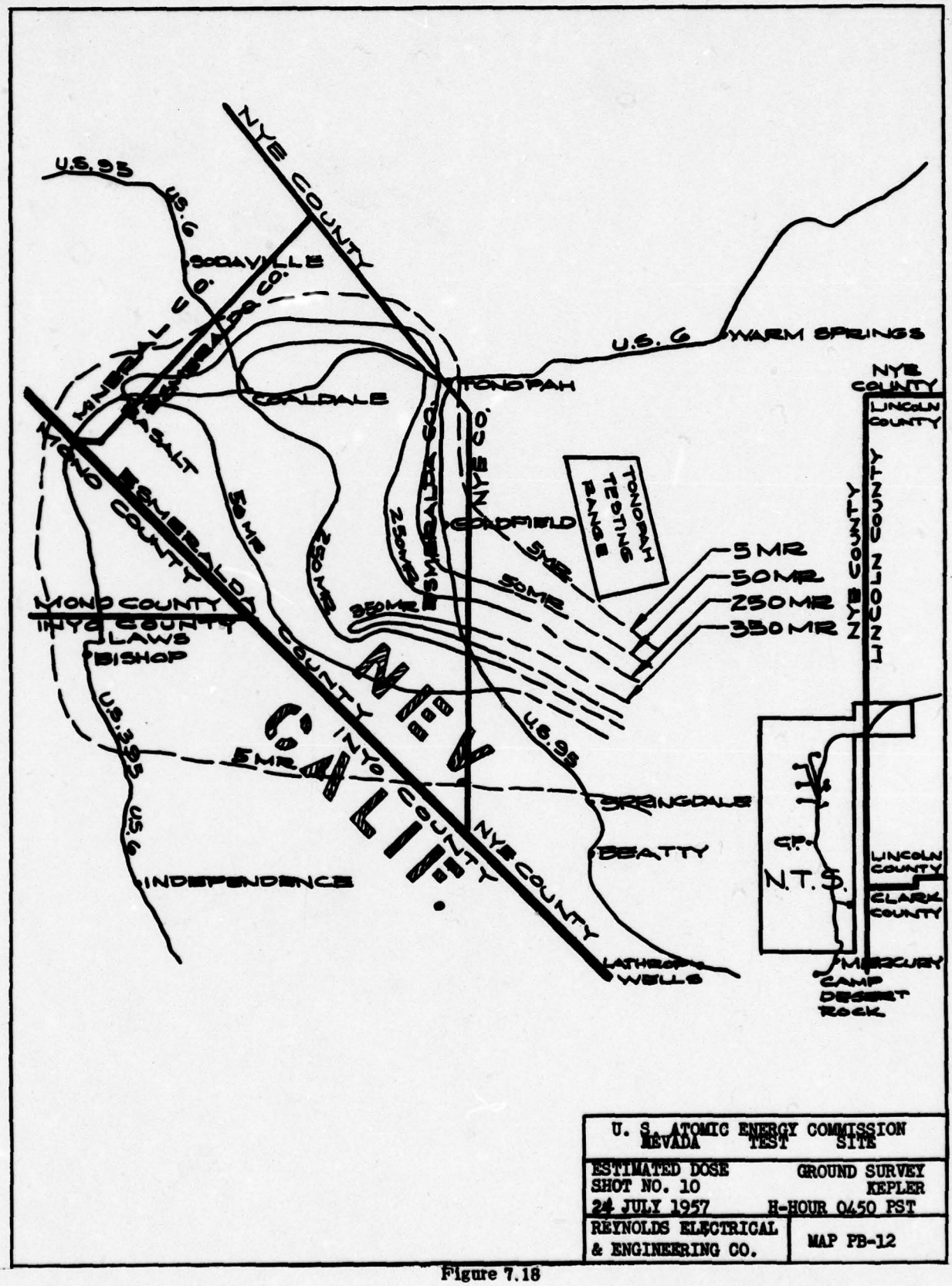

NYE COUNTY
U.S. 95
U.S. 6
HAWTHORNE
MINERAL CO.
ESMERALDA CO.
GOLDFIELD
TONOPAH
U.S. 6
WARM SPRINGS
NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
NYE CO.
ESMERALDA CO.
TONOPAH TESTING RANGE
5 MR
50 MR
250 MR
350 MR
5 MR
50 MR
250 MR
350 MR
MONO COUNTY
INYO COUNTY
LAWS
BISHOP
ESMERALDA COUNTY
INYO COUNTY
NEVADA
CALIF.
U.S. 95
U.S. 395
5 MR
SPRINGDALE
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
INDEPENDENCE
U.S. 6
NYE COUNTY
LATHROP WELLS
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 10
24 JULY 1957
GROUND SURVEY
KEPLER
H-HOUR 0450 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-12

Figure 7.18

DOSES IN POPULATED PLACES - KEPLER

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Basalt, Nevada	8	11.2	13.0	1.5	1.6	95	48
Coaldale, Nevada	25	10.0	13.0	9.5	11.0	650	340
Dodge Constr. Camp, Nevada	175	8.9	10.5	1.2	1.0	62	32
Dyer, Nevada	35	10.0	11.6	1.2	1.2	74	38
Fish Lake, Nevada	15	10.0	11.6	1.2	1.1	65	33
Goldfield, Nevada	220	6.5	9.1	0.8	0.5	36	19
Gold Point, Nevada	10	6.2	9.2	6.5	4.8	310	165
Lida, Nevada	25	6.9	9.9	4.2	3.5	235	124
Lincoln Mine, Nevada	200	9.0	9.7	0.8	0.6	32	16
Montgomery Pass, Nevada	3	11.4	13.2	1.0	1.2	68	34
Silver Peak, Nevada	7	8.2	11.9	7.5	7.5	450	235
Tonopah, Nevada	1,375	7.8	14.1	0.3	0.4	39	20
Watertown, Nevada	2	4.3	11.3	0.5	0.45	28	14
Benton Station, California	300	11.6	14.0	1.0	1.2	70	35
Bishop, California	2,891	10.7	14.9	0.9	1.2	70	35
Deep Springs, California	100	8.5	9.9	0.7	0.6	36	19
Laws, California	72	10.6	14.8	0.9	1.2	69	35
Oasis, California	12	8.5	10.3	0.8	0.7	42	22

Figure 7.19

DOSES IN POPULATED PLACES - OWENS

Location	Population	Estimated Time of Fallout In H +Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
A and B Mine, Nevada	4	4.5	13.9	0.2	0.25	18	10
Bardoli Ranch, Nevada	4	3.8	7.1	1.7	0.9	70	38
Below Ranch, Nevada	3	3.5	8.4	0.5	0.3	24	13
Currant, Nevada	75	5.8	5.8	5.5	2.3	160	86
Dodge Constr. Camp, Nevada	175	1.9	9.9	1.0	0.8	67	39
Duckwater, Nevada	50	5.8	9.0	0.8	0.6	41	22
El Dorado, Nevada	3	7.3	9.9	1.4	1.2	73	38
Ely, Nevada	3,560	7.5	13.7	0.5	0.6	38	20
Eureka, Nevada	500	7.7	8.0	1.3	0.8	50	26
Fallini Ranch, Nevada	15	3.5	5.3	1.8	0.7	53	29
Kimberly, Nevada	120	7.4	26.5	0.1	0.3	20	10
Lincoln Mine, Nevada	100	2.0	8.3	0.4	0.3	22	13
Lockes, Nevada	4	4.7	11.5	1.0	1.0	71	38
Lund, Nevada	250	5.5	12.6	0.4	0.3	22	12
McGill, Nevada	2,300	7.3	27.0	0.1	0.3	20	10
New Ruth, Nevada	1,200	7.3	26.0	0.1	0.3	20	10
Nyala, Nevada	6	3.9	6.7	2.5	1.3	90	49
Preston, Nevada	60	5.9	12.8	0.5	0.5	38	20
Rattlesnake Maint. Station, Nev.	4	4.5	11.0	0.3	0.3	20	11
Reveille Mill, Nevada	6	3.2	10.3	0.4	0.3	27	15
Uhalde Ranch, Nevada	5	3.3	12.3	0.3	0.3	25	14
Walch Pine Creek Ranch, Nevada	4	3.1	11.8	0.2	0.2	16	9
Warm Springs, Nevada	55	3.6	9.2	0.2	0.15	11	6

Figure 7.20

Dr. Kesler (Utah State Health Officer) was called on July 25, 1957 and informed of the predicted cloud trajectories which might produce light fallout or detectable air activity in Utah.

Dr. Hurley (Nevada State Health Officer) was called and briefed on the fallout situation and predicted cloud trajectories.

Mr. Anderson (PHS Radiological Health Program in Washington) was called and given information relative to the "Kepler" and "Owens" events.

7.12 "Stokes" Summary.

Shot number 12, "Stokes", was a 1,500-foot balloon detonation which was fired at 5:25 A.M. on August 7, 1957. The higher portion of the cloud travelled to the northeast while the lower parts of the cloud proceeded to the west of north with light fallout occurring to the north and northwest of Nevada Test Site.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 6 between Lockes, Nevada and a point 14 miles south of Lockes; on Nevada 25 in Railroad Valley; and on several of the desert roads north of Nevada Test Site.

The maximum air concentration found was 1.4×10^{-2} uc/m^3 at Eureka, Nevada. This represents the average air concentration of beta activity for a 28.3-hour sample period starting 15 minutes after the shot.

A table of selected doses is not included as no infinite dose greater than 10 mr. was calculated for a populated place.

During a telephone call from Mr. D. A. Holaday (PHS at Salt Lake City), he was requested to call Dr. Kesler, Utah State Health Officer, and brief him on the predicted trajectories over Utah.

Dr. Hurley, Nevada State Health Officer, was called and informed of the expected light fallout in Nevada and the predicted trajectories.

Three roadblocks were established and manned by Off-Site personnel. The locations of these roadblocks were: on the road to Willow Creek Boy Scout Camp; west of Crystal Springs, Nevada on Nevada 25; and Lincoln Mine, Nevada area.

Those in Lincoln County were coordinated through Sheriff Ike Orr. No incidents were reported.

7.13 "Shasta" Summary.

Shot number 13, "Shasta", was a 500-foot tower detonation which was fired at 5:00 A.M. on August 18, 1957. The higher portion of the cloud proceeded east while the middle part was moving to the northwest and the lower portion travelled to the northeast. Fallout occurred in the vicinity of Warm Springs, Eureka, Ely, Lund, Currant, Preston, Lockes, Nevada and several of the ranches north of Nevada Test Site. Rainout occurred in the Alamo-Hiko, Nevada area as well as Lincoln Mine, Nevada.

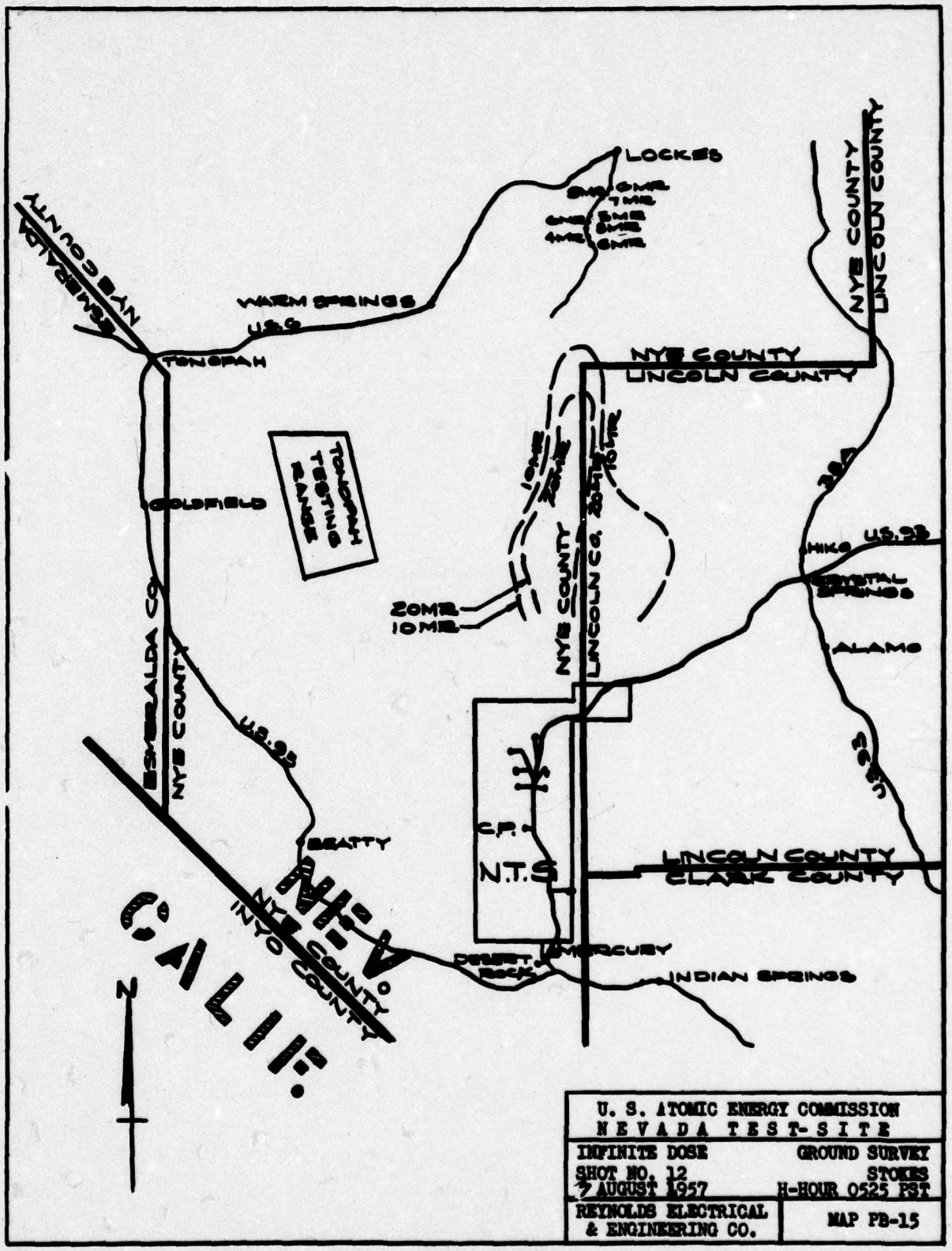

LOCKES
WARM SPRINGS
U.S. 6
TONOPAH
NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
TONOPAH TESTING RANGE
GOLDFIELD
ESMERALDA CO.
NYE COUNTY
20 MI.
10 MI.
NYE COUNTY
LINCOLN CO.
ALAMO
U.S. 93
U.S. 95
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
NEV.
CALIF.
INYO COUNTY
MERCURY
INDIAN SPRINGS
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
GROUND SURVEY
SHOT NO. 12
STOKES
7 AUGUST 1957
H-HOUR 0525 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-15

Figure 7.21

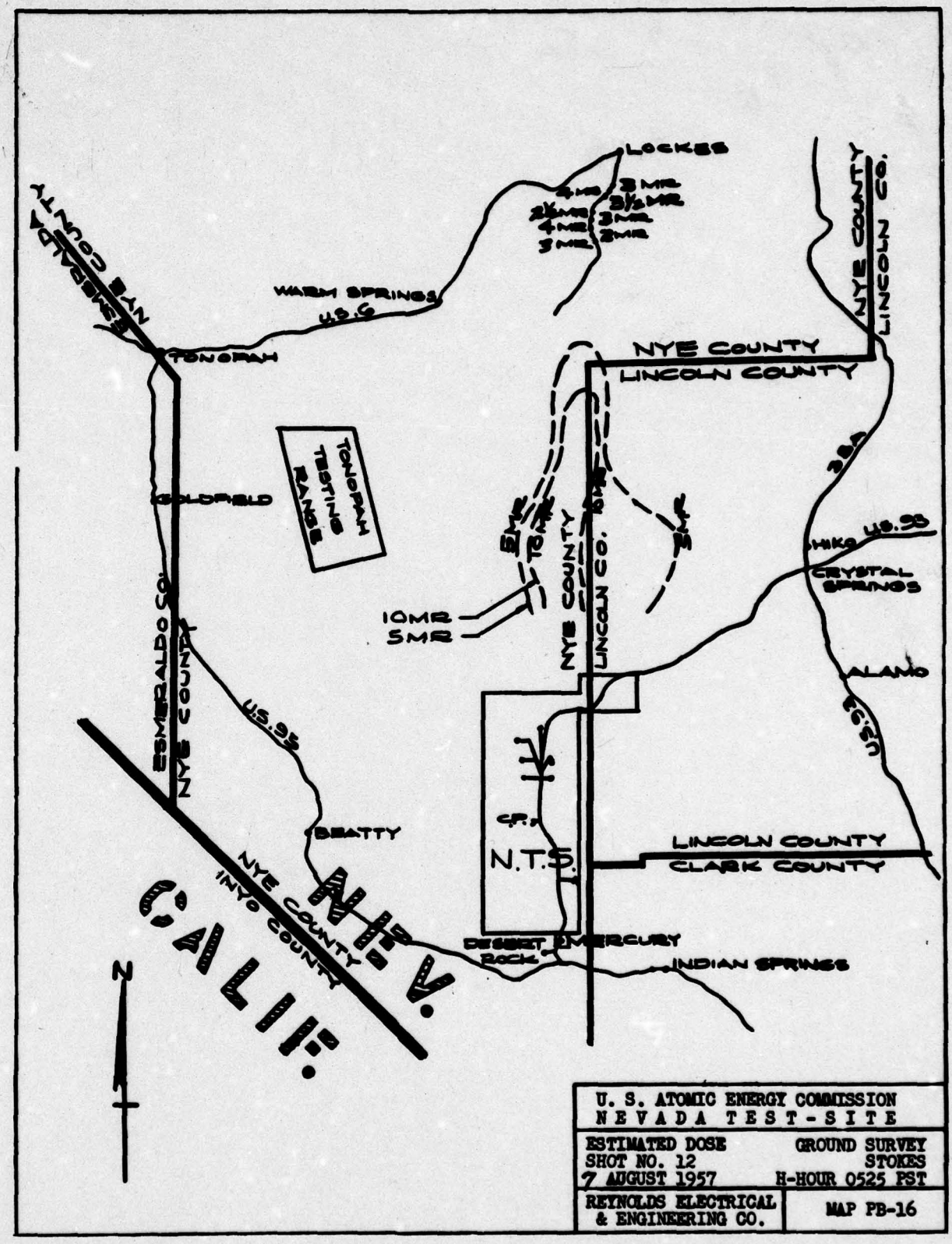

LOCKES
4 MR
3 MR
2½ MR
4 MR
3½ MR
3 MR
3 MR
2 MR
NYE COUNTY
LINCOLN CO.
WARM SPRINGS
U.S. 6
TONOPAH
NYE COUNTY
LINCOLN COUNTY
ESMERALDA COUNTY
TONOPAH TESTING RANGE
GOLDFIELD
ESMERALDA CO.
NYE COUNTY
10MR
5MR
NYE COUNTY
LINCOLN CO.
HWY 95
U.S. 95
CRYSTAL SPRINGS
ALAMO
U.S. 93
U.S. 95
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
NEV.
CALIF.
NYE COUNTY
INYO COUNTY
DESERT ROCK
MERCURY
INDIAN SPRINGS
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 12
7 AUGUST 1957
GROUND SURVEY
STOKES
H-HOUR 0525 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-16

Figure 7.22

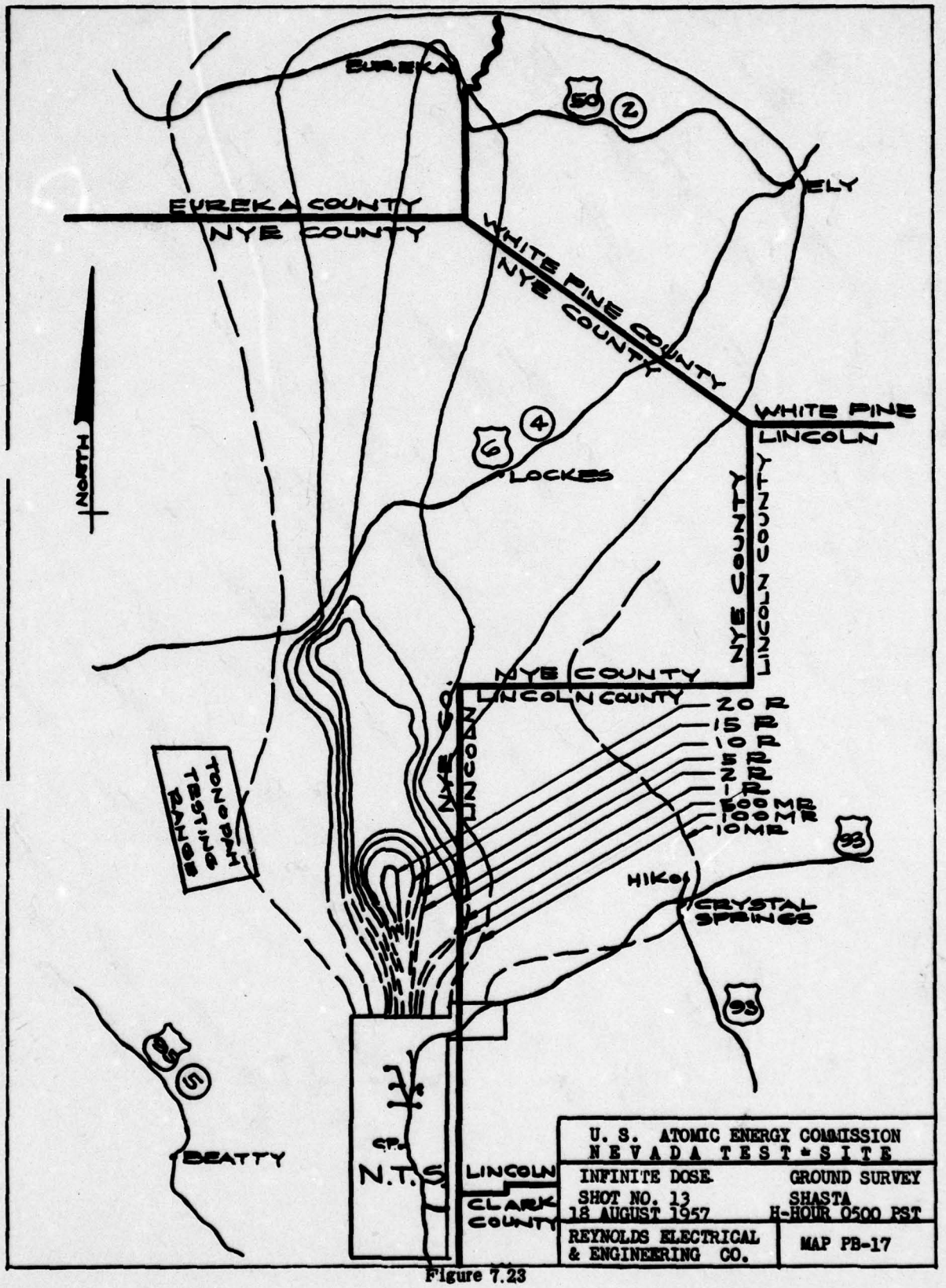

EUREKA
50
2
ELY
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
NYE COUNTY
WHITE PINE
LINCOLN
NORTH
6
4
LOCKES
NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
20 R
15 R
10 R
5 R
1 R
500 MR
100 MR
10 MR
TONOPAH TESTING RANGE
NYE CO.
LINCOLN
93
HIKO
CRYSTAL SPRINGS
93
95
BEATTY
CP
N.T.S.
LINCOLN
CLARK COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 13
18 AUGUST 1957
GROUND SURVEY
SHASTA
H-HOUR 0500 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-17

Figure 7.23

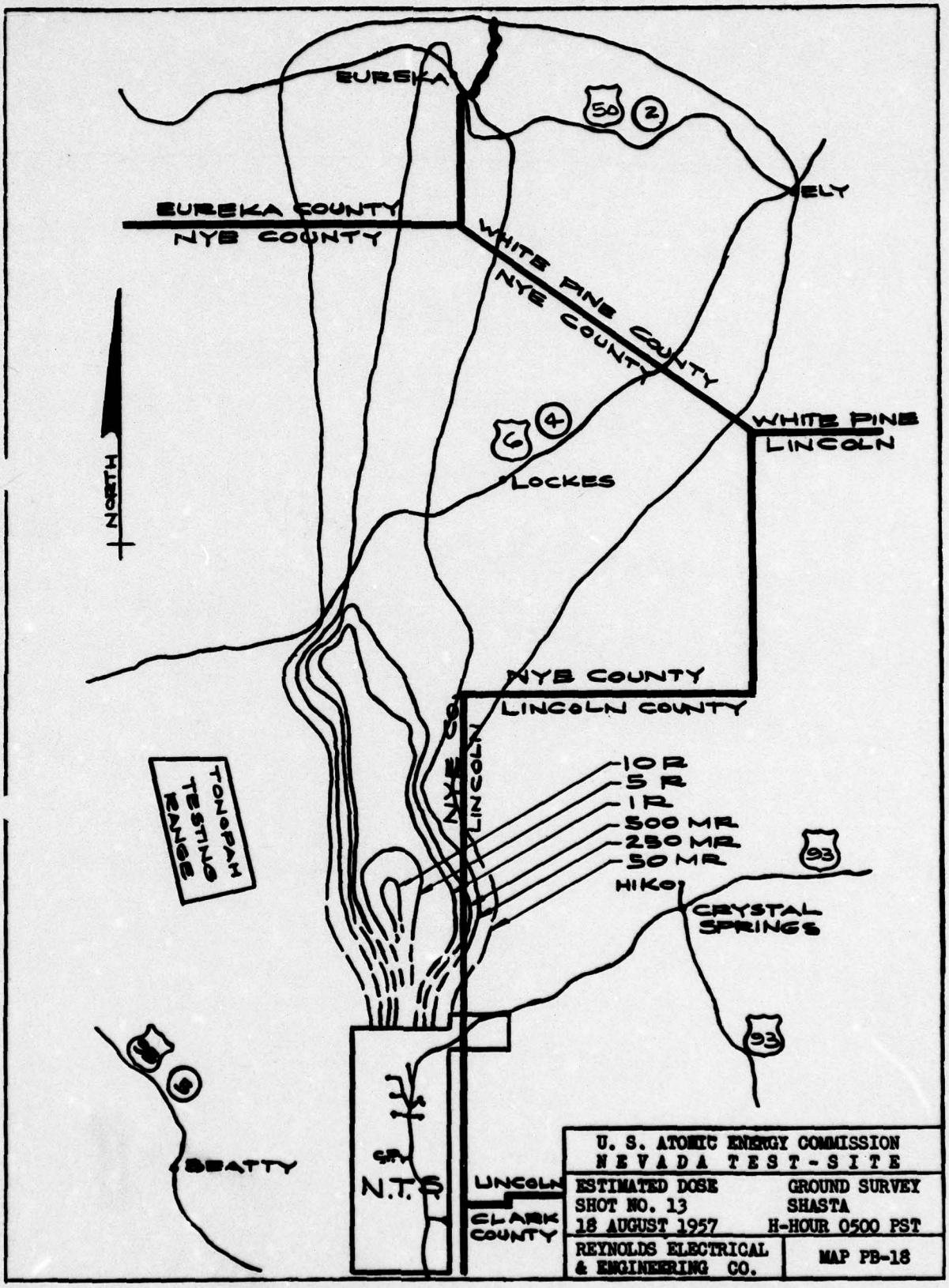

EUREKA
50
2
ELY
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
NYE COUNTY
WHITE PINE
LINCOLN
NORTH
6
4
LOCKES
NYE COUNTY
LINCOLN COUNTY
NYE CO.
LINCOLN
TONOPAH TESTING RANGE
10 R
5 R
1 R
500 MR
250 MR
50 MR
93
HIKO
CRYSTAL SPRINGS
93
95
6
BEATTY
GP
N.T.S.
LINCOLN
CLARK COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 13
18 AUGUST 1957
GROUND SURVEY
SHASTA
H-HOUR 0500 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-18

Figure 7.24

DOSES IN POPULATED PLACES - SHASTA

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Ash Springs, Nevada*	5	29.0	29.0	0.07	-	10	5
Bardoli Ranch, Nevada	4	5.5	10.3	4.8	4.0	275	148
Belew Ranch, Nevada	3	5.0	11.5	0.4	0.4	30	17
Crystal Springs, Nevada*	0	29.0	29.0	0.3	-	44	21
Currant, Nevada	75	8.6	8.7	3.5	2.5	150	77
El Dorado, Nevada	3	10.0	11.8	11.5	10.0	650	325
Ely, Nevada	3,560	14.0	16.3	3.5	-	435	216
Eureka, Nevada	500	10.0	10.5	13.0	11.0	700	354
Fallini Twin Springs Ranch Nev.	15	5.3	6.9	33.0	17.0	1,270	685
Hiko, Nevada*	55	28.8	28.8	0.13	-	19	9
Lincoln Mine, Nevada*	100	3.2	11.4	0.24	0.22	19	11
Lockes, Nevada	4	7.4	8.1	7.0	4.3	324	168
Lund, Nevada	250	9.4	10.6	2.5	2.2	132	68
Nyala, Nevada	6	5.9	8.7	5.0	3.2	236	124
Preston, Nevada	60	9.3	10.2	3.5	3.0	186	95
Rattlesnake Maintenance Station, Nevada	4	6.5	7.6	10.0	5.9	391	205
Reveille Mill, Nevada	6	4.9	6.0	20.0	9.0	640	348
Ruby Hill Mine, Nevada	50	10.0	10.1	16.0	13.0	800	402
Uhalde Ranch, Nevada	5	4.9	11.6	0.35	0.33	24	13
Warm Springs, Nevada	55	5.7	6.8	2.5	1.3	88	47
Whipple Ranch, Nevada*	10	28.5	28.5	0.3	-	43	21

*Rainout

Figure 7.25

Monitoring runs, which indicated activity substantially above background, were made along Nevada 25 between Railroad Pass and Warm Springs, Nevada; on U.S.6 between the Warm Springs, Nevada area and Ely, Nevada; on Nevada 38 in the Preston-Lund, Nevada area; along U.S. 50 in the Eureka, Nevada area; and on several of the desert roads north and northwest of Nevada Test Site, Rainout produced readings, above background, in the vicinity of Hiko-Alamo and Lincoln Mine, Nevada.

The maximum air concentration found was 8.10×10^{-2} uc/m^3 at Eureka, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting 15 minutes after the shot.

As this shot was detonated on a Sunday, the pertinent state health officies were closed and therefore no telephone calls were made.

7.14 "Doppler" Summary.

Shot number 14, "Doppler", was a 1,500-foot balloon detonation which was fired at 5:30 A.M. on August 23, 1957. The low parts of the cloud travelled north while the higher parts of the cloud moved rapidly to the northeast. Fallout (or rainout) occurred in the vicinity of Reveille Mill, Ely, New Ruth, and Kimberly, Nevada. Rainout occurred in the off-site area at several places due to localized thunder showers.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 6 in the Warm Springs, Nevada area; along Nevada 25 in Railroad Valley; on Nevada 38 between points 48 and 69 miles north of Hiko, Nevada; on U.S. 93 between Ely, Nevada and a point 32 miles south of Ely; on the roads in the Ely, Nevada area; and along several of the desert roads north of Nevada Test Site.

The maximum air concentration found was 8.7×10^{-3} uc/m^3 at Ely, Nevada. This represents the average air concentration of beta activity for a 27.5-hour sample period starting at shot time.

Mr. W. W. White (Nevada State Sanitary Engineer) was called on August 23, 1957 and briefed as to fallout and predicted trajectories within Nevada.

Shot morning, it was reported that two Air National Guard Planes were suspect of contamination as their flight patterns might have intersected the higher parts of the "Doppler" cloud. These planes were then located at the Salt Lake City, Utah Municipal Airport. Mr. D. A. Holaday (PHS in Salt Lake City) was requested to investigate this situation. The planes were monitored and the readings were background. Mr. Holaday was requested to call Dr. Kesler (Utah State Health Officer) and inform him of the fallout pattern and the predicted cloud trajectories over Utah.

Roadblocks for flash protection purposes were established near Crystal Springs and Lincoln Mine, Nevada No incidents were reported.

7.15 "Franklin Prime" Summary.

Shot number 15, "Franklin Prime", was a 750-foot balloon detonation which was fired at 5:40 A.M. on August 30,1957. The higher portion of the cloud moved off to the northeast

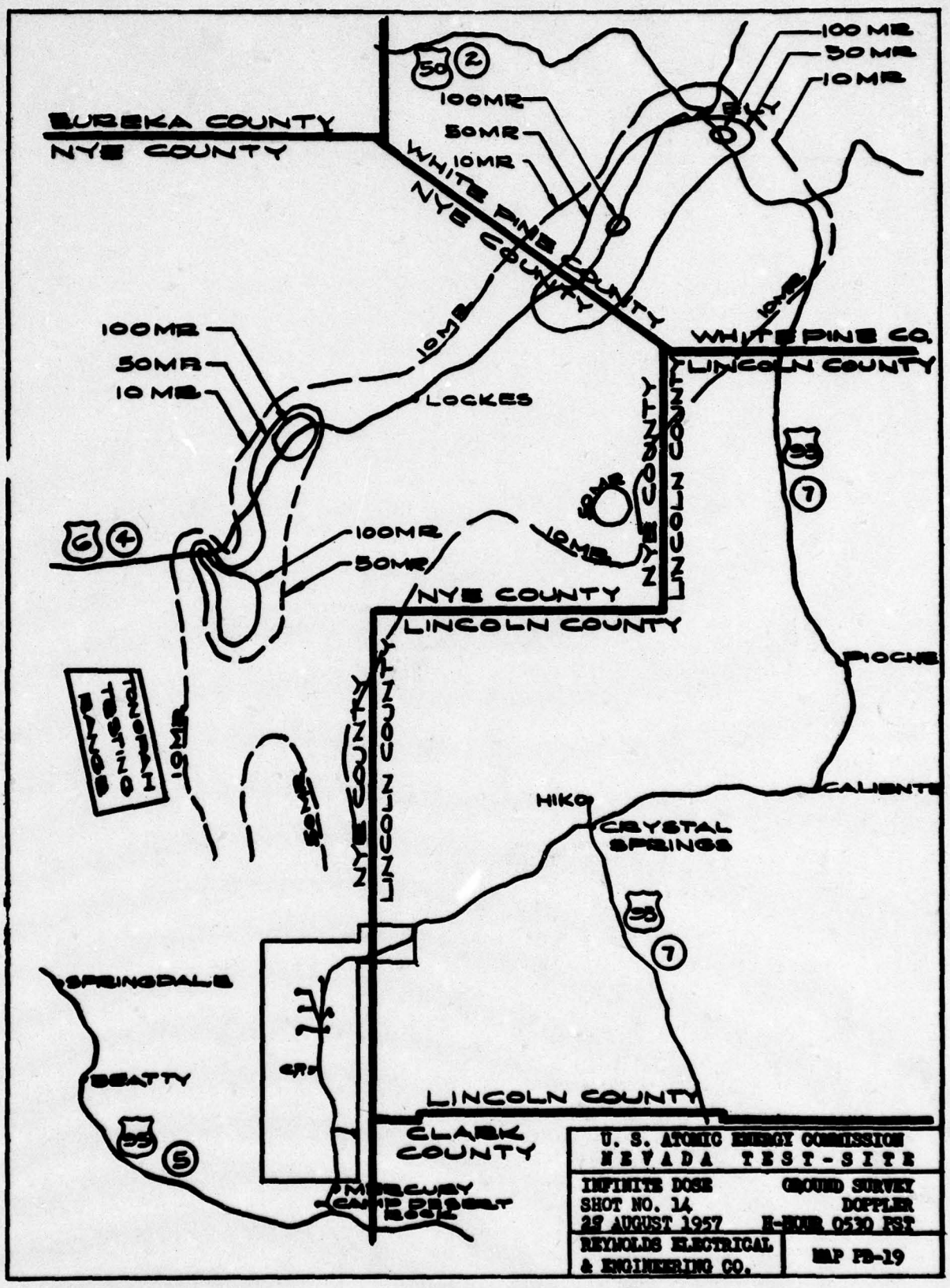

100 MR
50 MR
10 MR
50
2
100MR
50MR
10MR
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
NYE COUNTY
WHITE PINE CO.
LINCOLN COUNTY
100MR
50MR
10 MR
LOCKES
NYE COUNTY
LINCOLN COUNTY
50
7
6
4
100MR
50MR
10MR
NYE COUNTY
LINCOLN COUNTY
PIOCHE
BANEBERRY
19MR
NYE COUNTY
LINCOLN COUNTY
HIKO
CRYSTAL SPRINGS
CALIENTE
50
7
SPRINGDALE
BEATTY
95
5
LINCOLN COUNTY
CLARK COUNTY
MERCURY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 14
29 AUGUST 1957
GROUND SURVEY
DOPPLER
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP FB-19

Figure 7.26

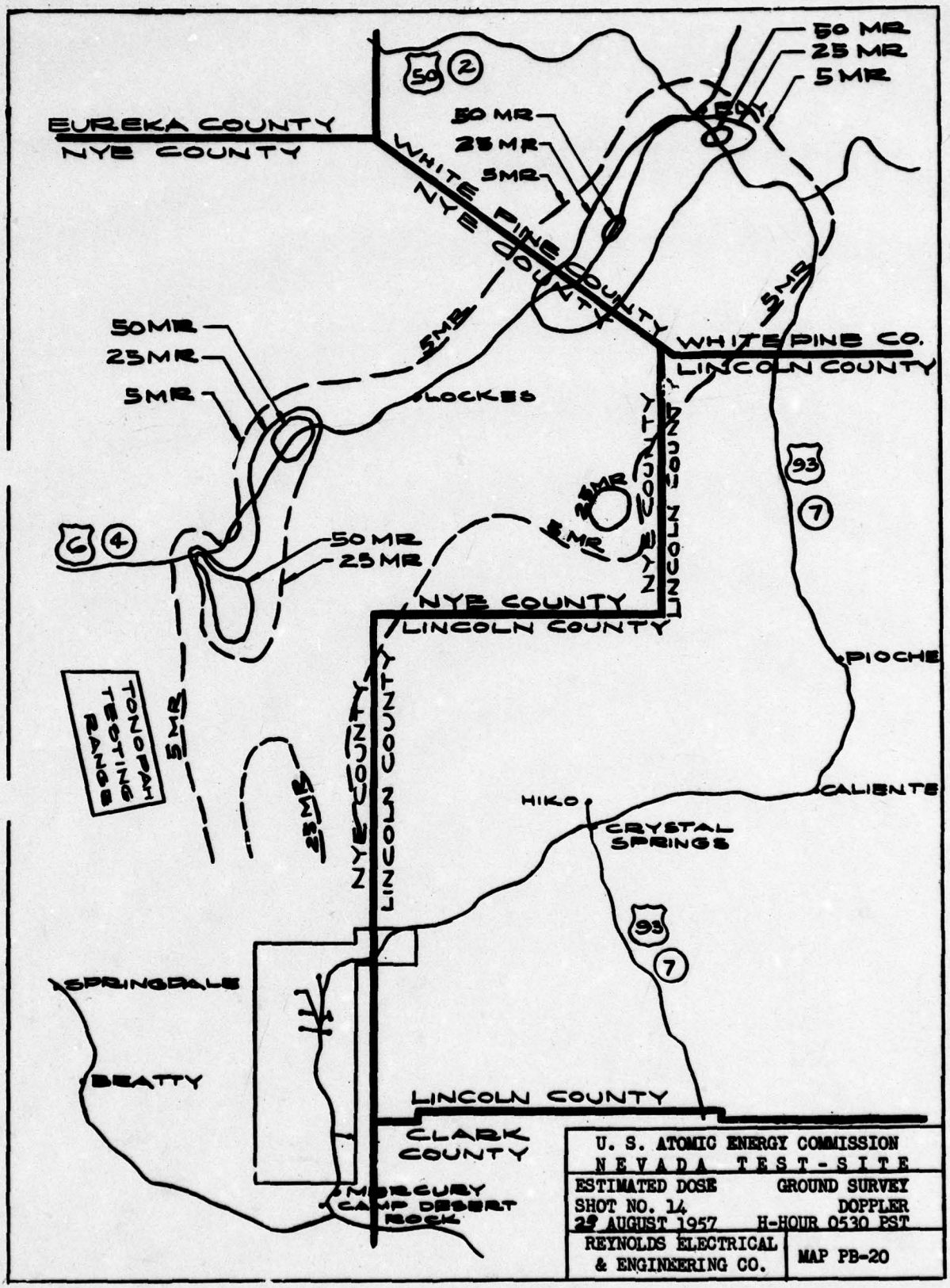

50 MR
25 MR
5 MR
EUREKA COUNTY
NYE COUNTY
50 MR
25 MR
5MR
WHITE PINE COUNTY
5MR
WHITE PINE CO.
LINCOLN COUNTY
50MR
25MR
5MR
5MR
ELOCKER
LINCOLN COUNTY
93
7
25MR
5MR
50 MR
25 MR
NYE COUNTY
LINCOLN COUNTY
PIOCHE
TONOPAH TESTING RANGE
5MR
25MR
NYE COUNTY
LINCOLN COUNTY
HIKO
CRYSTAL SPRINGS
CALIENTE
93
7
SPRINGDALE
BEATTY
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
GROUND SURVEY
SHOT NO. 14
DOPPLER
29 AUGUST 1957
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-20

Figure 7.27

DOSES IN POPULATED PLACES - DOPPLER

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Ely, Nevada	3,560	10.0	15.3	0.5	0.7	42	21
Kimberly, Nevada	120	9.8	12.1	0.25	0.25	16	8
New Ruth, Nevada	1,200	9.9	12.1	0.25	0.25	16	8
Reveille Mill, Nevada	6	4.1	13.5	1.6	1.8	133	73

Figure 7.28

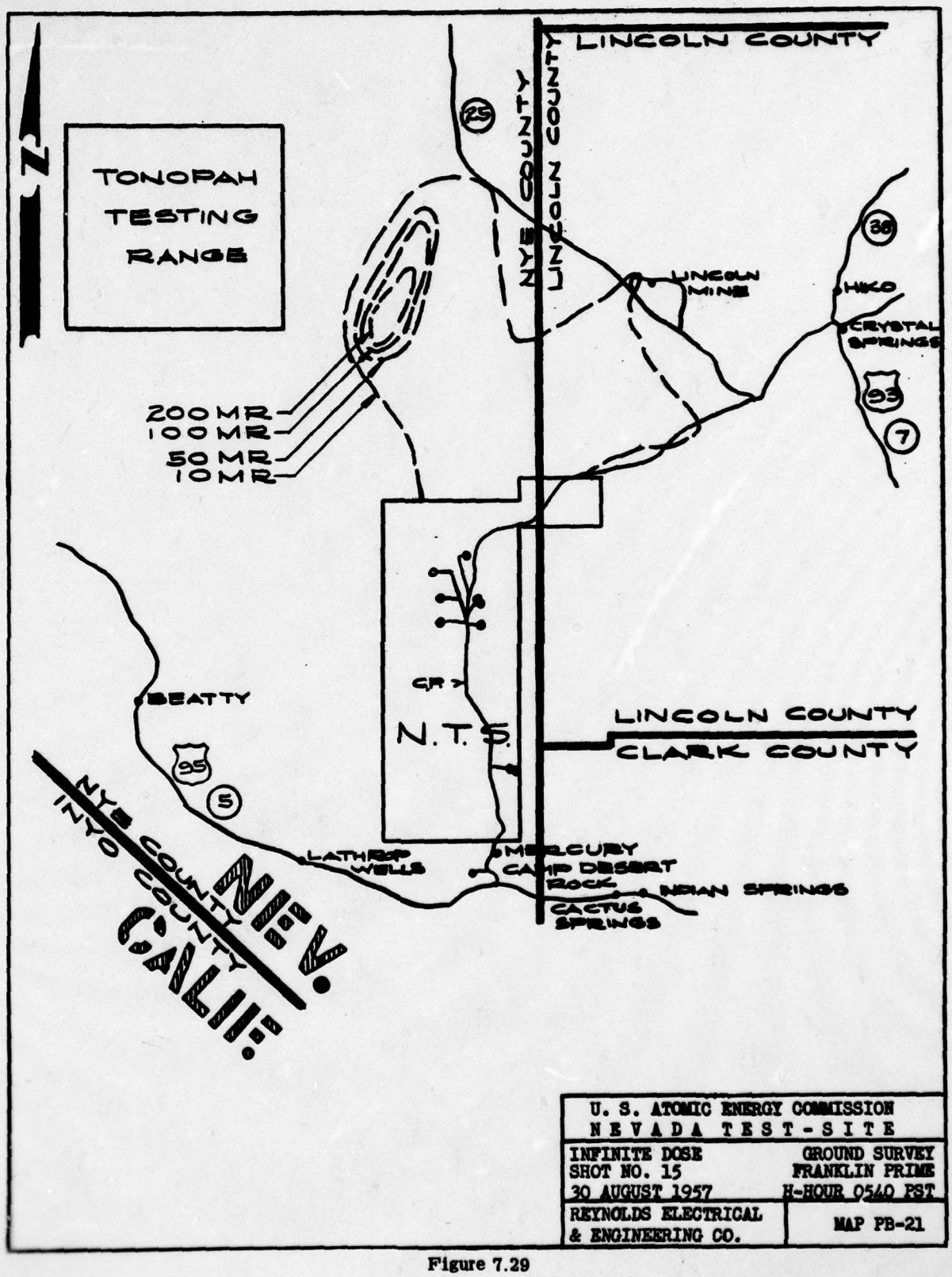

LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
TONOPAH
TESTING
RANGE
25
LINCOLN
MINE
HIKO
CRYSTAL
SPRINGS
93
7
38
200 MR
100 MR
50 MR
10 MR
CP
N.T.S.
BEATTY
95
5
LATHROP
WELLS
MERCURY
CAMP DESERT
ROCK
INDIAN SPRINGS
CACTUS
SPRINGS
LINCOLN COUNTY
CLARK COUNTY
NYE COUNTY
INYO COUNTY
NEV.
CALIF.
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 15
30 AUGUST 1957
GROUND SURVEY
FRANKLIN PRIME
H-HOUR 0540 PST
REYNOLDS ELECTRICAL
& ENGINEERING CO.
MAP PB-21

Figure 7.29

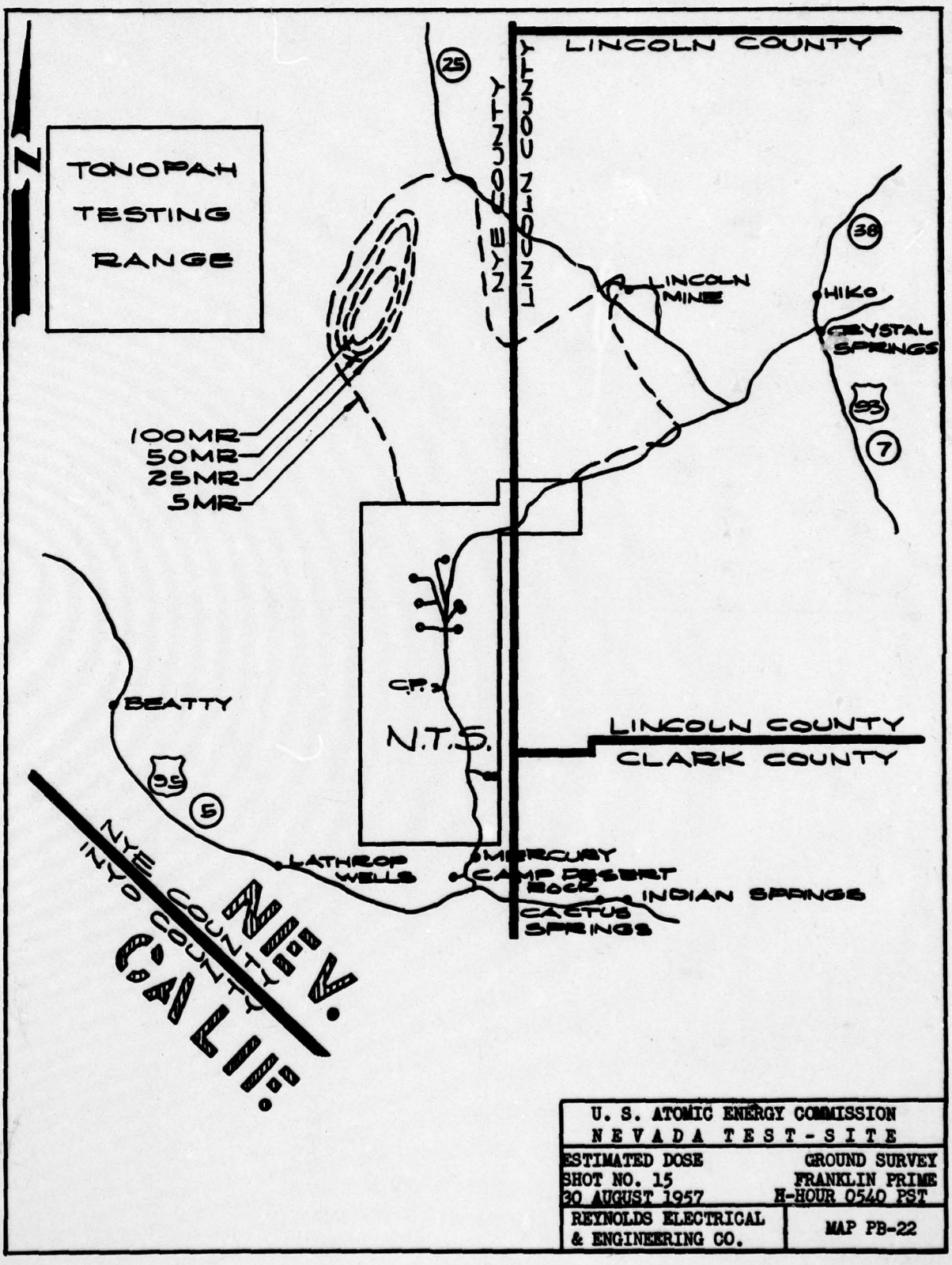

LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
TONOPAH
TESTING
RANGE
25
38
LINCOLN
MINE
HIKO
CRYSTAL
SPRINGS
95
7
100MR
50MR
25MR
5MR
C.P.-1
N.T.S.
BEATTY
95
5
LINCOLN COUNTY
CLARK COUNTY
NYE COUNTY
INYO COUNTY
NEV.
CAL IF.
LATHROP
WELLS
MERCURY
CAMP DESERT
ROCK
INDIAN SPRINGS
CACTUS
SPRINGS
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 15
30 AUGUST 1957
GROUND SURVEY
FRANKLIN PRIME
H-HOUR 0540 PST
REYNOLDS ELECTRICAL
& ENGINEERING CO.
MAP PB-22

Figure 7.30

while the lower part of the cloud travelled slowly to the northwest. Light fallout occurred to the north and northwest of Nevada Test Site.

Monitoring runs, which indicated activity substantially above background, were made on Groom Road between Gate 385 and Ticabou Valley; along Road B between Groom Lake and Nevada 25; along Kawich Valley Road; on the road between Kawich Valley and Reed; on Nevada 25 in the Lincoln Mine, Nevada area; and in the vicinity of Eureka, Nevada.

The maximum air concentration found was 1.95×10^{-2} uc/m^3 at Eureka, Nevada. This represents the average air concentration of beta activity for a 24.3-hour period starting ten minutes prior to shot time.

A table of selected doses is not included as no infinite dose greater than 10 mr. was calculated for a populated place.

Dr. Hurley, Nevada State Health Officer, was called and informed of fallout in Nevada and predicted cloud trajectories.

Mr. Thatcher, Utah State Sanitary Engineer, was called and informed of the predicted cloud trajectories which might affect Utah. (The State Health Officer, Dr. Kesler, was out of his office).

7.16 "Smoky" Summary.

Shot number 16, "Smoky", was a 700-foot tower detonation which was fired at 5:30 A.M. on August 31, 1957. The 10,000-foot part of the cloud travelled to the east of south while the higher parts of the cloud moved slightly to the southeast and then travelled to the northeast. No fallout was found from the lower part of the cloud.

Fallout occurred in the vicinity of Butler Ranch, Rox, Moapa, Overton, Logandale, Indian Springs, Carp, and Panaca, Nevada; Beaver Dam and Littlefield, Arizona; and Shivwits Indian Reservation, Santa Clara, St. George, Veyo, Mt. Carmel Junction, Glendale, Kanarraville, Pintura, Cedar City, Enterprise, Parawan, Paragonah, Newcastle, Beryl, Modena, and Panguitch, Utah. (Other towns which were affected by fallout are listed in Figure 7.33).

Monitoring runs, which indicated activity substantially above background, were made along Road B from a point 13 miles south of Gate 400 to Indian Springs, Nevada; on Road C between points 12 miles and 44 miles south of the junction with U.S. 93; on U.S. 91 between the junction with U.S. 93 and Beaver, Utah; along the Carp-Elgin road between Carp, Nevada and the junction with U.S. 93; on the road southeast from Carp to the junction with U.S. 91; on U.S. 93 between the junction with U.S 91 to a point nine miles south of Alamo, Nevada; on the road through Gunlock, Utah; on Utah 18 between the junction of U.S. 91 and Beryl Junction, Utah; on Utah 17 between Harrisburg Junction and La Verkin, Utah; on Utah 15 between Anderson Junction and Mt. Carmel Junction, Utah along U.S. 89 between Mt. Carmel Junction and Marysvale, Utah; on Utah 14 between Cedar City and Long Valley Junction, Utah; on Utah 20 between U.S. 91 and U.S. 89; on Utah 56 between the Nevada-Utah state line and the Cedar City, Utah area; on Nevada 25 between the Utah-Nevada state line and Panaca, Nevada; and along U.S. 95 in the vicinity of Indian Springs, Nevada.

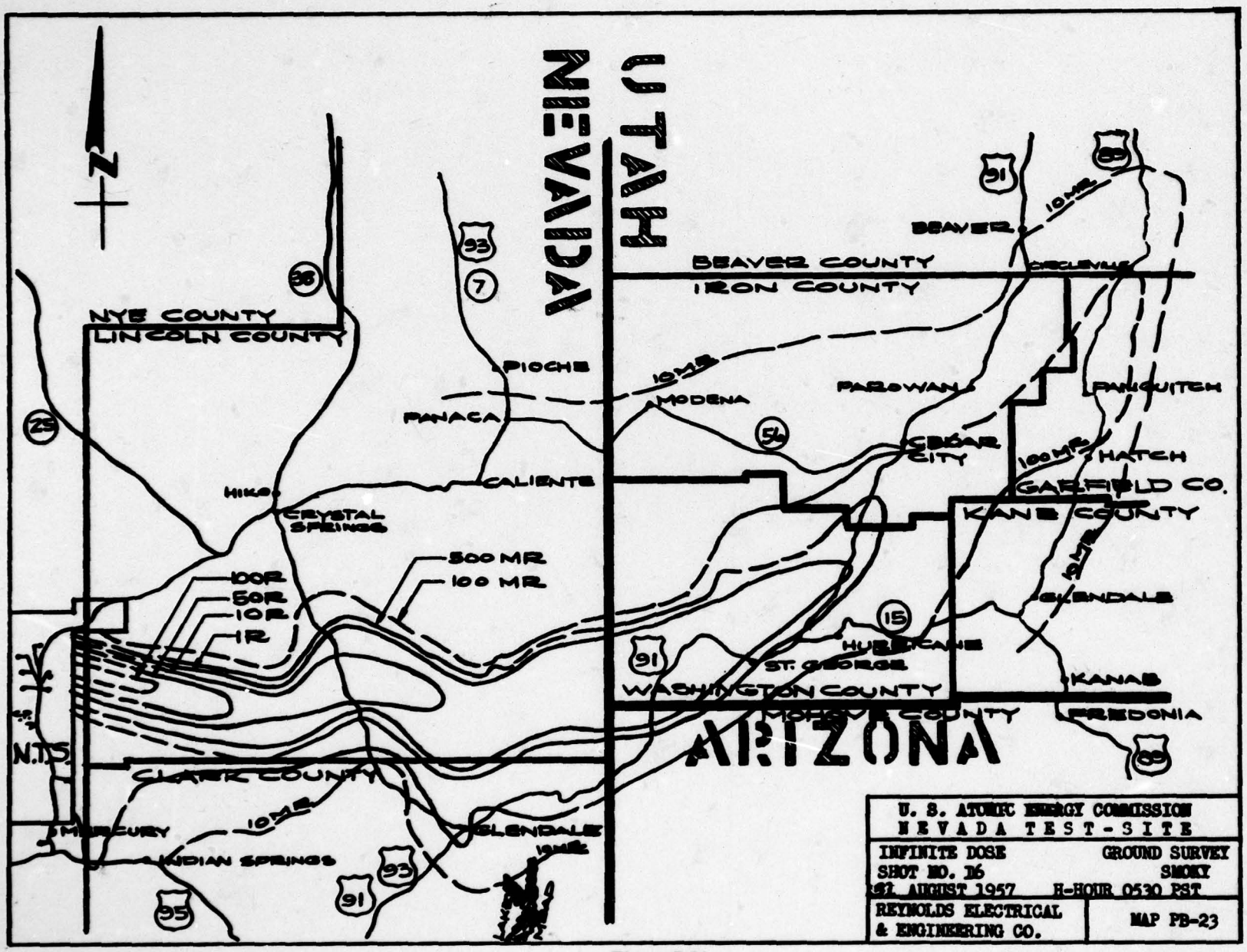

NEVADA
UTAH
ARIZONA
N
NYE COUNTY
LINCOLN COUNTY
BEAVER COUNTY
IRON COUNTY
WASHINGTON COUNTY
KANE COUNTY
GARFIELD CO.
CLARK COUNTY
MOHAVE COUNTY
PIOCHE
PANACA
MODENA
CALIENTE
HIKO
CRYSTAL SPRINGS
PAROWAN
CEDAR CITY
HATCH
PANGUITCH
BEAVER
CIRCLEVILLE
GLENDALE
HURRICANE
ST. GEORGE
KANAB
FREDONIA
MERCURY
INDIAN SPRINGS
N.T.S.
100R
50R
10R
1R
500 MR
100 MR
10 MR
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. B6
GROUND SURVEY
SMOKY
31 AUGUST 1957
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-23

Figure 7.31

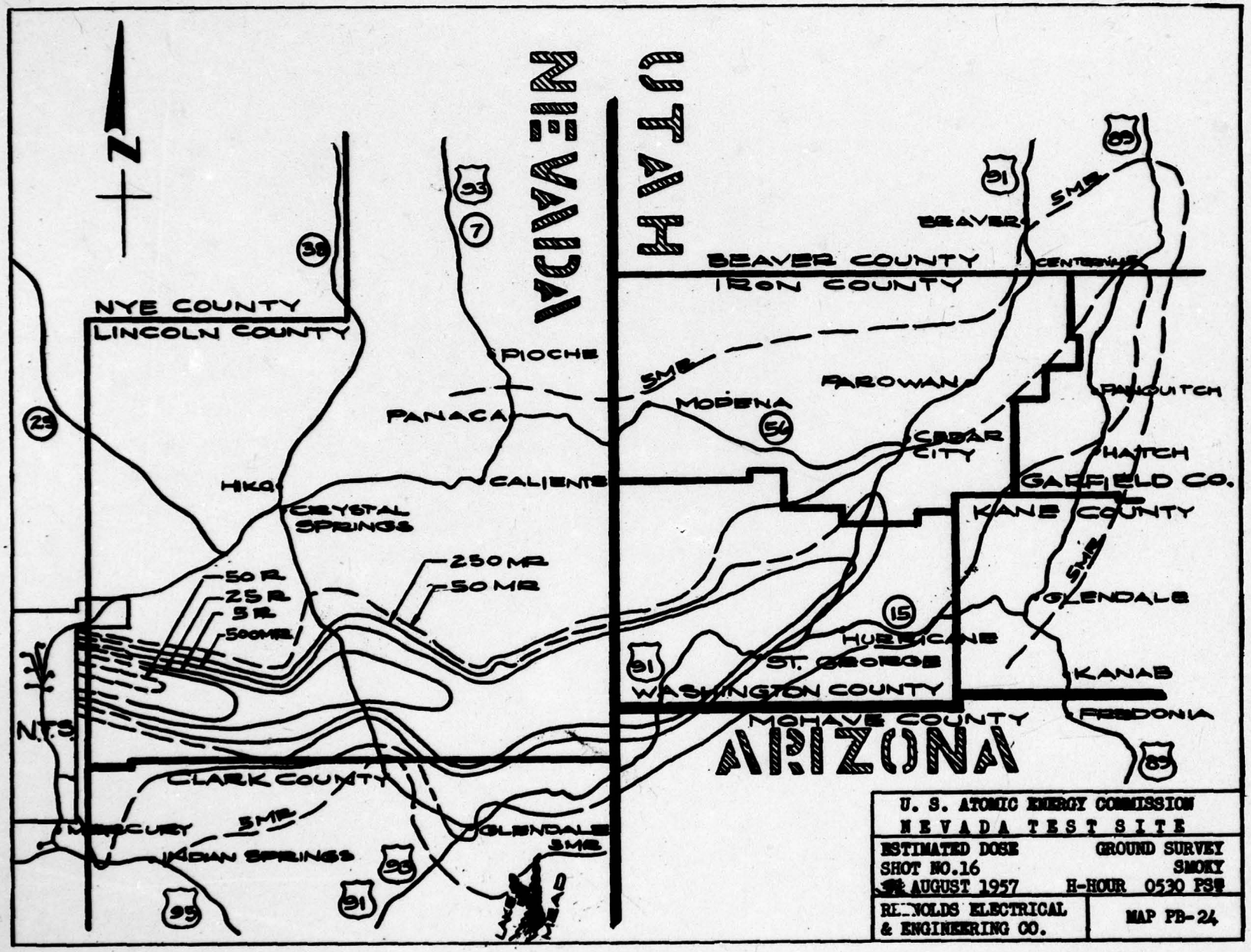

N
NEVADA
UTAH
ARIZONA
NYE COUNTY
LINCOLN COUNTY
CLARK COUNTY
BEAVER COUNTY
IRON COUNTY
WASHINGTON COUNTY
KANE COUNTY
GARFIELD CO.
MOHAVE COUNTY
PIOCHE
PANACA
MODENA
BEAVER
PAROWAN
CEDAR CITY
PANGUITCH
HATCH
GLENDALE
KANAB
FREDONIA
HIKO
CRYSTAL SPRINGS
CALIENTE
ST. GEORGE
MERCURY
INDIAN SPRINGS
N.T.S.
50 R.
25 R.
5 R.
500 MR.
250 MR.
50 MR.
5 MR.
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO.16
AUGUST 1957
GROUND SURVEY
SMOKY
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-24

Figure 7.32

DOSES IN POPULATED PLACES - SMOKY

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity At H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Beaver Dam, Arizona	6	6.7	13.1	5.0	5.7	402	210
Littlefield, Arizona	44	6.7	13.2	6.0	6.8	470	247
Butler Ranch, Nevada	2	3.7	3.8	360	85	5,845	3,220
Cactus Springs, Nevada	18	3.0	7.1	1.5	0.8	54	31
Carp, Nevada	25	4.9	11.6	1.5	1.4	101	55
Farrier, Nevada	3	4.7	7.9	3.2	2.1	146	79
Gault, Nevada	1	4.6	8.4	120	75	5,200	2,860
Glendale Junction, Nevada	50	5.5	12.4	2.0	2.1	140	75
Hoya, Nevada	8	4.5	9.3	50	38	2,600	1,410
Indian Springs, Nevada	250	3.0	7.0	3.5	2.1	165	93
Logandale, Nevada	300	5.7	12.8	0.8	0.9	60	32
Mesquite, Nevada	590	6.3	13.6	2.0	2.3	157	83
Moapa, Nevada	125	4.8	10.4	2.0	1.7	120	65
Overton, Nevada	750	5.7	13.2	0.2	0.2	14	8
Panaca, Nevada	500	5.6	14.6	0.7	0.9	62	33
Rox, Nevada	3	4.5	8.5	8.0	5.2	383	208
Warm Springs, Nevada	58	5.6	12.1	1.0	1.0	73	39
Anderson Junction, Utah	12	8.5	10.7	11.0	9.0	595	306
Beryl, Utah	15	6.9	13.4	0.5	0.6	41	22
Beryl Junction, Utah	8	6.4	12.4	0.9	0.9	61	32
Bryce Canyon, Utah	400	11.7	34.4	0.1	0.4	21	10
Cedar City, Utah	6,100	9.4	11.9	3.0	3.0	183	94
Central, Utah	49	7.5	10.9	6.0	5.2	344	179
Circleville, Utah	600	12.0	33.5	0.5	1.7	102	51
Enterprise, Utah	800	7.4	13.6	0.8	0.9	59	31
Glendale, Utah	275	10.4	14.5	0.8	1.0	62	31
Grafton, Utah	10	9.0	12.7	2.0	2.2	135	70
Gunlock, Utah	127	7.3	9.7	7.0	5.2	346	180
Hamilton Fort, Utah	26	9.3	11.3	3.5	3.2	205	105
Hatch, Utah	24	11.4	33.6	0.4	1.2	74	37
Harrisburg Junction, Utah	5	8.1	10.3	3.5	3.0	182	94
Hillsdale, Utah	10	11.6	33.7	0.8	3.1	180	88
Hurricane, Utah	1,375	8.5	12.2	2.5	2.5	143	74
Ivins, Utah	75	7.3	12.1	14	15	950	495

Figure 7.33

DOSES IN POPULATED PLACES - SMOKY

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 hrs. mr/hr.	I.D. mr.	E.D. mr.
Kanarraville, Utah	263	9.0	11.1	15	13	855	440
Leeds, Utah	100	8.3	9.5	17	13	830	427
Long Valley Junction, Utah	10	11.0	33.4	0.1	0.3	19	9
Marysvale, Utah	520	12.7	34.2	0.05	0.2	10	5
Modena, Utah	100	7.1	14.0	0.5	0.6	43	22
Mt. Carmel, Utah	135	10.0	13.8	0.6	0.7	45	23
Newcastle, Utah	115	6.7	12.6	0.7	0.7	50	26
Orderville, Utah	371	10.2	14.3	0.9	1.1	67	34
Orton Junction, Utah	15	11.7	35.4	0.6	2.2	134	66
Panguitch, Utah	1,500	11.9	35.2	3.5	13	743	364
Paragonah, Utah	404	10.5	13.0	0.4	0.4	27	14
Parowan, Utah	1,455	10.2	12.8	0.4	0.4	26	13
Pintura, Utah	50	8.6	10.8	18	15	989	510
Rockville, Utah	125	9.2	12.8	2.0	2.1	138	69
Santa Clara, Utah	319	7.4	11.9	14	14	890	463
Shivwits Reservation, Utah	95	7.2	12.3	14	15	1,010	525
Springdale, Utah	209	9.3	12.9	1.5	1.7	107	54
St. George, Utah	5,000	7.6	12.5	14	15	950	495
Summit, Utah	146	10.0	12.3	0.4	0.4	25	13
Toquerville, Utah	219	8.5	10.6	5.0	4.2	264	136
Veyo, Utah	100	7.4	10.0	15	12	815	425
Virgin, Utah	135	8.7	12.6	2.0	2.2	135	70
Washington, Utah	435	8.0	11.6	4.0	3.4	240	125
Zion National Park, Utah	15	9.5	13.2	2.0	2.3	147	74

Figure 7.33

The maximum air concentration found was 3.4×10^{-2} uc/m^3 at St. George, Utah. This represents the average air concentration of beta activity for a 27.5-hour period starting a half-hour after shot time.

On August 31, Dr. Kesler (Utah State Health Officer) was called and informed of fallout in Utah and predicted cloud trajectories. In the event of rain in Salt Lake City, Dr. Kesler was to contact Mr. D. A. Holaday (Public Health Service at Salt Lake City) for assistance in monitoring.

Health officials in Nevada could not be contacted.

7.17 "Galileo" Summary.

Shot number 17, "Galileo", was a 500-foot tower detonation which was fired at 5:40 A.M. on September 2, 1957. The lower part of the cloud moved to the northwest while the higher portions of the cloud travelled to the southwest. Fallout occurred in the vicinity of Reveille Mill, Warm Springs, A and B Mine, Fallini-Twin Springs Ranch, Lockes, Stone Cabin Ranch, Dodge Construction Camp, and the M and M Mine, Nevada.

Monitoring runs, which indicated activity substantially above background, were made along Nevada 25 in Railroad Valley; on Reveille Mill Road; on U.S. 6 from a point 23 miles east of Tonopah, Nevada to Lockes, Nevada; on Nevada 82 between the junction with Nevada 8A and a point 20 miles north; on old Nevada 25 between U.S. 6 and Reed, Nevada; and along several of the Desert roads northwest of Nevada Test Site.

The maximum air concentration found was 4.9×10^{-2} uc/m^3 at Caliente, Nevada. This represents the average air concentration of beta activity for a 28-hour period starting five minutes after shot time.

On September 3rd, Dr. Hurley (Nevada State Health Officer) was called and informed of the fallout and predicted cloud trajectories for "Galileo" and "Smoky".

Dr. Kesler (Utah State Health Officer) was informed of the predicted "Galileo" cloud trajectories which could affect Utah.

On September 5th, Mr. Thatcher (Utah State Sanitary Engineer) called and requested information concerning long range predicted cloud trajectories for "Galileo". Beta activity in the air was detected at Salt Lake City on September 4th and 5th. This activity was probably due to the 20,000-foot part of the "Galileo" cloud. (Beta activity was also detected in air samples at Denver on September 6, 1957).

7.18 "Wheeler" and "Coulomb B" Summary.

Shot number 18, "Wheeler", was a 500-foot balloon detonation which was fired at 5:45 A.M. on September 6, 1957. The cloud travelled slowly to the northwest. At 1:05 P.M., "Coulomb B" was detonated and its cloud moved to the northwest with light fallout occurring in the vicinity of Beatty, Nevada.

"Coulomb B" is not numbered as the off-site sampling schedule was based on "Wheeler". However, air sampling data are undoubtedly due to the combination of shots. The fallout

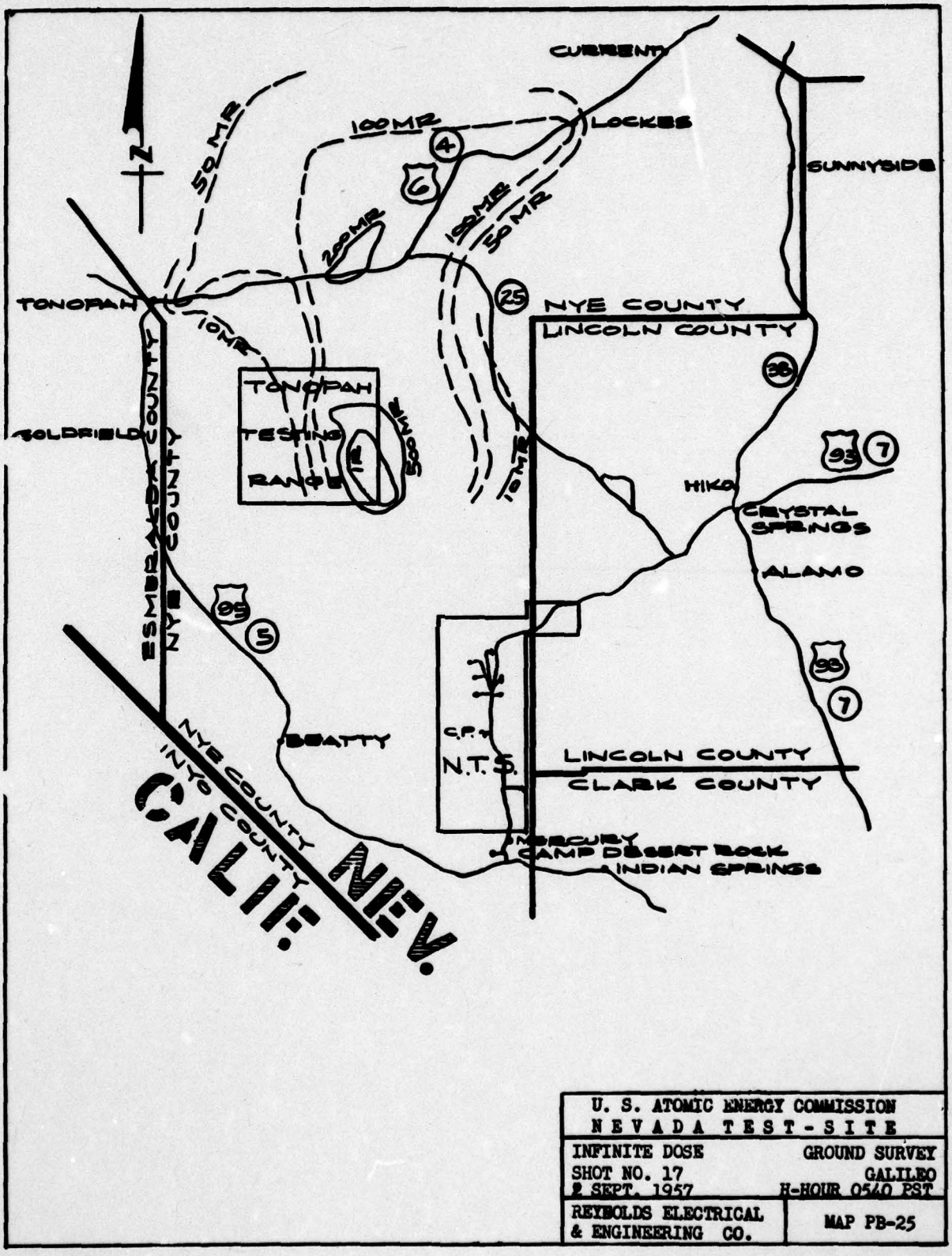

CURRANT
LOCKES
SUNNYSIDE
100 MR
50 MR
150 MR
200 MR
150 MR
50 MR
TONOPAH
NYE COUNTY
LINCOLN COUNTY
10 MR
TONOPAH TESTING RANGE
50 MR
1 MR
ESMERALDA COUNTY
GOLDFIELD
HIKO
CRYSTAL SPRINGS
ALAMO
95
5
95
7
98
7
BEATTY
C.P.-1
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
NYE COUNTY
INYO COUNTY
CALIF.
NEV.
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 17
2 SEPT. 1957
GROUND SURVEY
GALILEO
H-HOUR 0540 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-25

Figure 7.34

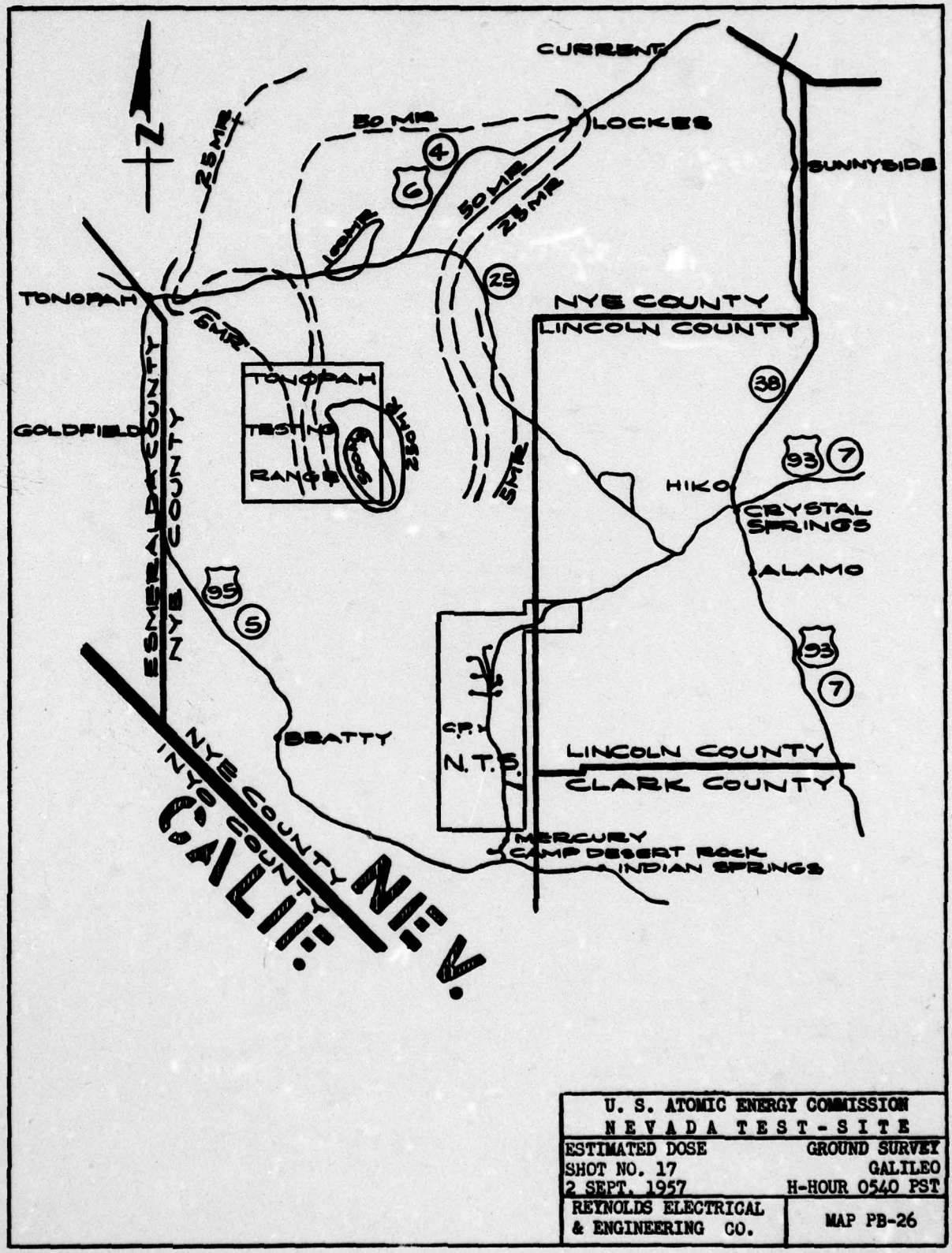

N
25 MI.
50 MI.
100 MI.
50 MI.
25 MI.
5 MI.
5 MI.
CURRANT
LOCKES
SUNNYSIDE
TONOPAH
NYE COUNTY
LINCOLN COUNTY
TONOPAH TEST RANGE
GOLDFIELD
ESMERALDA COUNTY
NYE COUNTY
HIKO
CRYSTAL SPRINGS
ALAMO
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NYE COUNTY
INYO COUNTY
CALIF.
NEV.
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 17
2 SEPT. 1957
GROUND SURVEY
GALILEO
H-HOUR 0540 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-26

Figure 7.35

DOSES IN POPULATED PLACES - GALILEO

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
A and B Mine, Nevada	4	9.6	13.4	3.0	3.1	173	88
Dodge Construction Camp, Nevada	175	8.0	9.3	0.3	0.25	13	7
Fallini Twin Springs Ranch, Nev.	15	8.1	14.7	0.8	1.0	65	33
Lockes, Nevada	5	12.0	34.6	0.5	1.5	90	45
M and M Mine, Nevada	1	9.6	13.6	2.0	2.4	144	73
Parmon's Ranch, Nevada	8	12.2	14.0	0.9	1.2	73	37
Rattlesnake Maintenance Sta., Nev.	4	10.2	11.8	0.8	0.8	51	26
Reveille Mill, Nevada	6	7.5	11.7	3.5	3.2	218	113
Stone Cabin Ranch, Nevada	8	10.0	10.8	2.3	2.0	125	64
Warm Springs, Nevada	5	9.0	33.3	0.8	3.0	157	80

Figure 7.36

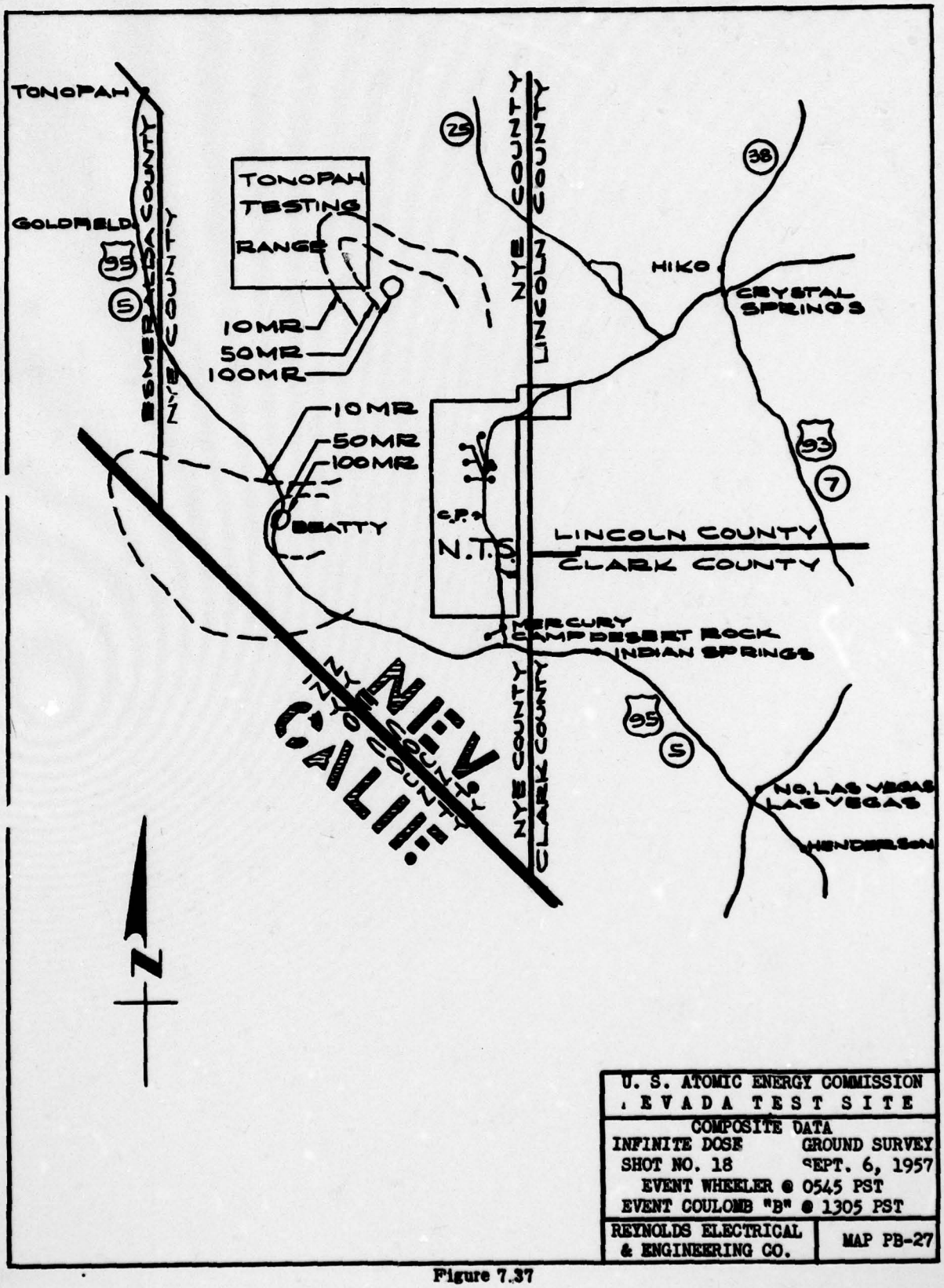

TONOPAH
GOLDFIELD
95
5
ESMERALDA COUNTY
NYE COUNTY
TONOPAH TESTING RANGE
10MR
50MR
100MR
10MR
50MR
100MR
BEATTY
C.P.
N.T.S.
25
NYE COUNTY
LINCOLN COUNTY
38
HIKO
CRYSTAL SPRINGS
93
7
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NEV.
CALIF.
NYE COUNTY
INYO COUNTY
NYE COUNTY
CLARK COUNTY
95
5
NO. LAS VEGAS
LAS VEGAS
HENDERSON
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
COMPOSITE DATA
INFINITE DOSE GROUND SURVEY
SHOT NO. 18 SEPT. 6, 1957
EVENT WHEELER @ 0545 PST
EVENT COULOMB "B" @ 1305 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-27

Figure 7.37

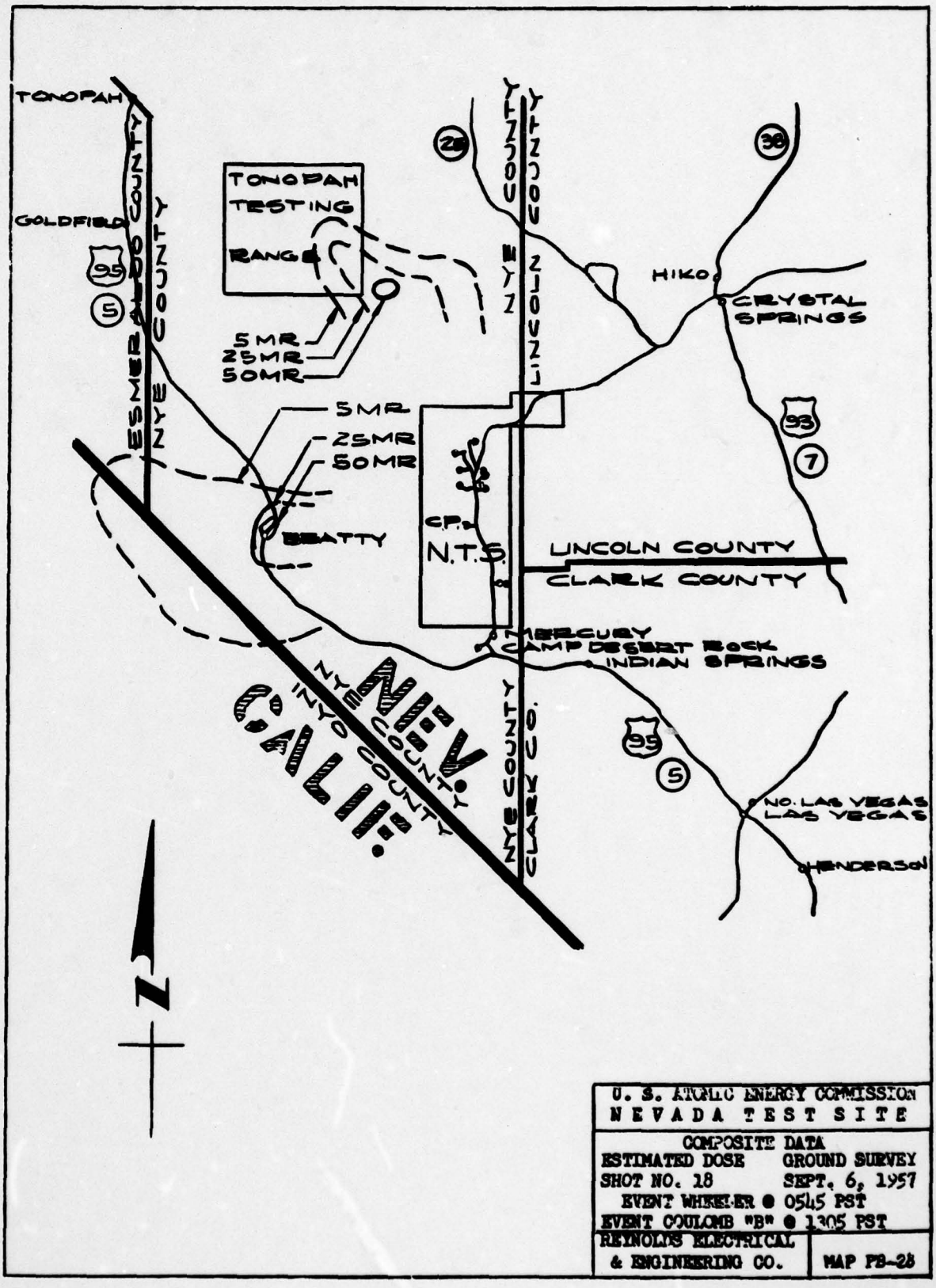

TONOPAH
GOLDFIELD
95
5
ESMERALDA COUNTY
NYE COUNTY
TONOPAH TESTING RANGE
5MR
25MR
50MR
5MR
25MR
50MR
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
NYE COUNTY
95
HIKO
CRYSTAL SPRINGS
93
7
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NEV.
CALIF.
NYE COUNTY
INYO COUNTY
NYE COUNTY
CLARK CO.
95
5
NO. LAS VEGAS
LAS VEGAS
HENDERSON
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
COMPOSITE DATA
ESTIMATED DOSE
GROUND SURVEY
SHOT NO. 18
SEPT. 6, 1957
EVENT WHEELER @ 0545 PST
EVENT COULOMB "B" @ 1305 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-28

Figure 7.38

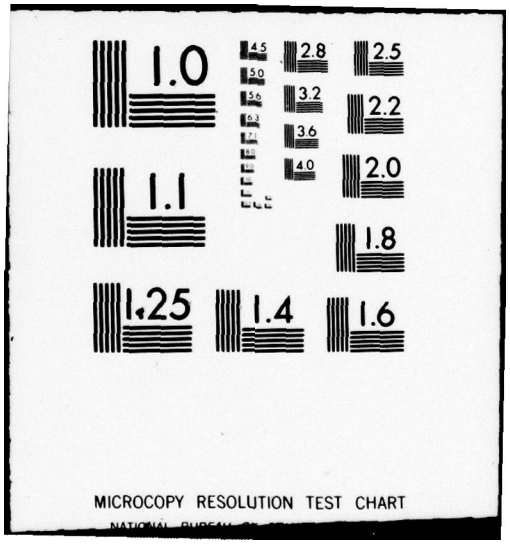
DOSES IN POPULATED PLACES - WHEELER AND COULOMB B

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Beatty, Nevada	550	5.4	27.6	0.45	1.6	108	59
Scotty's Castle, California	2	9.0	11.6	0.2	0.2	13	7

Figure 7.39

AD-A075 357 NEVADA TEST ORGANIZATION (AEC) MERCURY OFF-SITE RADI--ETC F/G 18/3
OPERATION PLUMBBOB OFF-SITE RADIOLOGICAL SAFETY REPORT. NEVADA --ETC(U)
1957 O R PLACAK , M W CARTER , R A GILMORE
UNCLASSIFIED OTO-57-3 NL

2 OF 3
ADA
075357


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART

pattern, which was determined from monitoring results, was most likely produced by "Coulomb B".

Monitoring runs, which indicated activity substantially above background, were made on U.S. 95 between 18 miles north of the junction with Nevada 29 and Lida Junction; on Nevada 58 between Beatty, Nevada and the junction with California 190; along Nevada 72 between U.S. 95 and through Death Valley to the junction with California 190; and on several of the desert roads northwest of Nevada Test Site.

The maximum air concentration found was 2.7×10^{-2} uc/m^3 at Hiko, Nevada. This represents the average air concentration of beta activity for a 27.9-hour sample period starting five minutes prior to shot time.

On September 6th, Dr. Hurley (Nevada State Health Officer) was called and informed of the predicted cloud trajectories for "Wheeler" and "Comlomb B". Dr. Hurley stated that rain had been predicted for the Reno, Nevada area.

7.19 "La Place" Summary.

Shot number 19, "La Place", was a 750-foot balloon detonation which was fired at 6:00 A.M. on September 8, 1957. The high part of the cloud travelled to the northwest while the lower parts moved to the south of east.

As fallout occurred in areas previously contaminated by recent detonations, no maps of fallout are presented. However, a table of monitoring results is included. These represent data which resulted from "La Place." No monitoring readings, above background, were found in populated places.

The maximum air concentration found was 1.6×10^{-2} uc/m^3 at both Mesquite, Nevada and St. George, Utah. This represents the average air concentration of beta activity for 28 and 29-hour sampling periods, respectively, starting at shot time.

The pertinent state health departments were closed on Sunday so no telephone calls were made.

7.20 "Fizeau" Summary.

Shot number 20, "Fizeau", was a 500-foot tower detonation which was fired at 9:45 A.M. on September 14, 1957. The cloud travelled to the northwest with the 10,000, 20,000, and 30,000-foot trajectories going between Beatty and Tonopah, Nevada. The higher part moved to the east and then north of Tonopah, Nevada. Fallout occurred in the vicinity of Tonopah, Luning, Gabbs, Belmont, Manhattan, Round Mountain, and Austin, Nevada.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 95 between 17 miles south of Tonopah, Nevada and the junction with Nevada 47 and between Mina, Nevada and 14 miles west of Hawthorne, Nevada; on Nevada 8A south of Nevada 82 and between the junctions with Nevada 70 and U. S. 50; on Nevada 82 between the junction with Nevada 8A and Belmont, Nevada; along Nevada 69, between Belmont, Nevada and the junction with Nevada 8A; along Nevada 70 between Round Mountain, Nevada and the junction with Nevada 8A; along Nevada 23 between the junctions with U. S. 95 and U. S. 50; along U. S. 6 between Tonopah, Nevada and a point 5

MONITORING RESULTS - LA PLACE

Location	Estimated Time of Fall H + Hrs.	Time of Survey H + Hrs	Instrument Reading mr/hr.	Reading at Time of Fall mr/hr.	Reading At H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
9.8 miles southwest of Watertown on Groom Lake Road	1.6	2.3	0.9	1.4	0.13	11.2	6.6
10.5 " "	1.6	2.4	1.1	1.8	0.15	14.4	8.5
11.7 " "	1.6	2.4	0.8	1.3	0.12	10.4	6.1
12.3 " "	1.5	2.5	1.1	2.0	0.17	15.0	9.0
12.6 " "	1.5	2.5	2.0	3.3	0.30	24.8	14.9
Gate 385	1.5	2.5	5.0	9.0	0.80	67.5	40.5
13.5 miles southeast of Gate 400 on Road B	2.0	4.4	1.0	2.5	0.3	25	15
14.0 " "	2.0	4.5	3.5	9.1	1.1	91	54
15.0 " "	2.0	4.6	7.0	19	2.3	190	110
16.5 " "	2.0	4.7	6.0	17	2.0	170	100
17.0 " "	2.0	4.7	10.0	28	3.3	280	165
18.0 " "	2.0	4.8	11.0	30	3.6	300	175
19.0 " "	2.0	4.8	12.0	33	4.0	330	195
20.0 " "	2.0	5.0	7.0	21	2.5	210	125

Figure 7.40

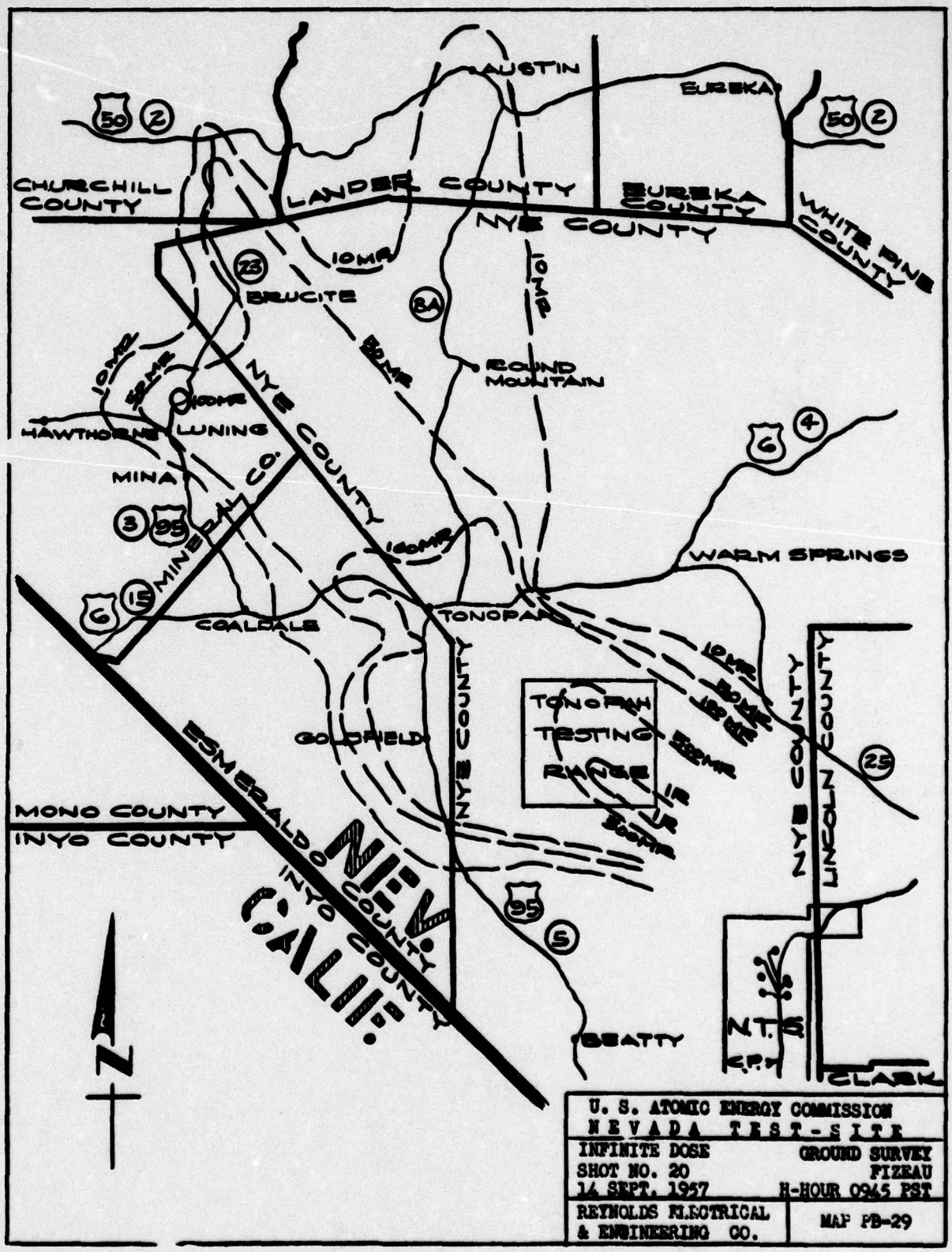

AUSTIN
EUREKA
50
2
CHURCHILL COUNTY
LANDER COUNTY
EUREKA COUNTY
NYE COUNTY
WHITE PINE COUNTY
23
BRUCITE
84
10MR
20MR
ROUND MOUNTAIN
HAWTHORNE
LUNING
MINA
3
95
6
15
COALDALE
TONOPAH
4
WARM SPRINGS
TONOPAH TESTING RANGE
GOLDFIELD
ESMERALDA COUNTY
MONO COUNTY
INYO COUNTY
NEV.
CALIF.
25
LINCOLN COUNTY
95
5
BEATTY
N.T.S.
CLARK
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
INFINITE DOSE
SHOT NO. 20
14 SEPT. 1957
GROUND SURVEY
FIZEAU
H-HOUR 0945 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-29

Figure 7.41

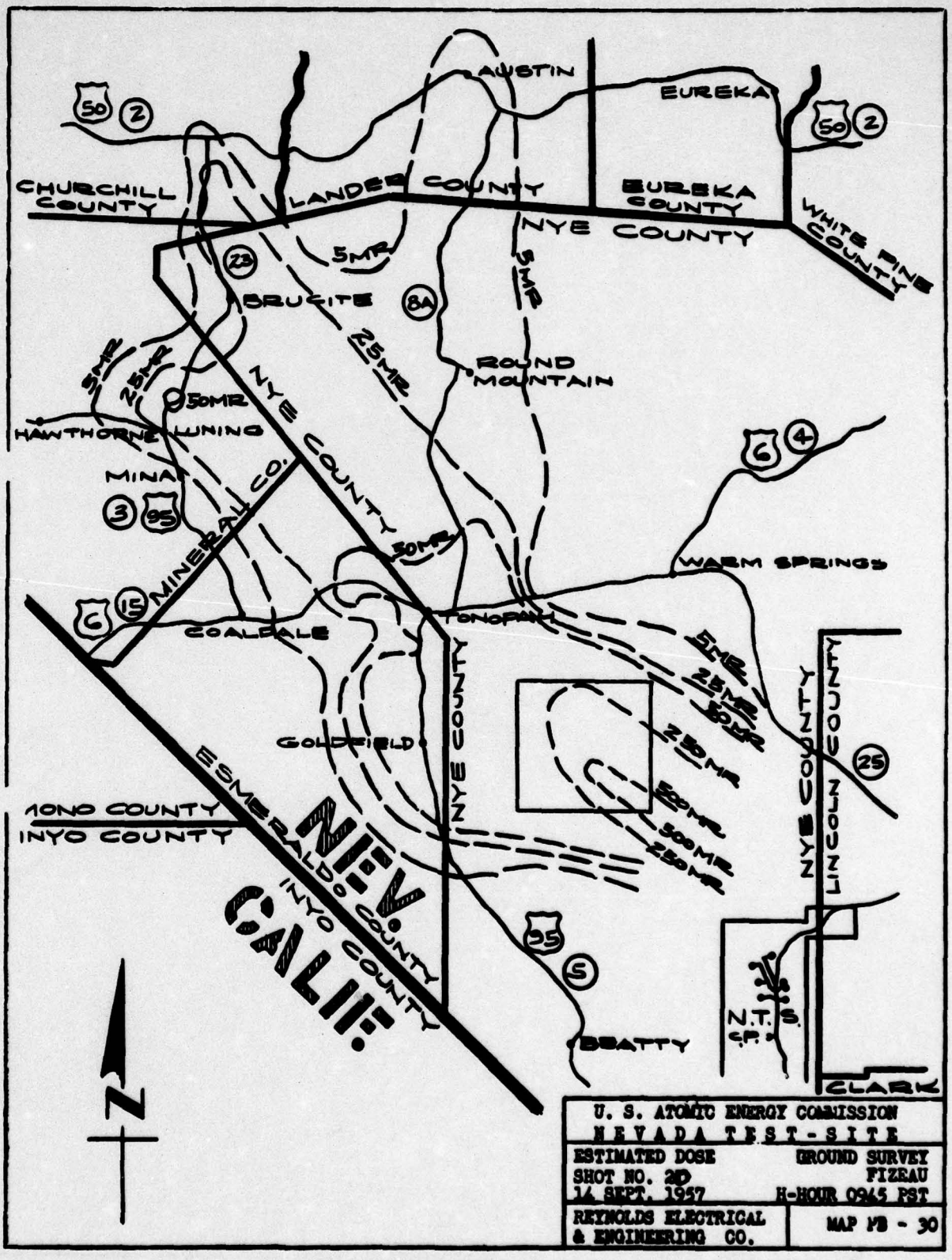

AUSTIN
EUREKA
50
2
CHURCHILL COUNTY
LANDER COUNTY
EUREKA COUNTY
WHITE PINE COUNTY
NYE COUNTY
5MR
5MP
23
BRUCITE
84
25MR
ROUND MOUNTAIN
5MR
25MR
50MR
HAWTHORNE
LUNING
NYE COUNTY
MINA
3
95
MINERAL CO.
6
4
WARM SPRINGS
6
15
COALDALE
TONOPAH
5MR
25MR
50MR
NYE COUNTY
LINCOLN COUNTY
GOLDFIELD
250 MR
500 MR
250 MR
25
ESMERALDA COUNTY
MONO COUNTY
INYO COUNTY
NEV.
INYO COUNTY
CALIF.
25
5
BEATTY
N.T.S. C.P.-1
CLARK
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 2D
14 SEPT. 1957
GROUND SURVEY
FIZEAU
H-HOUR 0945 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP MB - 30

Figure 7.42

DOSES IN POPULATED PLACES - FIZEAU

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Austin, Nevada	520	10.5	10.5	0.8	0.7	42	21
Belmont, Nevada	6	7.3	8.3	0.7	0.5	29	15
Gabbs, Nevada	625	11.0	13.5	1.2	1.3	83	44
Goldfield, Nevada	220	6.3	10.9	4.0	3.5	246	120
Luning, Nevada	50	9.4	9.4	0.8	0.6	35	18
Manhattan, Nevada	42	7.4	8.9	0.7	0.5	31	16
Millett, Nevada	5	9.0	9.8	0.4	0.3	20	10
Round Mountain, Nevada	200	8.0	9.4	0.4	0.3	20	10
Tonopah, Nevada	1,375	6.3	6.5	9.0	4.2	286	150
Tonopah Ballistics Range, Nev.	7	4.0	6.1	19.0	9.0	660	360

Figure 7.43

miles west of Warm Springs, Nevada; along Nevada 47 between the junction with U.S. 6 and a point ten miles south of Silver Peak, Nevada (the road southwest of Silver Peak); and on several of the desert roads northwest of Nevada Test Site.

The maximum air concentration found was 1.7×10^{-2} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 24.25-hour sample period starting 45 minutes after the shot.

Dr. Hurley (Nevada State Health Officer) was called on September 16th and informed of the fallout results from "Fizeau".

7.21 "Newton" Summary.

Shot number 21, "Newton", was a 1,500-foot balloon detonation which was fired at 5:50 A.M. on September 16, 1957. The various segments of the cloud travelled to the northeast with light fallout occurring in Lincoln Mine, Watertown, and Hiko, Nevada areas.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 93 between points 41 miles west of Caliente, Nevada and one mile south of Crystal Springs, Nevada; on Groom Road between the junction with Nevada 25 and Watertown, Nevada; on Road B between the junction with Nevada 25 and a point six miles south of Gate 400; along Nevada 38 between Crystal Springs and a point eight miles north of Crystal Springs, Nevada; and on Nevada 25 between the junction with U.S. 93 and the Lincoln Mine, Nevada area.

The maximum air concentration found was 1.1×10^{-3} uc/m^3 at Watertown, Nevada. This represents the average air concentration of beta activity for a 28-hour sample period starting ten minutes prior to the shot.

A table of selected doses is not included as the only infinite dose for a populated place (which exceeded 10 mr.) was 13 mr. at Watertown, Nevada. This corresponds to an estimated dose of 8 mr.

Dr. Hurley (Nevada State Health Officer) was called on September 16th and informed of fallout and predicted cloud trajectories.

Dr. Kesler and Mr. Thatcher (Utah State Health Department) were both out of the office.

Mr. Anderson (Radiological Health Program in Washington) was called and informed of the results from "Fizeau" and "Newton".

Roadblocks for flash protection purposes were established on the road to Cold Creek and in the Lincoln Mine and Crystal Springs, Nevada areas. No incidents were reported.

7.22 "Whitney" Summary.

Shot number 22, "Whitney", was a 500-foot tower detonation which was fired at 5:30 A.M. on September 23, 1957. The lower level of the cloud travelled west of north while the upper parts of the cloud travelled to the west. The 40,000-foot trajectory was predicted to move due east. Fallout occurred in the vicinity of Lida, Silver Peak, Goldfield, Tonopah,

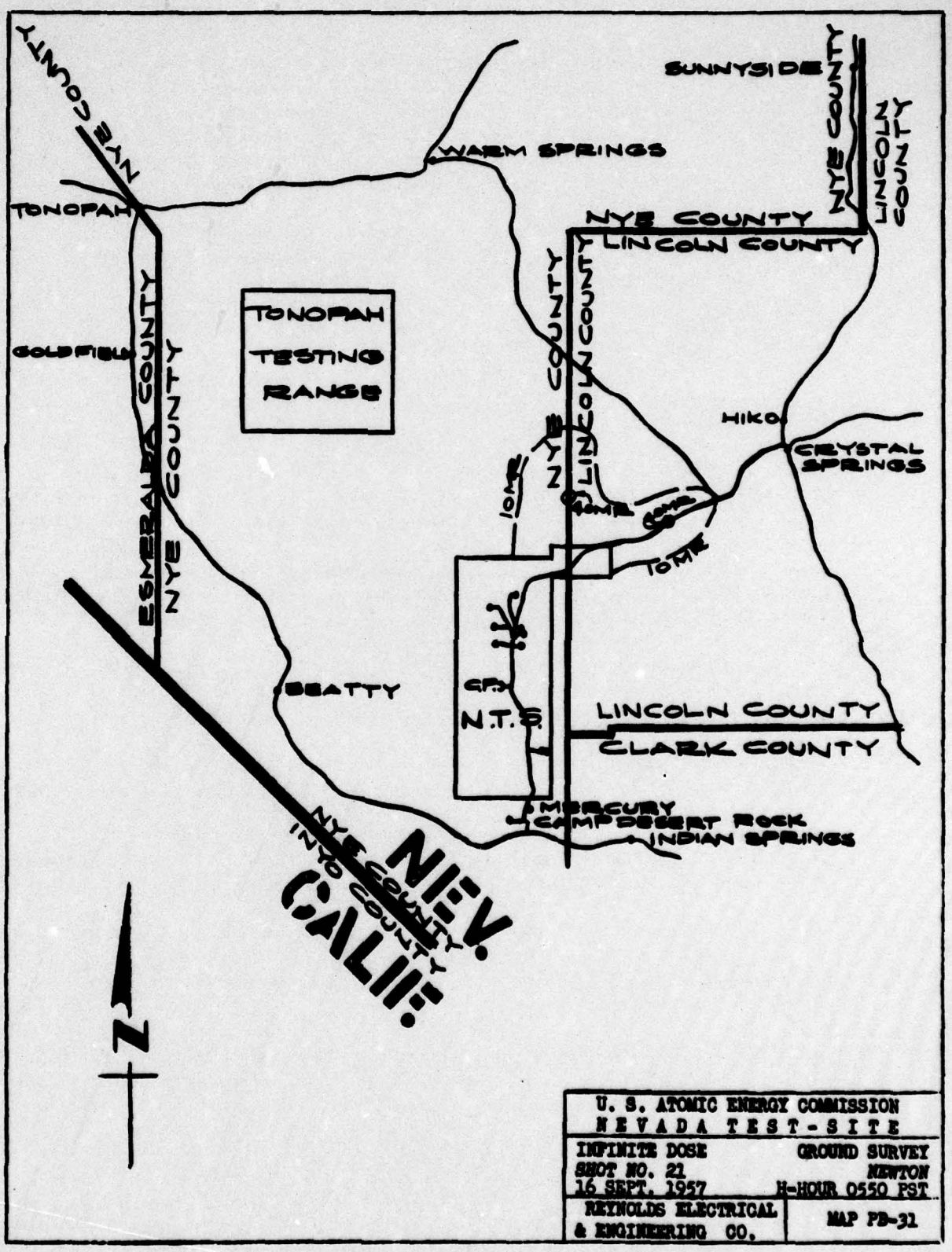

NYE COUNTY
TONOPAH
GOLDFIELD
ESMERALDA COUNTY
NYE COUNTY
TONOPAH
TESTING
RANGE
WARM SPRINGS
SUNNYSIDE
NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
HIKO
CRYSTAL SPRINGS
10 MILE
4 MILE
10 MILE
BEATTY
CP-1
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NEV.
CALIF.
NYE COUNTY
INYO COUNTY
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 21
16 SEPT. 1957
GROUND SURVEY
NEWTON
H-HOUR 0550 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-31

Figure 7.44

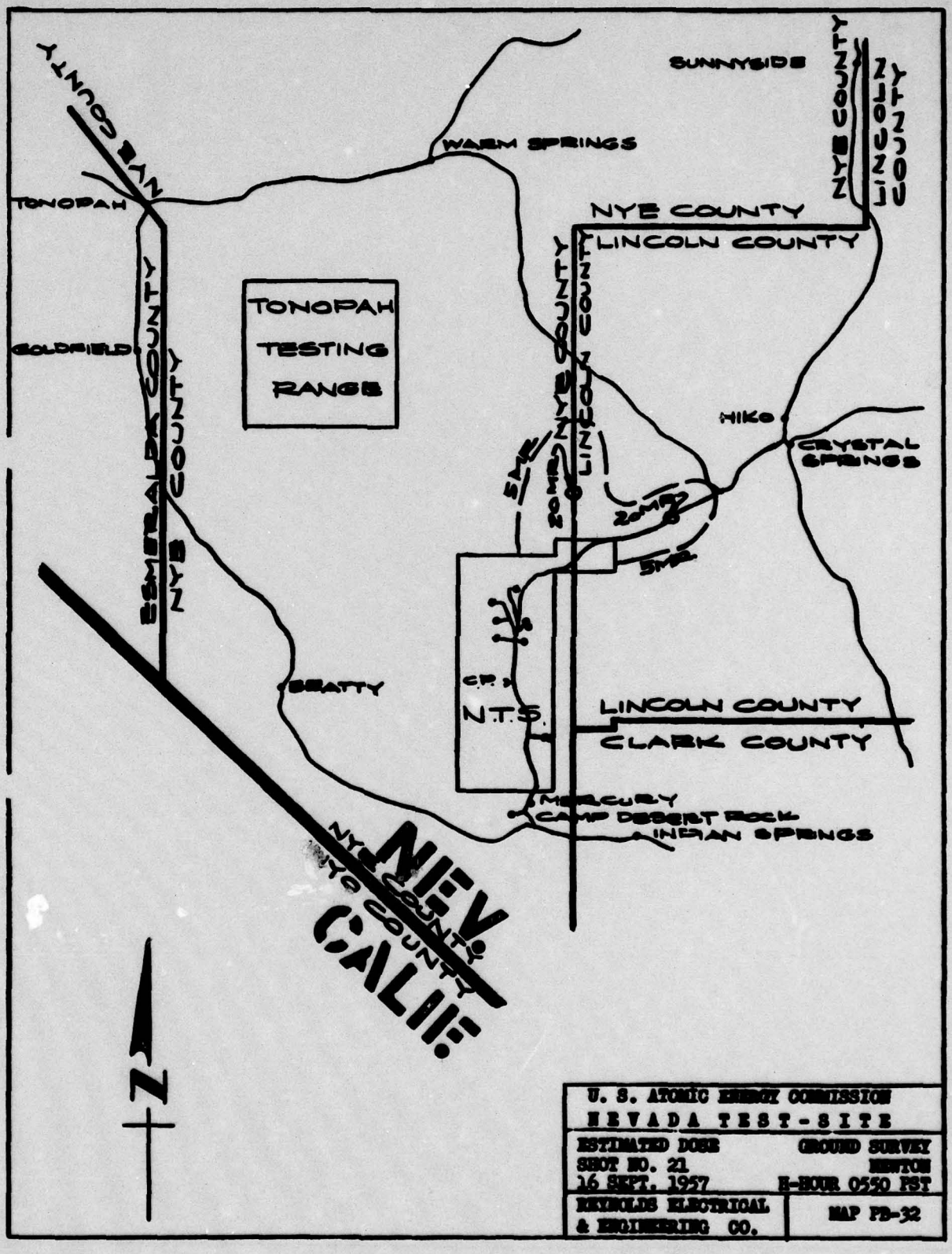

SUNNYSIDE
NYE COUNTY
LINCOLN COUNTY
WARM SPRINGS
NYE COUNTY
LINCOLN COUNTY
TONOPAH
NYE COUNTY
TONOPAH TESTING RANGE
GOLDFIELD
ESMERALDA COUNTY
NYE COUNTY
LINCOLN COUNTY
HIKO
CRYSTAL SPRINGS
5 MI.
20 MI.
20 MI.
5 MI.
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NEV.
CALIF.
NYE COUNTY
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 21
16 SEPT. 1957
GROUND SURVEY
NEWTON
H-HOUR 0550 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-32

Figure 7.45

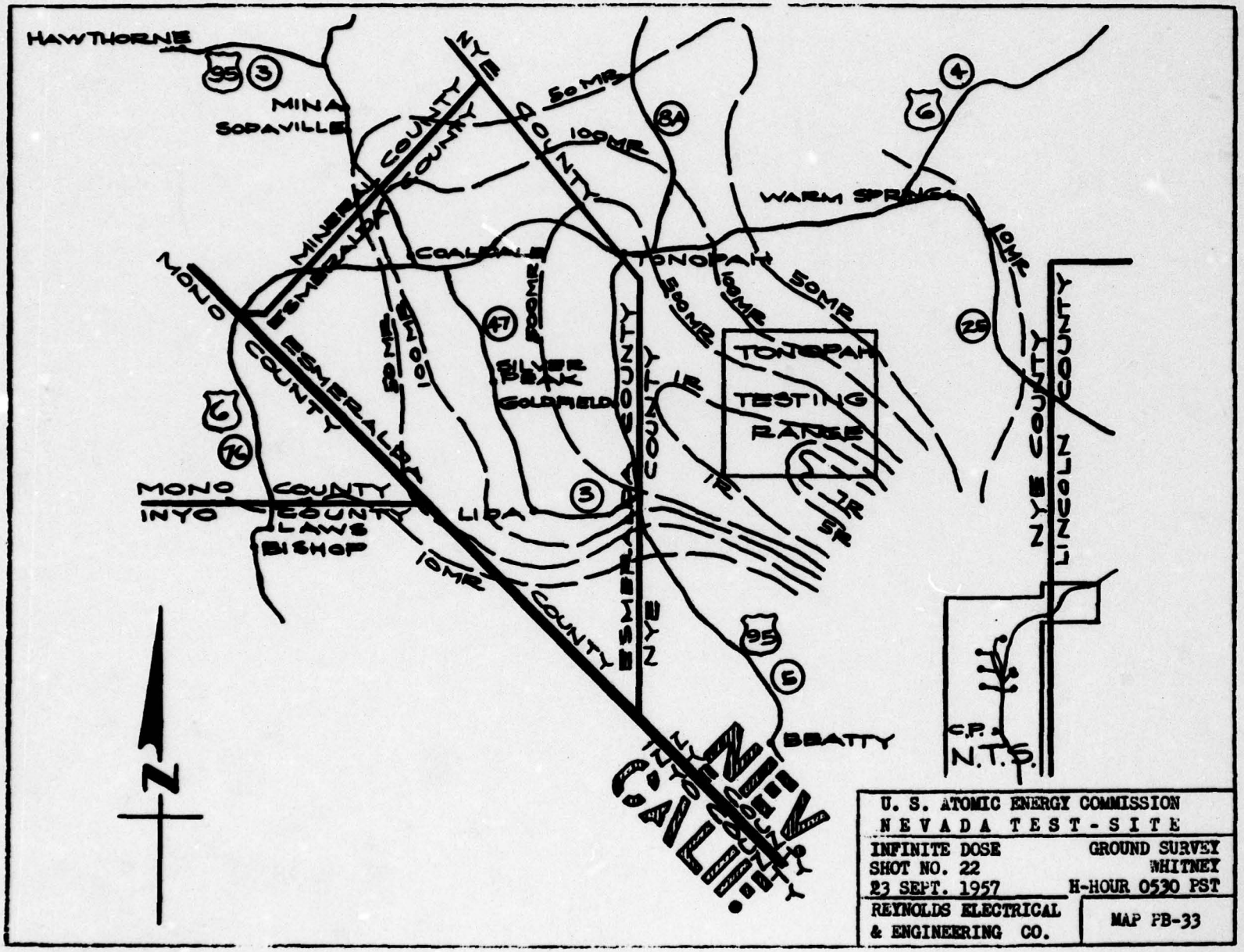

HAWTHORNE
95
3
MINA
SODAVILLE
NYE COUNTY
50 MI.
100 MI.
84
6
4
WARM SPRINGS
MINERAL COUNTY
ESMERALDA COUNTY
COALDALE
TONOPAH
50 MI.
100 MI.
50 MI.
25
MONO
ESMERALDA COUNTY
47
BLUE BELL
GOLDFIELD
TONOPAH TESTING RANGE
NYE COUNTY
LINCOLN COUNTY
6
7K
MONO COUNTY
INYO COUNTY
LAWS
BISHOP
LIDA
3
95
5
BEATTY
C.P.
N.T.P.
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 22
23 SEPT. 1957
GROUND SURVEY
WHITNEY
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-33

Figure 7.46

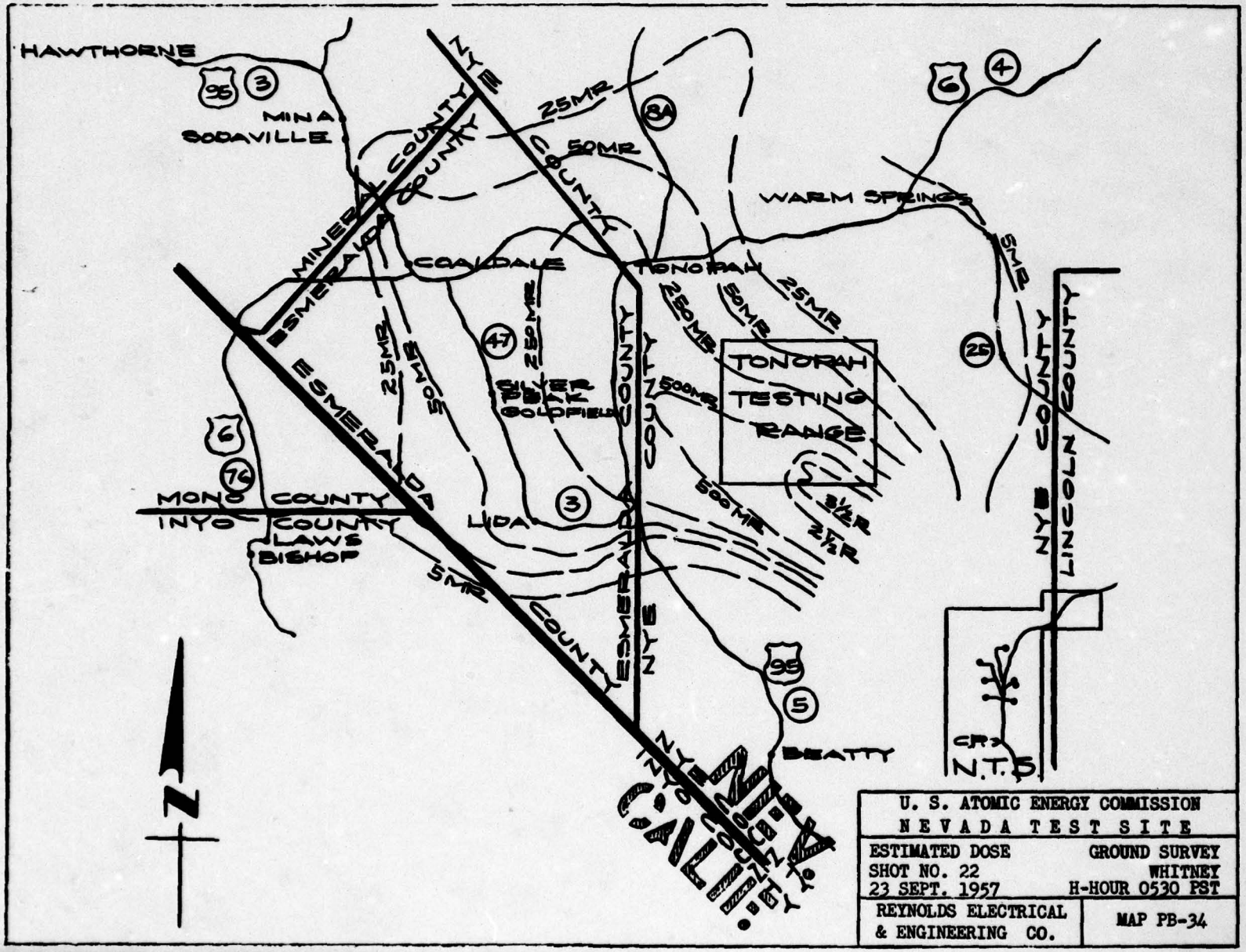

HAWTHORNE
MINA
SODAVILLE
MINERAL COUNTY
ESMERALDA COUNTY
NYE COUNTY
25MR
50MR
WARM SPRINGS
5MR
COALDALE
TONOPAH
250MR
50MR
25MR
TONOPAH TESTING RANGE
500MR
3½R
2½R
2.5MR
5MR
250MR
GOLDFIELD
ESMERALDA
MONO COUNTY
INYO COUNTY
LAWS
BISHOP
LIDA
5MR
NYE COUNTY
LINCOLN COUNTY
BEATTY
CP-1
N.T.S.
CALIFORNIA
NEVADA
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST SITE
ESTIMATED DOSE
SHOT NO. 22
23 SEPT. 1957
GROUND SURVEY
WHITNEY
H-HOUR 0530 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-34

Figure 7.47

DOSES IN POPULATED PLACES - WHITNEY

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Belmont, Nevada	6	9.6	13.4	0.7	0.8	53	27
Benton, California	300	13.7	13.7	0.4	0.4	24	12
Chalfant, California	250	12.7	14.2	0.3	0.4	22	11
Coaldale, Nevada	25	11.5	13.7	3.0	3.2	220	110
Dodge Construction Camp, Nev.	175	6.7	12.5	0.2	0.2	12	7
Dyer, Nevada	35	10.5	11.1	0.3	0.2	14	7
Fallini Twin Springs Ranch, Nev.	15	6.7	12.5	0.2	0.2	12	7
Goldfield, Nevada	220	7.5	15.1	11.0	15.0	940	486
Lida, Nevada	25	8.0	11.3	2.0	1.9	120	62
Manhattan, Nevada	42	9.6	12.8	1.2	1.3	81	42
Mina, Nevada	450	14.0	14.5	0.5	0.6	21	11
Oasis, California	7	10.0	12.2	0.9	1.0	60	30
Parmon's Ranch, Nevada	8	9.2	13.6	0.8	0.9	60	31
Silver Peak, Nevada	7	9.6	13.4	3.5	4.0	272	140
Sodaville, Nevada	20	13.7	14.4	0.6	0.8	45	22
Tonopah, Nevada	1,375	8.8	15.0	9.5	12.5	790	407
Tonopah Ballistics Compound, Nev.	7	5.7	10.0	0.9	0.7	54	29
Warm Springs, Nevada	5	7.4	13.5	0.2	0.2	13	68

Figure 7.48

Warm Springs, Manhattan, Belmont, Coaldale, Sodaville, and Mina, Nevada and also Oasis, California.

Monitoring runs, which indicated activity substantially above background, were made along U.S. 95 between Mina and Lida Junction, Nevada; along U.S. 6 between Tonopah, Nevada and the junction with old Nevada 25; on U.S. 6 between Coaldale, Nevada and Chalfant, California; along Nevada 8A between the junctions with Nevada 82 and U.S. 6; on Nevada 82 between the junction with Nevada 8A and Belmont, Nevada; along Nevada 3 between U.S. 95 and the Nevada-California state line; on the roads in the vicinity of Oasis, California; on Nevada 3A between the California-Nevada state line and the junction with U.S. 6; on the road north from near Oasis, California to Silver Peak, Nevada; along Nevada 47 between Silver Peak, Nevada and the junction with U.S. 95; along Nevada 69 in the vicinity of Manhattan, Nevada; on Nevada 25 from Railroad Valley to Warm Springs, Nevada; and along several of the desert roads northwest of Nevada Test Site.

The maximum air concentration found was 4.2×10^{-2} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 28.8-hour sample period starting 18 minutes prior to shot time.

The Radiological Health Program in Washington was called and informed of the results from the "Whitney" event.

7.23 "Charleston" Summary.

Shot number 23, "Charleston", was a 1,500-foot balloon detonation which was fired at 6:00 A.M. on September 28, 1957. All parts of the cloud travelled slightly east of north. Light fallout occurred to the northeast of Nevada Test Site.

Monitoring runs, which indicated activity substantially above background, were made on Groom Road between Gate 385 and a point five miles west of Watertown, Nevada; and along Road B between points two miles and 14 miles north of Groom Lake.

The maximum air concentration found was 1.5×10^{-3} uc/m^3 at Tonopah, Nevada. This represents the average air concentration of beta activity for a 28.8-hour sample period starting 1.8 hours prior to shot time.

A table of selected doses is not included as no infinite dose greater than 10 mr. was calculated for a populated place.

The pertinent state health departments were closed on Saturday so no telephone calls were made.

Roadblocks for flash protection purposes were established near Crystal Springs, Lincoln Mine, and Beatty, Nevada. There were two roadblocks in the Beatty area.

7.24 "Morgan" Summary.

Shot number 24, "Morgan", was a 500-foot balloon detonation which was fired at 5:00 A.M. on October 7, 1957. The higher parts of the cloud travelled to the northeast while the lower portion moved to the south of east. Fallout occurred in the vicinity of Carp, Nevada and Veyo, Central, Hamilton Fort, Kanarraville, Pintura, Anderson Junction and Leads, Utah.

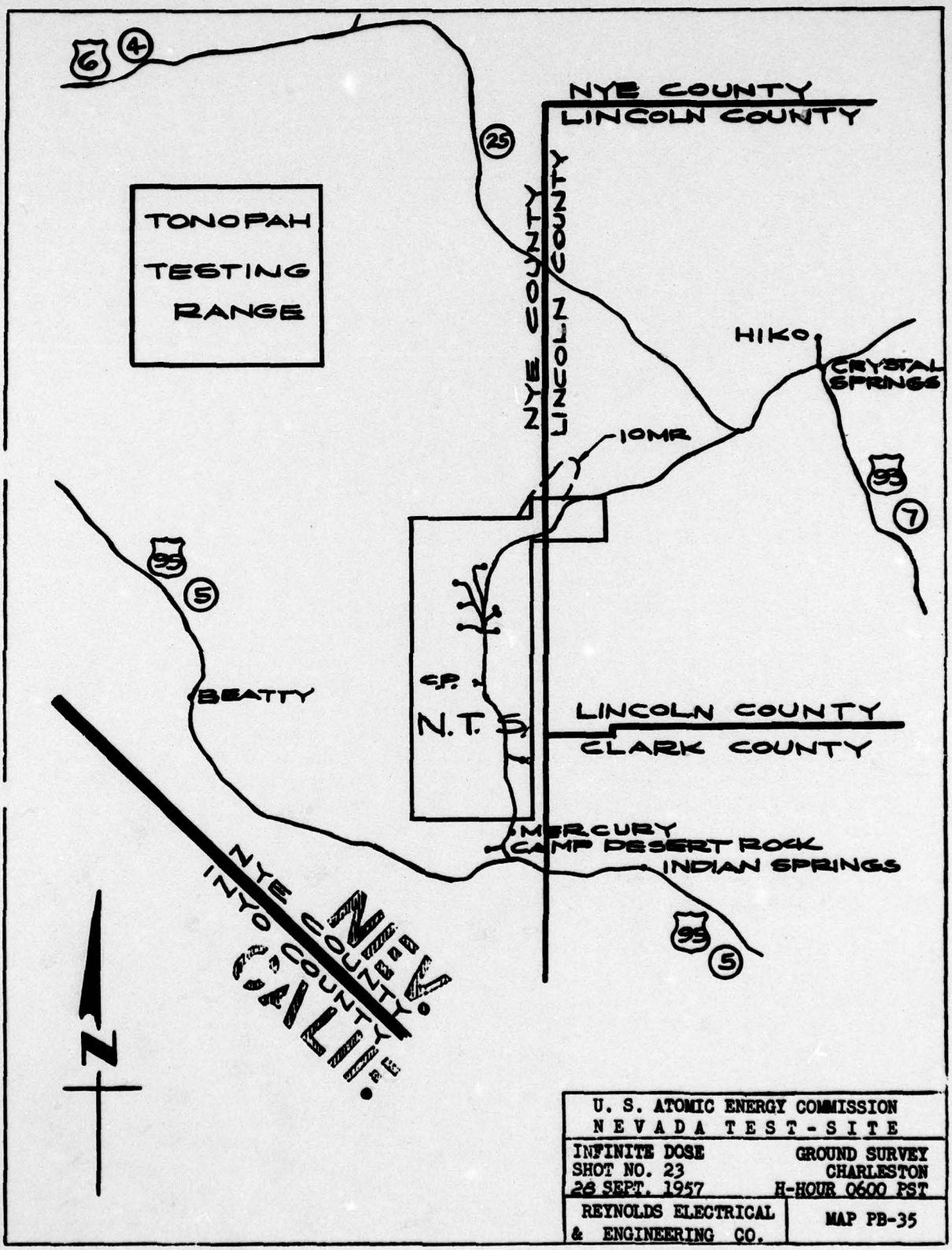

NYE COUNTY
LINCOLN COUNTY
TONOPAH
TESTING
RANGE
NYE COUNTY
LINCOLN COUNTY
HIKO
CRYSTAL SPRINGS
10MR
95
6
4
25
7
5
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NYE COUNTY
INYO COUNTY
NEV.
CALIF.
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
INFINITE DOSE
SHOT NO. 23
28 SEPT. 1957
GROUND SURVEY
CHARLESTON
H-HOUR 0600 PST
REYNOLDS ELECTRICAL & ENGINEERING CO.
MAP PB-35

Figure 7.49

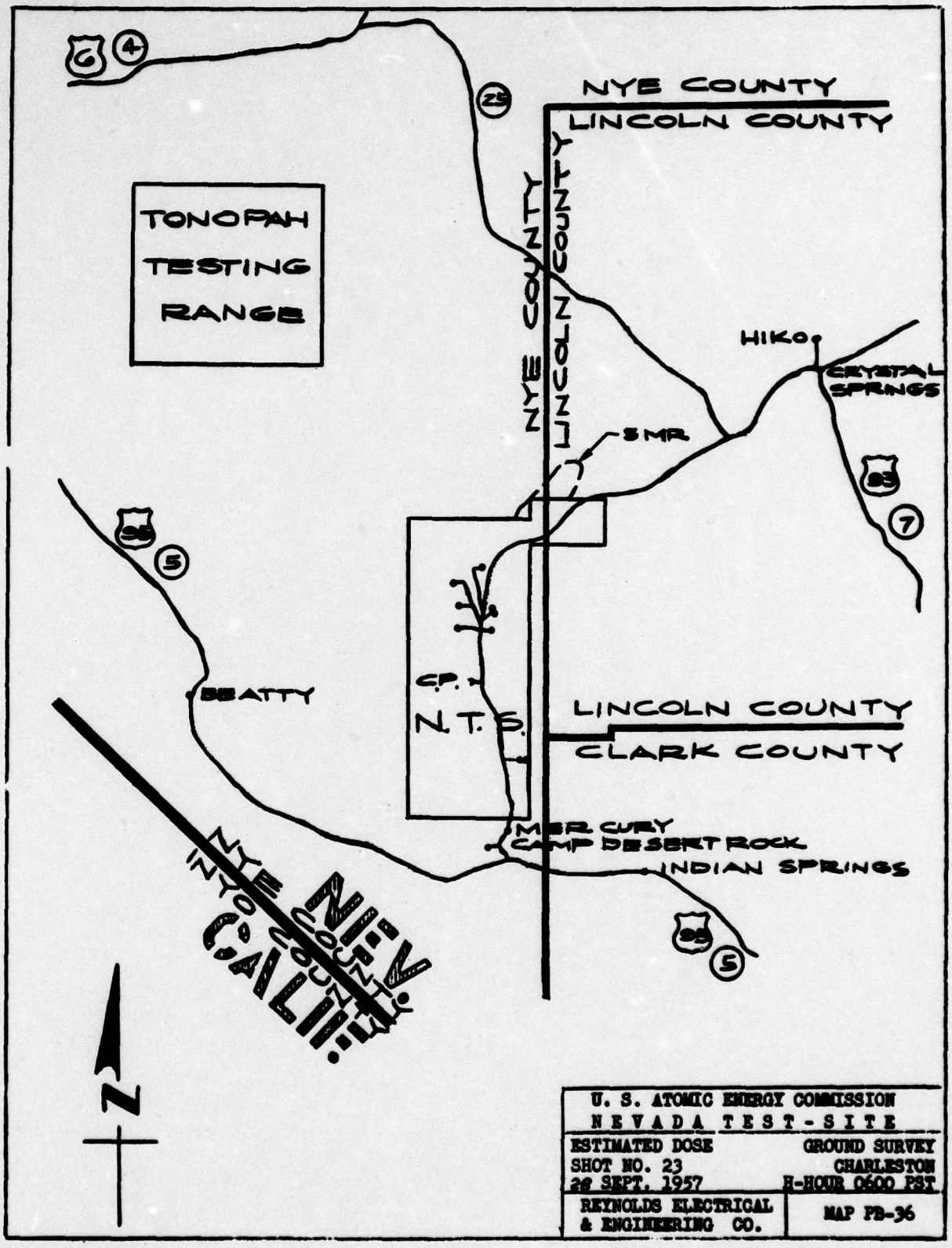

NYE COUNTY
LINCOLN COUNTY
NYE COUNTY
LINCOLN COUNTY
TONOPAH
TESTING
RANGE
HIKO
CRYSTAL
SPRINGS
SMR
BEATTY
C.P.
N.T.S.
LINCOLN COUNTY
CLARK COUNTY
MERCURY
CAMP DESERT ROCK
INDIAN SPRINGS
NYE COUNTY NEV.
INYO COUNTY CALIF.
N
U. S. ATOMIC ENERGY COMMISSION
NEVADA TEST-SITE
ESTIMATED DOSE
SHOT NO. 23
28 SEPT. 1957
GROUND SURVEY
CHARLESTON
H-HOUR 0600 PST
REYNOLDS ELECTRICAL
& ENGINEERING CO.
MAP PB-36

Figure 7.50

Monitoring runs, which indicated activity substantially above background, were made along Road B from 13 to 40 miles south of Gate 400; an Road C from 14 to 24 miles south of the junction with U.S. 93; on U.S. 93 between 20 and 30 miles south of Alamo, Nevada; along the road in Meadow Valley Wash in the vicinity of Carp, Nevada; on Utah 18 from 6 miles north of St. George, Utah to the vicinity of Central, Utah; on U.S. 91 from Leeds to Hamilton Fort, Utah; and along the Cane Springs Road west of Nevada Test Site.

The maximum air concentration found was 4.4×10^{-3} uc/m^3 at Mercury, Nevada. This represents the average air concentration of beta activity for a 13-hour period starting fifty-five minutes after the shot.

Dr. Hurley (Nevada State Health Officer) was called and informed of fallout in Nevada and the predicted cloud trajectories.

No officials of the Utah State Health Department could be contacted.

The PHS Radiological Health Program was informed of the "Morgan" event and subsequent fallout.

DOSES IN POPULATED PLACES - MORGAN

Location	Population	Estimated Time of Fallout In H + Hours	Time of Instrument Reading In H + Hours	Maximum Instrument Reading In mr/hr.	Intensity at H + 12 Hrs. mr/hr.	I.D. mr.	E.D. mr.
Anderson Junction, Utah	12	5.6	11.7	0.5	0.5	36	19
Carp, Nevada	25	3.2	8.2	0.3	0.2	16	9
Central, Utah	49	5.0	10.4	0.25	0.2	15	8
Leeds, Utah	100	5.5	12.1	0.8	0.8	55	29
New Harmony, Utah	126	5.6	12.5	0.15	0.15	10	5
Pintura, Utah	50	5.6	11.5	0.5	0.4	31	16
Veyo, Utah	100	5.0	10.1	0.6	0.5	35	19

Figure 7.51

CHAPTER VIII

FILM BADGE PROGRAM

8.1 General Procedures.

The film badge program initiated during Operation TEAPOT was expanded in preparation for Operation PLUMBBOB. The area covered by means of film badges was approximately 80,000 square miles. The film badge stations may be divided into the following categories: 1,514 worn by residents in the *off*-site area; 358 in non-populated areas; 318 inside structures; 431 outside structures; and 120 miscellaneous which included those on vehicles, aircraft, etc. The total number of stations established exceeded 2,700. Badges were changed at approximately monthly intervals with a total of about 16,500 individual badges used during the operation. Following the last detonation, badges were left in place to measure residual gamma radiation for a period of about two months. The tabulation below lists the number of film badge stations in each category by zones.

Figure 8.1

Zone	Category				
	People	Non-Populated Places	Inside Structures	Outside Structures	Miscellaneous
Alamo	330	19	20	47	8
Barstow	65	15	31	34	2
Beaver	61	16	15	15	2
Bishop	103	20	12	34	35
Caliente	79	14	10	23	6
Cedar City	94	31	17	22	3
Ely	79	17	51	47	7
Eureka	30	14	12	16	3
Kingman	75	32	35	33	4
Las Vegas	75	8	6	11	10
Lincoln Mine	62	35	7	14	13
Mercury	75	32	36	29	11
Mesquite	18	15	4	9	2
Overton	62	4	8	32	2
Pioche	113	15	3	19	5
St. George	91	40	35	23	4
Tonopah	102	31	16	23	3
Totals	1,514	358	318	431	120

Due to the variety of situations encountered in film badging extensive areas and large numbers of people over a six-month period, many badges were damaged or lost either in the field or in processing. Also, at many stations complete coverage was not obtained, i.e., film

badges were not present at a particular station for the entire test series. This resulted from many factors such as inaccessibility of certain locations due to weather, from people moving out of the area prior to the last detonation, from requests for badges after the first detonation, and from refusal of a very few persons to continue wearing a badge.

8.2 Film Badge Results.

The results from stations where complete coverage was obtained have been summarized in five bar graphs, Figures 8.2 - 8.6. In these graphs, the percentage of accumulated exposures for the test period which fall into various arbitrary exposure classifications are plotted. The actual number of stations which occur in a particular exposure interval are written into the bar.

The categories and the number of film badge stations within the category are: 791 worn by people residing in the off-site area; 347 outside structures (in general these are inhabited); 230 inside structures (in general these are inhabited); and 253 at non-populated locations. The results obtained from combining all the stations from each category are plotted as a bar graph of the 1621 stations.

8.2.1 Figure 8.2 shows the accumulated gamma exposure received by 791 residents of the off-site area as they moved about in a normal manner. It can be seen that about 68 percent of the individual exposures were 50 mr. or less while about 97 percent were 500 mr. or less. Only one exposure may exceed 3,900 mr. The exposure approaching 3,900 mr. was received by Mr. Butler. This value is included as the total exposure received by Mr. Butler will probably exceed the criterion of 3,900 mr. for one year. At the time this report is written, his total exposure is 3,855 mr. but is accumulating at approximately 50-75 mr. per month. He will continue to be film badged as long as positive results may be obtained.

8.2.2 Figure 8.3 shows the accumulated exposure measured outside usually inhabited structures. Only about 49 percent of these exposures are 50 mr. or less while about 87 percent are 500 mr. or less. Three exposures exceeded 3,900 mr. On a gross basis it would appear that people receive less accumulated exposures than is indicated by the same evaluation method outside their houses.

8.2.3 Figure 8.4 shows the accumulated exposure measured at stations located inside various structures. About 70 percent of the exposures are 50 mr. or less while 96.5 percent are 500 mr. or less. The highest single exposure was 1,000 mr. Here again, on a gross basis, the results from stations inside structures are considerably less than those indicated for outside.

8.2.4 Figure 8.5 shows the accumulated exposure measured at 253 non-populated locations. Forty percent of the exposures are 50 mr. or less while about 79 percent are 500 mr. or less. Three exposures were higher than 3,900 mr.

8.2.5 Figure 8.6 indicates the accumulated exposure distribution for the composite group of 1,621 stations.

The distribution of film badge results would be much different if one considered individual badge results rather than station results. The results would be weighted more heavily toward the lower exposure levels. For example, a station may have received fallout twice,

while the other four badges indicated no exposure. Also, the low readings are affected by the developing and reading steps. These procedures help determine the lowest significant exposure which can be obtained for an individual film badge. This value was 20 or 25 mr.

8.3 Film Badge Results in Populated Places.

The results from film badges in populated places are presented as Figure 8.7. This table shows the gamma dose as determined by film badges worn by people and placed outside of structures or on other objects within the specific populated area.

In compiling these data, all results are included for each community with the exception of results from badges placed inside structures to help determine shielding characteristics. Also, in general, the reported data represent complete series results. In other words, in a community which had several outside stations, if four stations had complete results, these would be averaged and reported as an average value even though other results are available which for one reason or another may not have included the entire operational period. Perhaps one badge was lost or damaged for a particular station.

The superscripts used in the table are:
(1) Interval covered by film badges did not include entire test period.
(2) A badge result is missing which may have added significantly to the total dose.
(3) An average value.
(4) Assigned from comparable data.

8.3.1 The first statement refers to the fact that at a specific station the complete period of the series from May 28 to October 8 was not covered. This could result from many causes. For example, coverage was expanded somewhat during the operation which would mean that coverage at many stations did not start until after May 28. There were many requests from people to wear badges, and these requests could occur at any time. No request was refused. Likewise, the period covered by film badges could be terminated prior to October 8 by people moving away or refusing to continue wearing a badge. A very few cases of refusal did take place.

8.3.2 The second superscript indicates that a badge was lost or damaged and, from other film badge results or monitoring results, it is probable that it would have indicated an exposure.

8.3.3 The third superscript is self-explanatory while the fourth superscript is used when data were not available at a specific station but are available at a station nearby. For example, A and B Mine was not badged initially but M and M Mine was. The two mines are about two miles apart.

In any interpretation of these results, one should bear in mind that the results for people and their community should not necessarily be the same. The results from personal badges reflect people's movements, which may or may not include trips away from their homes and more or less time spent inside structures which afford various degrees of gamma attenuation. Actually, persons may live in one town and commute daily to another community to work.

Complete film badge results are published as a separate document.

8.4 Film Badge Program for Alamo, Nevada.

Prior to PLUMBBOB, it was decided that a typical town within the off-site area should should be completely film badged. This thought was incorporated into the basic operational plan. The community selected for this special study was Alamo, Nevada. A preliminary visit to Alamo to solicit the help and cooperation of the people was made in April 1957.

At this meeting held in the high school auditorium, the complete film badge program was described and their aid was requested. There were many questions asked but no one present indicated any objections to the program.

Alamo was selected for this study for several reasons. First, due to prevailing winds, it usually received some fallout from each test series. Second, it is a relatively small community with fairly well defined boundaries. Actually, when the term Alamo is used here it is in the broad sense of the Pahranagat Valley which includes the communities of Hiko, Ash Springs, and Alamo as well as the many farms and ranches in the immediate area. The industry of the area is primarily farming and cattle raising, both beef and dairy.

The population of the valley is approximately 300. This figure refers to persons of school age or above. These people are scattered throughout the valley for a distance of 50 miles if one includes Butler Ranch, located about 30 miles south of the town of Alamo. The highest concentrations of population are centered around Alamo and Hiko with perhaps 75 percent of the population living within 10 miles of Alamo proper.

As this is an agarian community, one would expect a fair degree of stability. Inherent, however, in the beef cattle industry in this area is the large amount of grazing land which is required. Thousands of acres are used by the ranchers of Alamo for their cattle. These grazing areas may be located 50 to 75 miles from the parent ranch. This set of conditions necessitates some degree of travel for many ranch hands and on any given day it would be impossible to predict their location. Field trips of several days to several weeks are the rule rather than the exception. Such factors as this must be known before an individual exposure can be evaluated in relationship to doses received by persons in the same community. On a trip such as this, an individual may receive more or less radiation than if he had remained at home.

Several weeks prior to the first detonation of PLUMBBOB, three monitors were assigned to the Alamo zone to handle the normal zone activities of monitoring, public relations and initiating the film badge program.

Structures, primarily houses, were badged inside and out to obtain shielding information should fallout occur. Non-populated areas were also badged in addition to the distribution of badges to all people above pre-school age residing within the Pahranagat Valley.

The results from this study were minimized due to the fact that fallout was very low over the greater portion of this area. This single factor is a credit to the capability and prudence of the test organization, but on the other hand, it negated data which could have been collected on shielding effects of many types of dwelling structures and the correlation of area dose, personnel dose, and the individual movements of the inhabitants. However, the study did accomplish as one of its planned objectives the compilation of data relating to the problems inherent in film badging even this relative small "total" population.

The most important feature of the study is the complete willingness of people to cooperate in such an undertaking. Probable 99 percent of the people were most cooperative and helpful. Only a dozen or so persons refused to wear film badges and of this number about half wore badges for several months and then apparently tired of the task. The more general attitude was to wear a badge as a personal protection measure and with the spirit of being useful or helpful in a program of interest and concern to the community and to the nation as a whole.

Another item which became obvious as the study progressed was the dynamic habits of the population. Dozens of people left the area while other families moved into the community and some of those that moved returned. These conditions resulted from the decline in mining activities in the Lincoln Mine area, from the itinerant nature of many ranch jobs, from the return to out-of-area schools by young people, and from general migrations which are not specific to any given community.

To handle approximately 400 film badge stations and the accompanying record keeping required a great deal of the time of three men. In general, it would take three men, using two vehicles, about five to seven days to collect about 90 to 95 percent of the badges. The remaining badges were collected over an additional time period of several weeks.

As one would expect, some personnel badges were lost or damaged by such procedures as running the badge through a washing machine. However, the overall attrition rate was small and need not be considered as a real handicap to such a program.

The major conclusion to be drawn from this study is the willingness of people to cooperate in such a program even when it required a small degree of personal inconvenience.

8.5 Butler Ranch Film Badge Data.

Specific data were obtained at Butler's Ranch when it received fallout from the "Smoky" event. Three stations were established there on May 8, on Mr. Butler, Mrs. Butler, and an outside station about 50 feet from the house. These stations provided complete coverage with the exception of Mrs. Butler's badge for the period from July 7 to September 4 which was lost. The "Smoky" event took place August 31 which made this a critical time period.

The living habits of the Butlers indicate that except for brief shopping trips they are generally in the immediate vicinity of the ranch. However at the time of "Smoky", Mrs. Butler was out of state visiting relatives for a period of several weeks.

The film badge results for Mr. Butler from May 8 to February 3 give an accumulated dose of 3,755 mr. while for the same period the outside station received 8,680 mr. Mrs. Butler had an accumulated dose of 1,590 mr. During the period that her badge was lost, Mr. Butler received 2,440 mr.

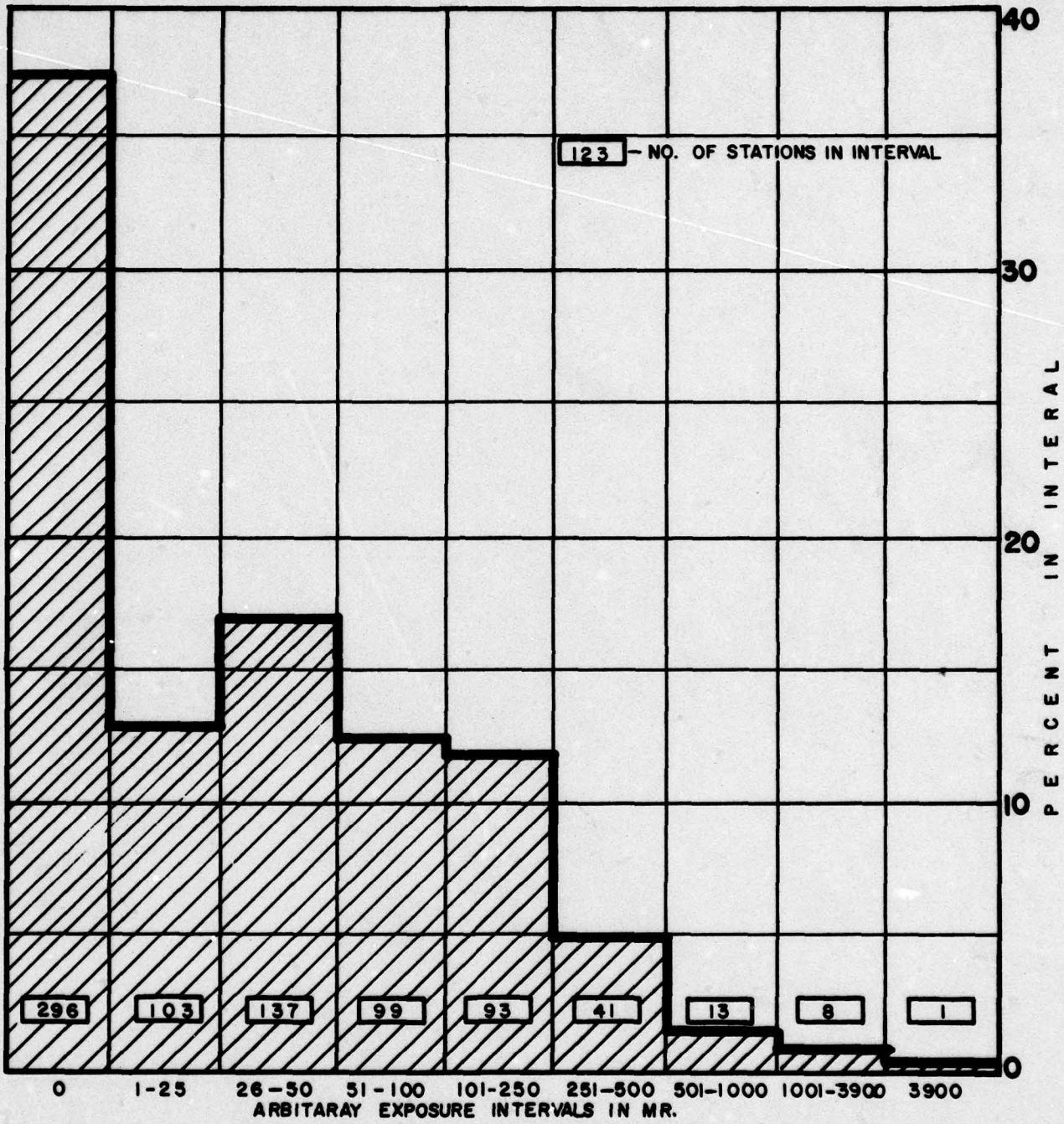
Mr. Butler would have received a larger exposure by perhaps 800 mr. if he had not been taken to Glendale for about three to four hours during the initial part of the "Smoky" fallout period. During the time that he was away, the gamma intensity ranged from 250 to 400 mr/hr. as measured by survey instruments.

If we add this assumed exposure to his total and then compare this result with the outside station total, we find that Mr. Butler would have received approximately 50 percent less gamma radiation than the outside station. This information confirms an overall shielding factor for Butler's Ranch of two which was determined using numerous monitoring readings taken at various positions inside and outside the house.

It is interesting to compare the doses received by Mr. Butler and the outside station by time periods as shown in the tabulation below:

Period	Mr. Butler (mr.)	Outside (mr.)
8/8 - 9/4	2,440	5,750
9/4 - 10/4	900	1,835
10/4 - 12/17	340	850
12/17 - 2/3	75	140

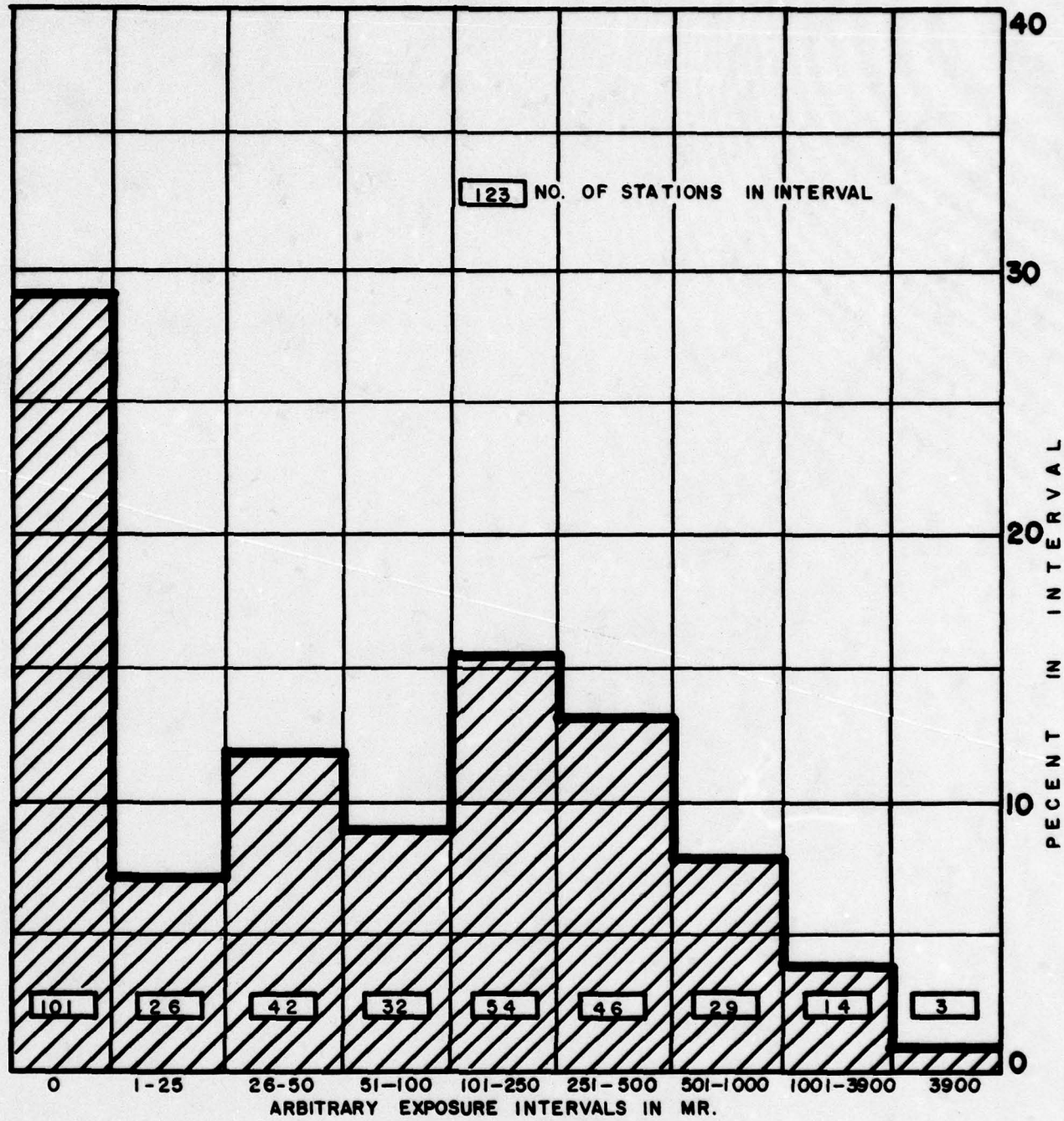
In all cases, Mr. Butler received less radiation by a considerable factor. Also, another important fact is the continuing accumulation five months after the detonation. It is apparent that Mr. Butler will continue to accumulate radiation at a rate of about 50 to 75 mr. for several more months and then lesser amounts on a monthly basis for a prolonged period if he continues to live in his present location.



OFF-SITE INHABITANTS

PERCENTAGE DISTRIBUTION OF ACCUMULATED EXPOSURE AS MEASURED AT FILM BADGE STATIONS (791 STATIONS)

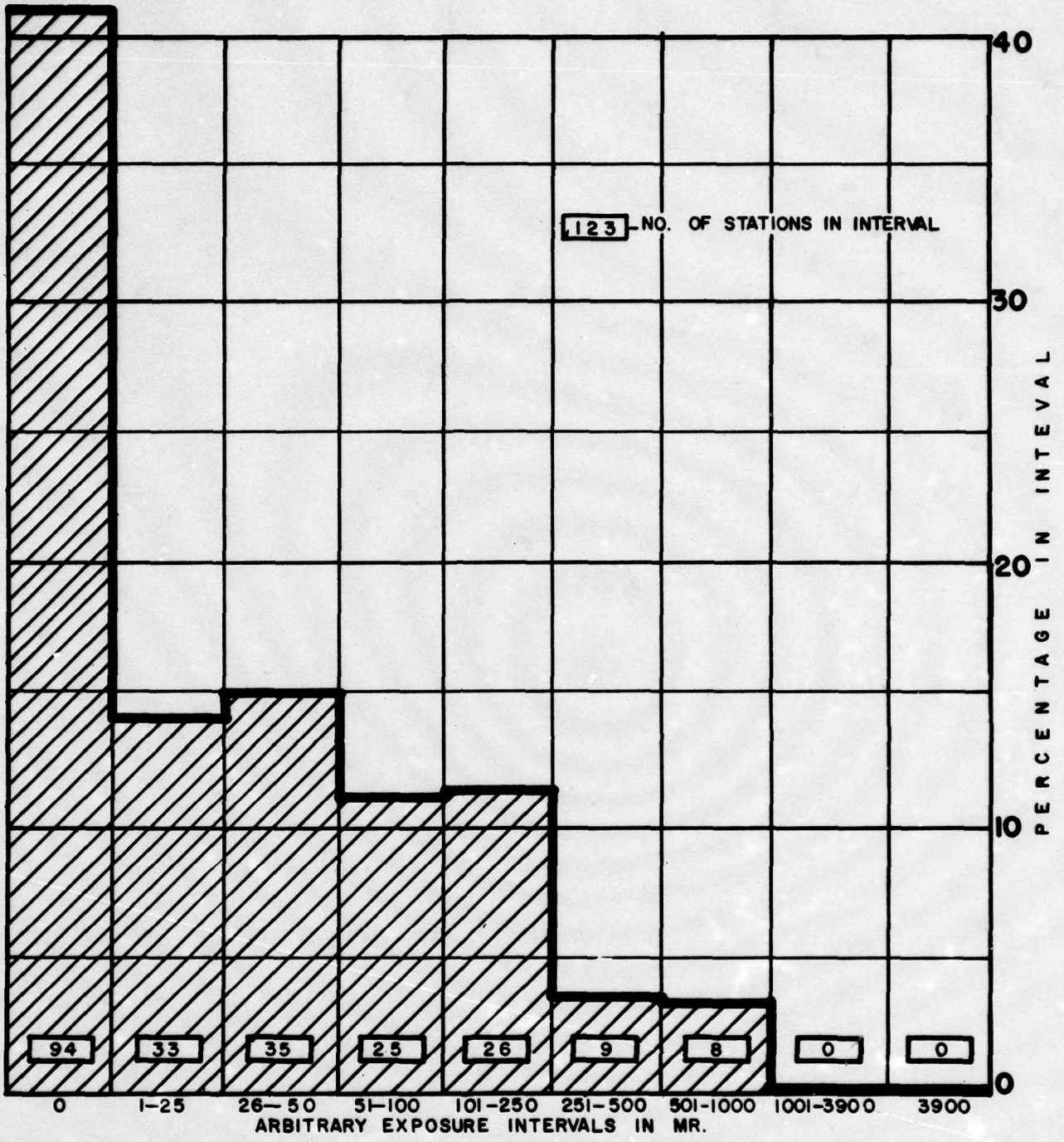
Figure 8.2



OUTSIDE STRUCTURES

PERCENTAGE DISTRIBUTION OF ACCUMULATED EXPOSURE AS MEASURED AT FILM BADGE STATIONS (347 STATIONS)

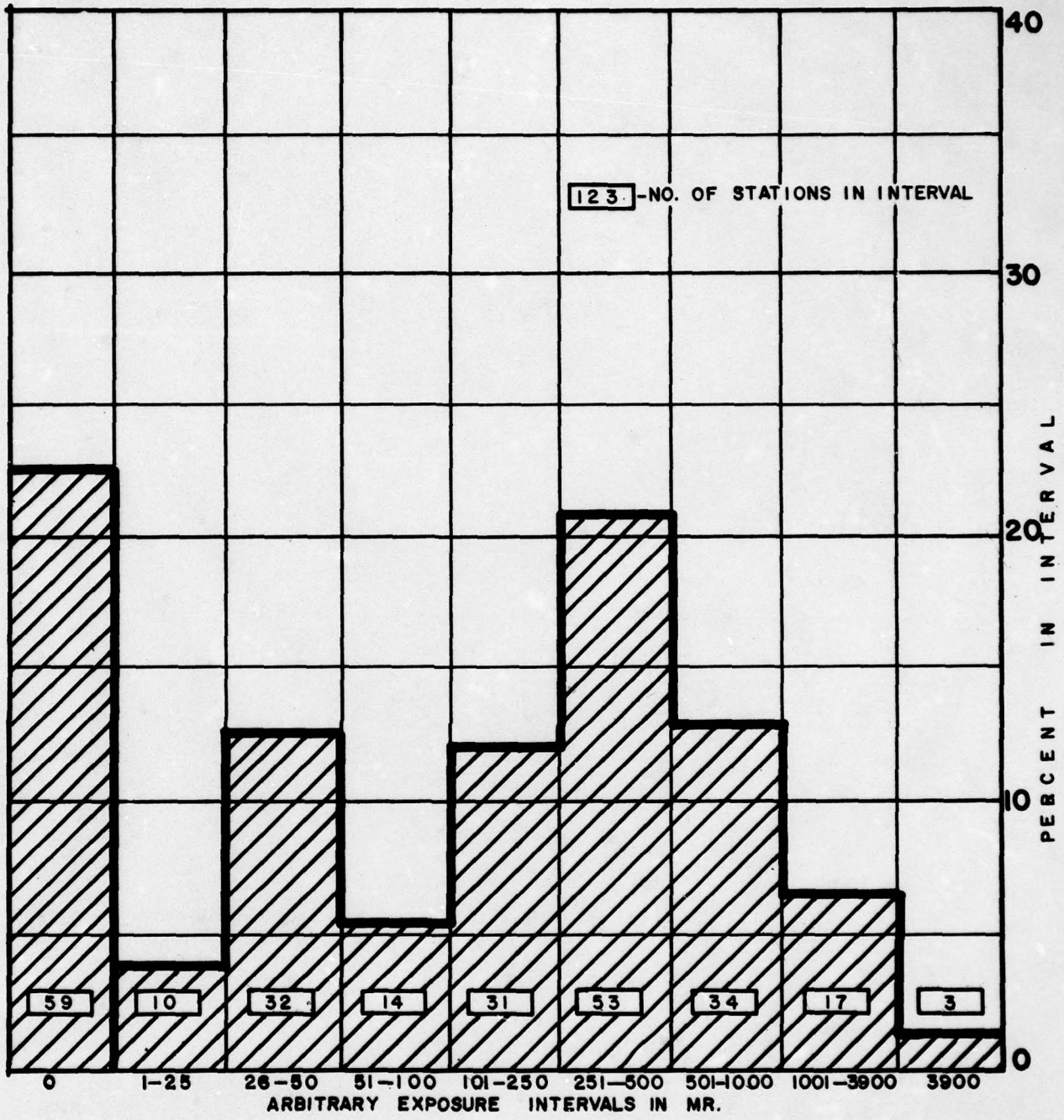
Figure 8.3



INSIDE STRUCTURES

PERCENTAGE DISTRIBUTION OF ACCUMULATED EXPOSURE AS MEASURED AS FILM BADGE STATIONS (230 STATIONS)

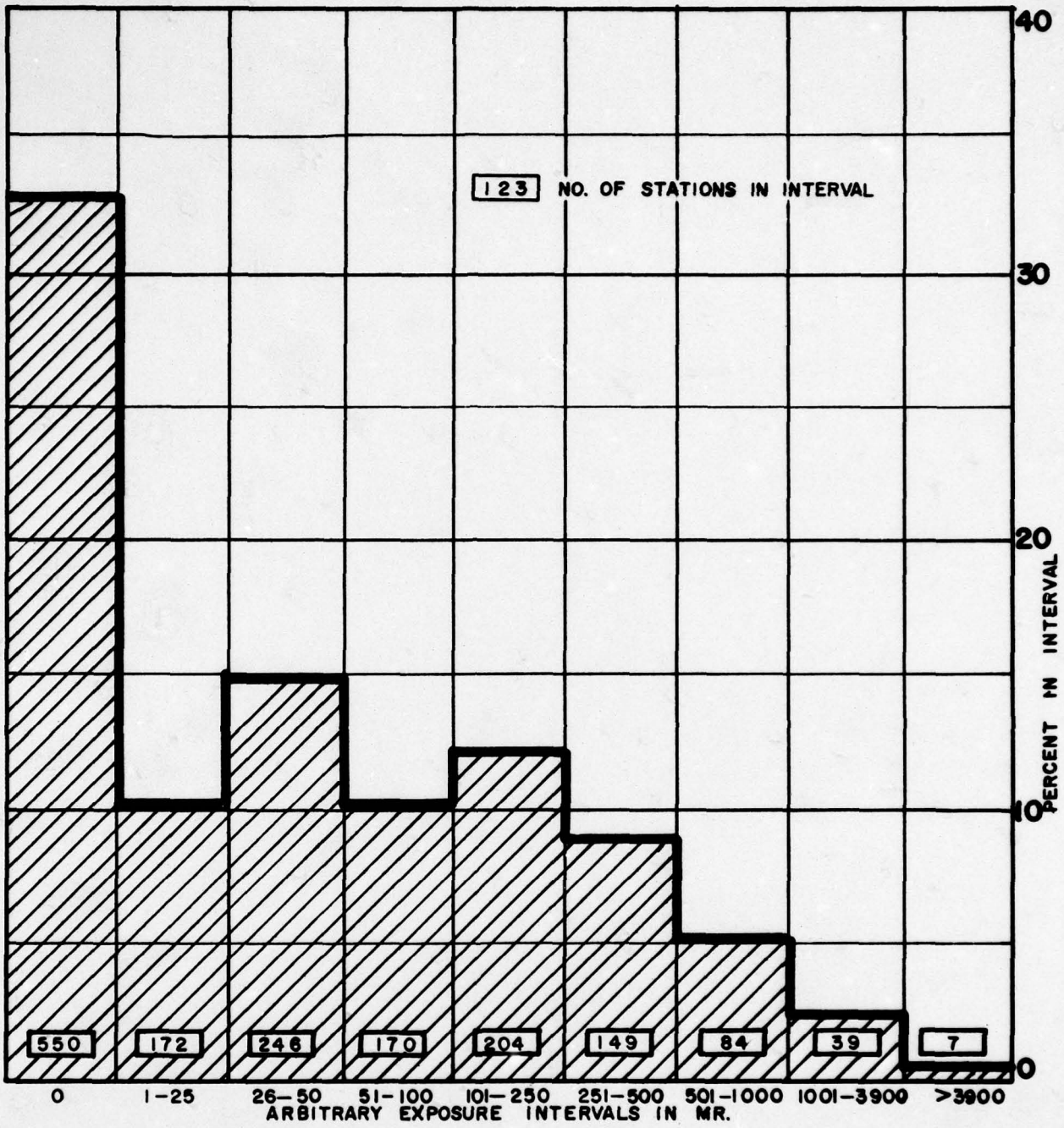
Figure 8.4



NON-POPULATED LOCATIONS

PERCENTAGE DISTRIBUTION OF ACCUMULATED EXPOSURE AS MEASURED AT FILM BADGE STATIONS (253 STATIONS)

Figure 8.5



TOTAL FILM BADGE LOCATIONS

PERCENTAGE DISTRIBUTION OF ACCUMULATED EXPOSURE AS MEASURED AT FILM BADGE STATIONS (1621 STATIONS)

Figure 8.6

Figure 8.7

Field Dosages in Populated Places
Through Use of Film Badges

Location	Personnel Dosage (Milliroentgen)	Area Dosage (Milliroentgen)
ARIZONA		
Beaver Dam	75(1)	245
Bullhead	0(1)	25(3)
Catherine Ranger Station (on Arizona 68)	25	-
Chloride	25(3)	25(3)
Davis Dam	0	0(3)
Grasshopper Jct.	0(1)	50
Hackberry	0	20(3)
Hoover Dam	0(3)	20(3)
Kingman	10(3)	10(3)
Lake Mohave	0(3)	25
Littlefield	0	165(2)
Oatman	-	0(3)
Peach Springs	0(3)	0(3)
Topock	-	0
Truxton	-	0
Valentine	0(3)	10(3)
Walapai	-	0
Warm Springs (on Arizona 68)	-	0
Willow Beach	0(1)	0
Yucca	-	0
CALIFORNIA		
Amboy	0	0
Baker	60(3)	50
Barstow	20(3)	10(3)
Benton Station	45	80(3)
Big Pine	60(3)	115(3)
Bishop	45(3)	120(3)
Boron	0	-
Camp Irwin	-	0
Cantil	0	0
Cartago	50	50(4)
Chalfant	100	180
China Lake	15(3)	0(1)
Crestview	0	0
Cromise Junction	50	55
Daggett	20	0
Death Valley Junction	-	0(1)
Deep Spring	-	50
Emigrant Springs Ranger Station	-	10(3)

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
CALIFORNIA		
Essex	20	35
Four Corners	0	-
Furnace Creek	-	0(3)
Gephart School (Boron, Calif.)	-	0
Hinkley	50	0
Inyokern	50	0
Independence	25(3)	35(3)
Johannesburg	0	50
Kelso	20	50
Laws	-	25
Lenwood	-	20(1)
Little Lake	0	0
Lone Pine	20(3)	50(3)
Ludlow	20	0
Manix	0	0
Mojave	0	0
Mountain Pass	-	0
Needles	0(3)	0(3)
Newberry	20(3)	0(3)
Oasis	-	75
Oasis (on U.S. 66)	20	-
Olancha	-	50
Randsburg	0(3)	0
Red Mountain	0	50
Ridgecrest	0	25(3)
Ryan Mine	-	85(3)
Shoshone	0(1)	-
Silver Lake	50	75
South Haiwee	20	0
Stove Pipe Wells	25	20
Tecopa	0	0(1)(3)
Toms Place	-	25
Trona	20(3)	0
Wheaton Springs	0(1)	-
Yermo	50	20
ZZYZX Springs	-	0(1)
NEVADA		
A and B Mine	2,750(4)	4,060(4)
Adams Ranch	50(2)	285
Alamo	45(3)	25(3)
Apex	40(3)	50
Ash Meadows	0(1)	-
Ash Springs	55	90(3)

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
NEVADA		
Atlanta	75	170
Austin	30(3)	195(3)
Baker	200	215
Barclay	105(1)	0
Bardoli Ranch	375	300
Basalt	-	50(2)
Beatty	90(3)	175(3)
Belew Ranch	230(1)(3)	520
Belmont	-	1,140(2)
Belmont Mill and Mine	275(1)(3)	400
Big Bend Ranch	-	290
Blue Diamond	-	0(3)
Blue Eagle School	160(1)(2)(3)	750
Bonanza Boy Scout Camp	-	0(1)(3)
Bond Ranch	135(1)	-
Boulder City	0	0(3)
Boyd	-	75
Bristol Silver Mine	15(3)	0
Buckhorn Ranch (Lamb)	40(1)(3)	40(1)(3)
Buckhorn Ranch (Stewart)	70(2)	0
Bunkerville	50(3)	260(3)
Butler Ranch	3,755	8,680
Cactus Springs	-	0
Caliente	15(3)	10(3)
Carp	-	70(1)(2)
Caselton Mine	0(3)	0
Cherry Creek	300	200(2)
Cloud	-	485(1)(2)
Clark's Station	-	1,445
Coaldale	385	480
Cold Creek	0	-
Cole and Dolan Ranch	0(1)	0(1)
Coment Mine	0(3)	0
Conlon Ranch	120	190
Corn Creek	0(1)	0(3)
Cove	25	-
Crestline	-	105(1)
Crown Point Globe Mine	-	0
Crystal	110(3)	85
Crystal Springs	30(1)(3)	110
Currant	75(2)	200(3)
Delamar	75(1)	0(1)
Delmue Ranch	30(3)	0
Dodge Construction Camp	795(1)(3)	2,670(3)

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
NEVADA		
Donahue Ranch (Camp Valley)	50(3)	0
Dry Lake	15(3)	50
Duckwater	235	220
D-X Ranch	50	100(2)
Dyer	45	205
El Dorado	120	100(2)
Eldridge Ranch (15 mi. E. of Eureka and 19 mi. N.)	-	530
Eldridge Ranch	50(1)	100(1)
Elgin	40(3)	40(3)
Ely	50(3)	95(3)
Etna	35(3)	35
Eureka	160(3)	350(3)
Fallini Ranch (Twin Springs Ranch)	650(3)	1,705
Fish Creek Ranch	270(1)	220(1)
Galt	-	3,205
Garnet	-	75
Geyser Maint. Station	320(3)	505
Geyser Ranch	115(2)	355
Glendale	140(3)	35
Goldfield	310(3)	410(3)
Goldpoint	-	430
Goodsprings	-	0
Groom Mine	-	3,305
Gubler (Merrill) Ranch	175	330
Hafen's Dairy	135	935
Heckethorn Ranch	0(1)	-
Henderson	0	0(3)
Hiko	30(3)	135(3)
Hollinger's Ranch (Eagle Valley)	135	-
Hoya	-	2,390
Hughes (Archie) Ranch	-	440(1)
Indian Creek Ranch	690(1)(3)	-
Indian Springs	55	20(3)
Jensen Dairy	70(1)(2)	410
Kimberly	235(3)	235(3)
Kyle	-	375
Kyle Canyon Ranger Station	-	0
La Board Ranch	-	500
Lake Mead Base	-	55(3)
Las Vegas	0(3)	20(3)
Lathrop Wells	95	10(1)(3)
Lehman Caves	175(1)	140(2)
Leith	-	550
Lida	215	430(4)

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
NEVADA		
Lida Jct.	365(3)	625
Lincoln Mine	760(3)	960(3) (Range 715-1140)
Lockes	230	565
Logandale	0(3)	245(3)
Lund	70	60(3)
Manhattan	130(3)	125
M and M Mine	2,750(3)	4,060
McGill	65(3)	55(3)
Mercury	35(1)(3)	-
Mesquite	25(3)	370(3)
Millett	-	695
Moapa	45(3)	-
Moapa Valley Indian Reservation	130(3)	260
Moon River Ranch	190(1)	355
Mount Charleston Lodge	-	0
Mounts (Ransom) Ranch	150	255
Mt. Wheeler Inn	-	100(2)
Nellis AFB	-	0(3)
Nelson	0(3)	-
Nipton	0(4)	-
North Las Vegas	0(1)	0(3)
Nyala	-	370
Overton	10(3)	120(3)
Pahrump	0	0
Pahrump Mining Co.	50	0(1)(3)
Panaca	35(3)	0(3)
Parman's Ranch	120	195
Pioche	10(3)	0(3)
Pioneer Jct. Cafe	-	270
Pittman	-	0
Pony Springs	-	395
Pop's Oasis	0(1)	-
Preston	0(2)	325
Rattlesnake Maintenance Station	-	1,245
Reed (non-populated but put in for comparative purposes)	-	3,640
Reveille Mill	2,670(3)	5,700
Rhyolite	15(3)	0
Roger's Ranch	175	320
Rose Valley (Lytle)	0	0
Round Mountain	120(3)	135
Rox	-	780(2)
Ruby Hill Mine	390	310

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
NEVADA		
Ruth	80(3)	225(3)
Saddler Ranch	250(1)	470(1)
Sarcobatus	100	120
Searchlight	0	120
Searl's Ranch	405	355
Seven L (7L) Ranch	60(3)	-
Silver Peak	-	405
South Paw Mine	355(3)	365
State Line	0	-
Stewart Ranch (North of Pioche)	220(1)(3)	300(1)
Stine	-	95
Stone Cabin Ranch	-	620
Sunnyside	165	300
Swallow Ranch	165	125(2)
Taft School	-	150
Thompson Ranch	270(1)	870(1)
Tonopah	180(2)(3)	460(3)
Tonopah Airport	250(3)	380(3)
Tonopah Ballistics Range	-	270
Unalde Ranch	50(1)	560
Urretia's Ranch (Cave Valley)	-	370
Ursine	0	0
Vigo	-	800
Walch Pine Creek Ranch	365(1)(3)	695
Warm Springs	250	625
Warm Springs Ranch	90(3)	380(3)
Watertown	770(3)	-
Whipple Ranch	75(1)(3)	100(3)
Whitney	-	0(3)
YWCA Camp	0(1)	-
UTAH		
Adamsville	-	0
Beaver	35(3)	0(3)
Beryl	20(3)	35
Beryl Junction	20	0(3)
Black Rock	0	0
Bloomington	-	1,010
Bryce Canyon	20(3)	20
Cedar City	70(3)	45(3)
Central	85(3)	245
Columbia Iron Mine	20	50
Cove Fort	0	0
Desert Experimental Range (on Utah 21)	-	0

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
UTAH		
Duck Creek Forest Camp (on Utah 14)	-	100
Enoch	-	50
Enterprise	50	25(3)
Garrison	70(3)	75
Glendale	100	85
Greenville	0	0
Gunlock	300	265
Hamilton Fort	-	245
Hamlin Valley	-	0
Hatch	-	50
Hillsdale	-	270
Hurricane	100	50(3)
Junction	-	50
Kanab	25(3)	25(3)
Kanarraville	640(3)	330(3)
Kanosh	0	0
La Verkin	50	235
Leeds	525	730
Long Valley Junction	-	50
Lund	-	0(1)
Manderfield	-	50
Marysvale	-	50(1)
Milford	25(3)	0
Minersville	30(3)	0
Modena	20(3)	0
Mount Carmel	-	0
Mount Carmel Junction	0	-
Nelson Ranch (N.W. of St. George)	160(1)	280(2)
New Castle	-	20
New Harmony	170(1)	245
Orderville	0(1)(3)	0
Orton Junction	325	430
Paiute Indian Reservation	-	0
Panguitch	230(3)	480(3)
Paragonah	70(3)	40(3)
Parowan	30(3)	50(3)
Pintura	570	1,040
Rockville	75(1)	-
St. George	250(3)	230(3)
Santa Clara	230	910
Springdale	0(1)	50(1)
Summit	50	50
Toquerville	150	310(3)

Figure 8.7 (Cont'd)

Location	Personnel Dosage (Milliroentgens)	Area Dosage (Milliroentgens)
UTAH		
Uvada	-	0
Veyo	320	595(1)
Vic's Place (Utah 17 and U.S. 91)	0	440
Vic's Service Station (20 miles S.W. of Santa Clara on U.S. 91)	390	1,230
Virgin	25(3)	100(3)
Wah Wah Ranch	0	0
Washington	135(1)	270(3)
Zane	35(1)	0
Zion Lodge (Inside)	-	50

CHAPTER IX

WEATHERING STUDIES

9.1 General Procedures.

Weathering studies were made by selecting stations within a fallout pattern and taking survey instrument readings at various times. The stations were normally marked by a stake in order to locate the place of measurement. Readings of gamma intensity were made three feet above the ground by various individuals using various instruments.

9.2 Results.

The data (time after detonation and gamma intensity in mr/hr.) for several weathering studies have been plotted on log-log graph paper and the slope (decay factor) for a particular time period determined. The locations and the decay factors determined from the data collected at these stations for the "Smoky" event are given below.

Location	Decay Factor
On Rd. C., 22 mi. S. of junction with U.S. 93	-1.21
Near Butler Ranch	-1.17
Kane Springs Wash on U.S. 93	-1.23
On Rd. C, 15.5 mi. S. of junction with U.S. 93	-1.25

As the graphs were plotted by drawing the straight line of best fit from visual observation using data obrained under field conditions. these values should all be rounded off to one decimal place. In other words, these four sets of results yield the same result, viz., a decay factor of -1.2. The time intervals vary slightly although results from each station areavailable from H + 3.8 hours to H + 660 hours. A decay factor of -1.2 appears to fit the data fairly well within this time period.

A complete set of data for the station located on Road C, 15.5 miles south of the junction with U.S. 93 is presented as Figure 9.1. Several observations can be made from this graph. First, the fairly good fit of the line to the data, particularly at the higher intensities, and second, the scattering of the data at the lower intensities. It would appear that survey instruments are not as accurate at lower intensities assuming the data follow -1.2 decay. Also, It would seem that this accuracy would not improve if lower intensity readings were made. This would tend to indicate that other methods of measurement should be investigated to follow the environmental decay of fallout over appreciable time periods.

Data from three stations established after the "Priscilla" event indicate an average decay factor of -1.5 for the period from H + 5 hours to H + 200 hours. Similar results for "Diablo" indicate decay factors of -1.3 between H + 5 and H + 600 hours and -1.3 between H + 3 and H + 250 hours.

The reasons for these differences are not known. The events themselves were different in that "Priscilla" was a 700-foot balloon shot while "Diablo" and "Smoky" were 500 and 700-foot tower shots, respectively. Also, the distances from ground zero to the weathering

stations varied which might affect the age of the fallout and perhaps its composition.

The decay factor as used here refers to the overall decay of the fallout field including normal decay as well as environmental effects. Other data are available and will be analyzed when time permits.

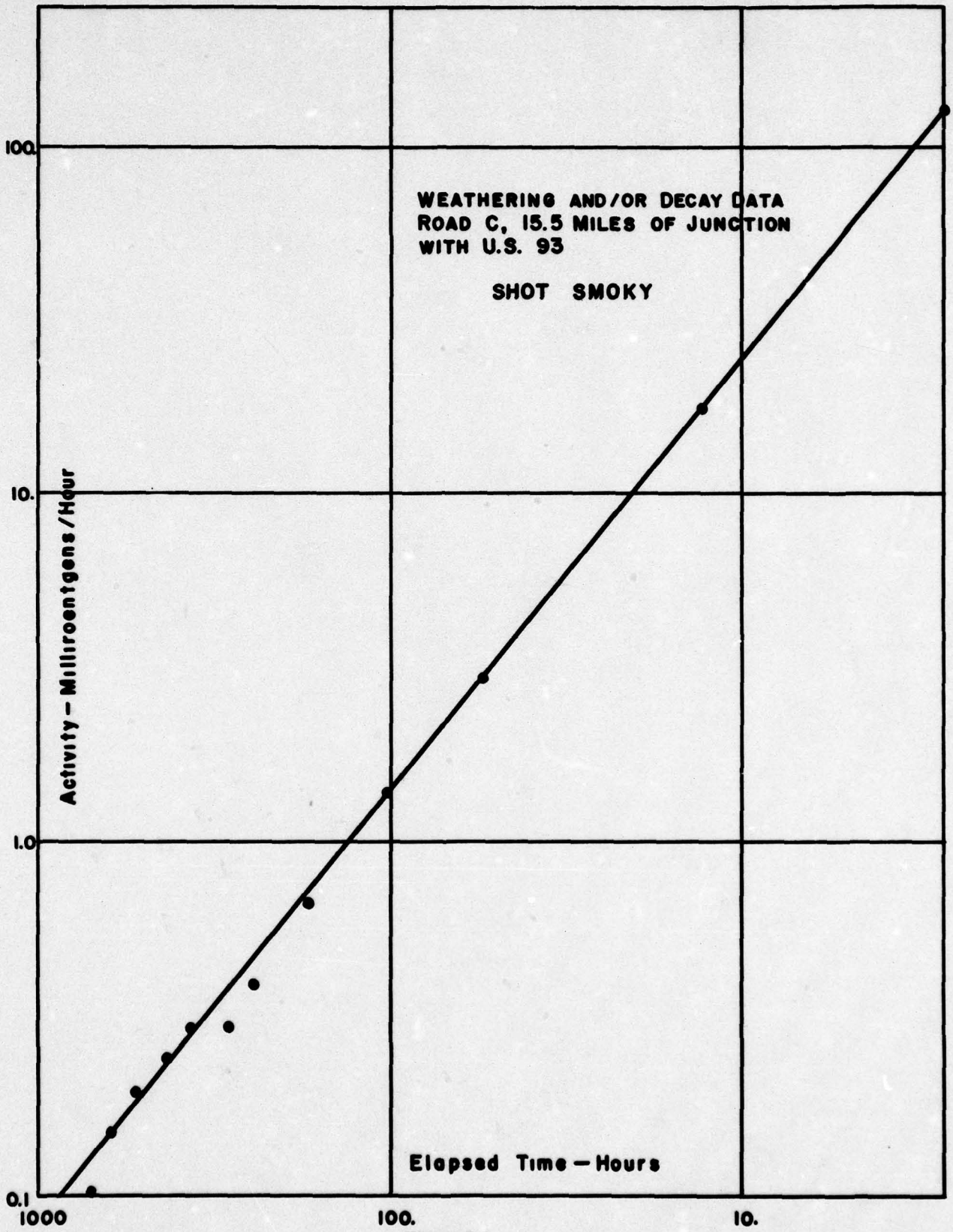

WEATHERING AND/OR DECAY DATA
ROAD C, 15.5 MILES OF JUNCTION
WITH U.S. 93
SHOT SMOKY
Activity – Milliroentgens/Hour
100.
10.
1.0
0.1
1000
100.
10.
Elapsed Time – Hours

Figure 9.1

CHAPTER X

SHIELDING STUDIES

10.1 General Procedures.

The pre-series off-site plan contemplated the accumulation of data related to the shielding afforded by structures whenever the opportunity arose. The needs and desires of the Division of Biology and Medicine for data of this type caused this program to be intensified after the start of the PLUMBBOB series. Some 89 pages of raw data resulted from this study. It is impossible to do complete justice to this data within the time schedules set for completion of an off-site report. Consequently only a limited selection of data will be given in this report and an analysis and interpretation of the complete data will be done by the Division of Biology and Medicine.

A full-scale test series does not lend itself readily to the acquisition of shielding data on existing structures regardless of the organizational structure set up to accumulate data. The objectives of the Test Organization in minimizing fallout on populated places are incompatible with the procurement of such data since necessarily we must have considerable fallout on dwellings or structures before definitive shielding factors can be determined. A test shot is cancelled if the predicted fallout pattern covers an inhabited community or even comes reasonably close to it and the final fallout pattern after a detonation may be sufficiently different from the predicted pattern so as to nullify preconceived plans. Consequently, it is difficult also to have personnel standing by merely for the purpose of obtaining shielding data. This fact would seem to indicate that it is difficult to set up a specific team for this purpose, but rather that it is probably better to collect such information through an organization such as Off-Site Rad-Safe which has 360° coverage around the Test Site. Certainly public safety is of primary importance, but after that has been assured, there is usually time to conduct shielding measurements providing a structure lies in the fallout pattern.

The off-site organization made prior arrangements with numerous people in 15 communities surrounding the Test Site (the complete list is included in Figure 10.1) for the purpose of using their dwellings for shielding measurements. Fortunately for the Test Organization, no appreciable amount of fallout was placed on any of these communities and, unfortunately, this precluded the acquisition of shielding data in these areas.

One other general comment should be made, the immediate region surrounding the Nevada Test Site, with the exception of the Las Vegas area, contains very few modern structures. Consequently, most data obtained relates to buildings which are not structurally comparable to those in older and more populated areas of the country.

Despite all of these adverse factors, a reasonable amount of data was obtained. For the purpose of this report certain selected data only will be included.

10 2 Butler Ranch Shielding Study.

Butler's Ranch, which lies about half way between Alamo and Glendale, was located close

to the center of the "Smoky" pattern. Probably the most comprehensive set of shielding data was obtained at this place over a period of 34 days following the detonation of "Smoky". A plan of Butler's Ranch House, indicating the type of construction and the monitoring locations, is shown in Figure 10.2. The monitoring data obtained over the 34-day period at the monitoring locations indicated on the Figure 10.2 is shown in Figure 10.3. It should be noted in this Table that the outside readings were made close to the outside walls of the residence. These are not true readings to be used for the determination of shielding factors inasmuch as they reflect shielding of the building itself. An additional table, Figure 10.4, indicates the best estimate of the general area readings at Butler's Ranch during the period of study. This best estimate is based on all readings taken in the general area during the period of study.

Shielding factors, defined as the ratio of the outside reading to the inside reading, are given for various time intervals in Figure 10.5. It is readily apparent that, while the shielding factors ranged from 1.5 to 3.0, the average for all monitoring stations and for all time intervals is approximately 2. If, however, the outside data given in Figure 10.3 is used to compute shielding factors rather than the general area readings, the average factors are in the range from 1.1 to 1.3.

Certain general conclusions can be drawn from this set of data. It would be well if these conclusions were verified by much additional data, but it does seem safe at this time to state that for this type of structure the average shielding factor would be about 2. This compares favorably with assumptions regarding shielding factors which have been used in the past to compute effective dosages.

It is apparent also that, if one is to evaluate shielding, it must be done on the basis of outside readings taken some distance from any structure so as to eliminate the discrepancies caused by the shielding afforded by the structure.

Almost any type of structure which might be used for residential purposes would be at least equal to, if not better than, the type of construction used in Butler's ranch house. Consequently, it is probably legitimate to assume that the average shielding factor of 2 obtained in this instance is the minimum shielding factor that should apply to the shielding afforded by residential construction.

10.3 Results.

Figure 10.6 tabulates some other data taken more or less at random from the Off-Site shielding files. It is noticeable that the heavy stone construction of the Goldfield fire station gave a very high shielding factor of 5.7 while the sturdy wooden and stucco service station at approximately the same location gave a shielding factor of about 3. The building selected for illustrative purposes at the Tonopah Ballistics Range affords no physical shielding except that from sheet metal sides and a small amount of insulation on the roof. Despite this, approximate shielding factors of 2 were obtained. This probably illustrates space shielding inasmuch as this building has a 35-foot ceiling with a consequent attenuation of the contribution from radioactive materials deposited on the roof. The metal trailer located at the Dodge Construction Camp illustrates another variety of shielding and illustrates also quite clearly the reduction in shielding as one proceeds from floor level to ceiling level. The Tonopah bank building data show not only the effect of brick and stone construction, but also the effects that one might observe on a multistoried building.

10.4 Vehicle Shielding.

The one type of shielding which could not fail to be within the fallout zone were the vehicles which were driven by the off-site monitors. Consequently, a considerable fund of information was obtained regarding the shielding characteristics of vehicles. This is given in more detail at this time than is probably warranted but this is done deliberately because it is felt that these data represent the complete story on vehicle shielding and there is no logical reason why this should ever have to be repeated again.

Everyone who has participated in monitoring operations has noticed the shielding effect of vehicles. No systematic data, however, has been collected. During PLUMBBOB, the evaluation of vehicle shielding was included in the off-site program.

Sixty-seven sets of observations were obtained under a variety of conditions with respect to intensity, distance from detonation, time since detonation and so forth. Some of these are scattered observations and others coherent series in the same monitoring run.

The range of intensities in these data varies from 1420 mr/hr to 0.3 mr/hr., with the majority falling in the 10 – 100 mr/hr. class.

A shielding factor, defined as the quotient of the outside reading divided by the inside reading has been determined for all data. The average shielding factor, so determined, is 2.1. The range of factors extends from a high of 4.5 to a low of 1.1, with the vast majority falling between 1.5 and 2.5. It appears to be justified to conclude that radiation exposure inside of a vehicle will be approximately one-half of that in the general area outside of the vehicle. This conclusion appears valid also regardless of the radiation intensity causing the exposure. Although our statistics could be better, it appears also that the shielding factor is about the same with one window open or all closed, up to the point where contamination of the inside of the vehicle occurs.

One other interesting conclusion is apparent from these observations. Normal monitoring readings are taken at least 25 feet from the vehicle. These readings were used to determine the shielding factor. An additional set of readings was made immediately adjacent to the vehicles. In all cases, such readings are much lower than those taken at the 25-foot distance. This indicates that merely standing in the open, close to a vehicle or structure affords considerable shielding; that taking monitoring readings in this fashion is an improper technique; and that shielding factors determined in this manner would certainly be too low. To illustrate these points, Figure 10.7 is included.

This table shows the base data and the individual shielding factors resulting from this data. A comparison between the shielding factors obtained by using the true area readings and those measured adjacent to the vehicle is interesting. These factors for the first ten readings along Road B are compared below:

Shielding Factor Computed from 25' Reading		Shielding Factor Computed from Adjacent Reading	
2.0	(Cont'd) 2.2	1.7	(Cont'd) 1.6
2.2	2.2	1.7	1.6
2.2	1.9	1.5	1.4
2.0	2.5	1.4	1.5
2.2	2.6	1.5	1.7

FIGURE 10.1

Structures Utilized for Shielding Studies

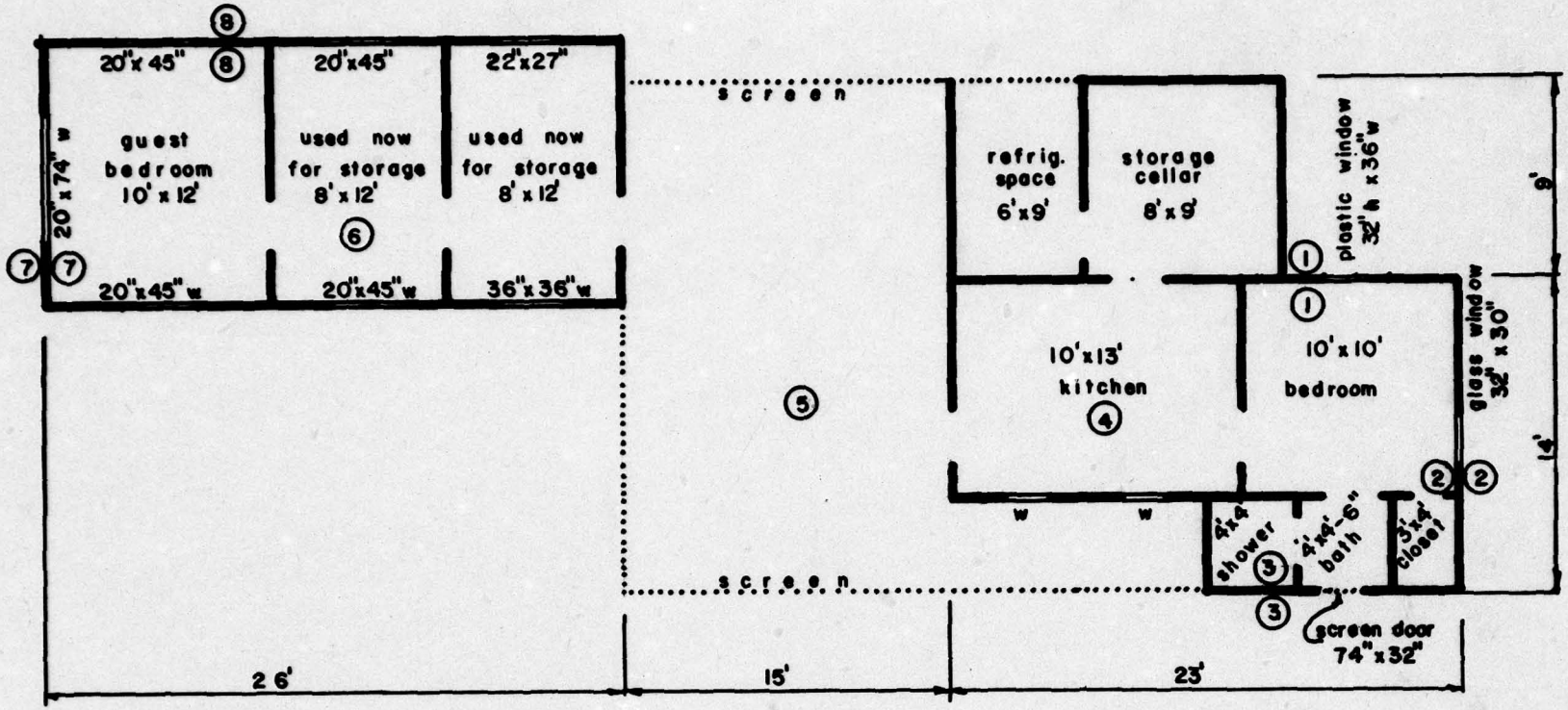
Community	Structure or Residents	Type of Construction
Alamo	Mr. & Mrs. Alden Stewart (Hotel)	10" plaster adobe
	Rose & Harvey Frehner	8" Concrete block
	Mrs. Erma Cox	8" plaster adobe
	Ainsley & Hulda Sharp	2 x 4 stud wall, 1" clapboard
	Mrs. Nettie Graff	8" plaster adobe
	Morton & Ethel Cutler	1" board, imitation brick siding
	Edna & Joseph Cox	2 x 4 stud wall, 1" weather board
	Mr. & Mrs. Russell Allen	8" concrete block
	Mr. & Mrs. LeMoine Davis	8" concrete block
	Jim & Cindy Tribbett	2 x 4 stud wall
Ash Springs	Charlie Henderson	14" masonry
	George Nesbitt	8" filled tufa block
	Louise O. Whipple	9" masonry
	Bill Schofield	2 x 4 stud wall, cedar shingles
	Mel D. Foremaster	2 x 4 stud wall, asbestos shingles
	Joe O. Ledbetter (PHS)	3" wall house trailer
Overton	Lavon Hickman	Brick
	Harold Doty	Brick
	Richard Heath	Frame
	Albert Dalley	Frame
	James F. Pace	Frame
	Moapa Valley School	Brick and Cement block
	Orson Johnson	Frame, stucco
	Ivan Jones	Cement brick
	Seymour Fish	Cement brick
	Ray Robison	Brick
	Desert Inn Cafe	Frame stucco
	Overton Motel	Frame stucco
	Chevron Station	Frame Stucco
	Perkins Store	Cement block
	Post Office	Frame stucco
	Phillip Anderson	12" adobe stucco
	W. H. Lyons' Store	Frame
	Texaco Station	Cement block
	Lost City Museum	Brick
	Virgil Avarett	Frame, asbestos shingle

FIGURE 10.1 (Cont'd)

Community	Structure or Residents	Type of Construction
Overton (Cont'd)	Don Squires	Frame, asbestos shingle
Logandale	Charles Pulsipher	Flat roof frame
	Union 76 Station	Cement block
	Moapa Valley Store	Frame
	Grant Bowler	Frame
	Logandale School	Brick
Piocha	Mrs. Nina Lister	9" stucco
	Grover Swallow	10" concrete & frame
	Victor Cottino	8" frame
	Lila Williams	6" frame
	George Bleak	6" frame
	Dan Martin	6" frame
	R. Chadburn	10" cinderblock
	Mrs. R. Orr, Sr.	9" stucco
	Frank J. Dolan	9" brick
	Hartley's Motel	Frame
	John A. Orr	9" brick
	Lincoln County Court House	12" concrete
Ursine	Gordon Lytle	9" stucco
	Harold Hammond	8" frame
	Mrs. Hollinger	8" frame, asbestos shingle
	Community Meeting Hall	6" frame
Caselton	Frank Dyson	8" frame
	Ralph Curl	6" frame
Mesquite	Oscar Abbott	8" adobe brick
	Victor Barrett	6" frame
	Harley Leavitt	8" cement block
	Hale Wood	12" adobe stucco
	Clark Showalter	6" frame
	Bertha Howe (Clark County Hospital)	18" rock
	Dick Chapter (Frontier Cafe)	8" frame
	Fenton Frehner	10" brick
	John Jensen	8" concrete
	Melburne Jensen	8" concrete block

FIGURE 10.1 (Cont'd)

Community	Structure or Residents	Type of Construction
Bunkerville	Durrel Adams	12" adobe brick
	Charles Leavitt	12" concrete, stucco
	Dan Waite	8" cement block, stucco
	Lemuel Leavitt	10" concrete, stucco
	Vincent Leavitt	10" rock, stucco
McGill	Miss Zella Hall	Frame
	Employment Building – Kennecott	8½" brick
	Tin Shop – Kennecott	Corrugated iron
	Assay Office – Kennecott	12" concrete block
East Ely	White Pine School Administration Building	6" frame, stucco
Kimberly	Office Bldg. – Consolidated Copper	*Corrugated iron & wood*
	Mr. Edward Harris	Asbestos shingle
Jct. Hw. 38 & 6	Mrs. Elfriede Hunt (Bill's Place)	6" asbestos shingle
Lund	Neil Gardner	Gravel block
	Mr. Jack Bean (Microbarograph)	Aluminum, plywood trailer
	Mr. Mark Gardner's Grocery Store	8"cement block
	Mr. Mark Gardner	Frame
	Mrs. Margaret Oxborrow	Frame
Ely	F. DeMarinis (PHS)	Asbestos shingle
	C. Selheimer (PHS)	Aluminum trailer



NOTE:

1. reading locations circled
   outside readings 36" from ground
   inside readings 30" from floor (same elevation)
2. all walls (except as noted) are 3 1/4" thick (5/8" plaster outside – felt paper – 2"x 2" studs 5/8" sheet rock inside)
3. shower wall is plastered inside but outside plaster not yet applied

N

FLOOR PLAN OF BUTLER RANCH HOME FOR SHIELDING DATA

Figure 10.2

SHIELDING DATA – BUTLER'S RANCH

(Activity from Shot 16) (Smoky)

FIGURE 10.3

Location of Reading *See Attached Diagram	Readings (mr/hr) at Indicated H + Hours and/or Days											
	5.75 hr.	6.9 hr.	9.75 hr.	10.75 hr.	57.5 hr.	155.3 hr	22 days, 4.5 hrs.		27 days, 4.5 hrs.		34 days, 4.5 hrs.	
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(1)	(2)	(1)	(2)
(1) Outside	140.	110.	60.	55.	6.5	2.7	0.6	3.0	0.5	2.6	0.4	2.0
(1) Inside	120.	100.	55.	50.	5.7	2.5	0.6	2.8	0.4	2.1	0.3	2.2
(2) Outside	180.	140.	85.	80.	8.3	3.5	0.7	3.1	0.45	2.6	0.4	2.4
(2) Inside	145.	115.	65.	65.	7.0	3.0	0.7	3.0	0.4	2.2	0.3	2.0
(3) Outside	145.	125.	70.	65.	7.1	2.9	0.5	2.9	0.4	2.5	0.4	2.4
(3) Inside	130.	105.	60.	55.	6.0	2.4	0.7	2.9	0.35	2.1	0.3	2.0
(4) Inside	110.	100.	55.	55.	6.2	2.6	0.45	2.5	0.4	2.0	0.3	2.0
(5) Inside	135.	115.	60.	55.	7.8	3.3	0.5	2.8	0.4	2.1	0.3	2.0
(6) Inside	135.	105.	60.	60.	7.5	3.0	0.6	2.85	0.38	2.1	0.3	2.0
(7) Outside	150.	115.	65.	60.	7.5	3.0	0.6	2.95	0.35	2.4	0.4	2.2
(7) Inside	125.	100.	60.	55.	6.7	2.7	0.5	2.9	0.38	2.2	0.3	1.9
(8) Outside	175.	140.	80.	80.	8.3	3.3	0.8	3.1	0.45	2.8	0.4	1.9
(8) Inside	140.	110.	60.	60.	7.2	2.8	0.7	3.0	0.4	2.2	0.4	2.5
Film Badge Station	–	–	–	–	–	–	1.2	4.05	0.7	3.4	0.6	3.0
Pig Pen	–	–	–	–	–	–	0.9	3.9	0.7	2.2	0.6	2.9
Garden Gate	–	–	–	–	–	–	1.0	3.9	0.7	3.2	0.6	2.8
Spring in Yard	–	–	–	–	–	–	0.9	3.8	0.6	3.0	0.6	2.6
Gate at Road	–	–	–	–	–	–	1.1	3.95	0.7	3.4	0.7	2.9

(1) Mx-5 Readings
(2) Scintillator Readings

Best Estimate of the General Area Readings
At Butler's Ranch During The Period of Study

FIGURE 10.4

H + Hours	mr/hr.	H + Hours	mr/hr.
5.75	255	155.3	5.1
6.9	205	22 days, 4.5 hours	1.1
9.75	140	27 days, 4.5 hours	0.9
10.75	125	34 days, 4.5 hours	0.65
57.5	17		

Butler's Ranch – Shielding Factors

FIGURE 10.5

Location of Reading	Factor at Indicated Time									
	5.75 hr.	6.9 hr.	9.75 hr.	10.75 hr.	57.5 hr.	155.3 hr.	22 days, 4.5 hrs.	27 days, 4.5 hrs.	34 days, 4.5 hrs.	Average
(1)	2.1	2.1	2.5	2.5	3.0	2.0	1.8	2.2	2.2	2.3
(2)	1.8	1.8	2.2	1.9	2.4	1.7	1.6	2.2	2.2	2.0
(3)	2.0	2.0	2.3	2.3	2.8	2.1	1.6	2.6	2.2	2.2
(4)	2.5	2.0	2.4	2.3	2.7	2.0	2.5	2.2	2.2	2.3
(5)	2.1	1.8	2.3	2.3	2.2	1.5	2.2	2.2	2.2	2.1
(6)	2.1	2.0	2.3	2.3	2.3	1.7	1.8	2.4	2.2	2.1
(7)	2.0	2.1	2.2	2.3	2.5	1.9	2.2	2.4	2.2	2.2
(8)	1.8	1.9	2.3	2.1	2.4	1.8	1.6	2.2	1.6	2.1

SELECTED SHIELDING DATA – STRUCTURES

Location	Type of Construction	Name of Shot	Reading H + Hours	Reading – mr/hr		Shielding Factor
				Inside	Outside	
Goldfield Fire Station	1-1/2' stone block	Fizeau	9.6	1.5	8.5	5.7
Goldfield Service Station	4" wood, 6" stucco	Fizeau	8.8	4.0	12.0	3.0
Tonopah Ballistics Range	Sheet metal, 4" insulation on roof	Fizeau	5.0	7.0	15.0	2.1
			5.2	8.0	17.0	2.1
			5.3	7.0	18.0	2.6
			5.5	7.0	18.0	2.6
			5.7	8.0	18.0	2.3
			6.0	7.0	18.0	2.6
			6.2	6.0	17.0	2.8
			6.5	6.0	16.0	2.7
Dodge Construction Camp Metal Trailer	16 gauge aluminum, 1/8" plywood, 2" fibre glass					
Floor level		Hood	3.6	1.5	4.5	3.0
3' from floor			3.6	2.5	4.5	1.8
Ceiling			3.6	4.0	4.5	1.1
Watertown – Dormitory	1/2" gypsum board, 3-5/8" framing, 3/4" wood siding					
On floor		Diablo	4.8	12.0	30.0	2.8
3' off floor			4.8	20.0	30.0	1.7
Tonopah – Bank Building	Brick and Stone					
3rd Floor		Fizeau	9.25	3.0	7.5	2.5
4th Floor			9.25	2.5	7.5	3.0
5th Floor			9.25	2.0	7.5	3.8
Lobby			9.25	2.2	7.5	3.4

FIGURE 10.6

FIGURE 10.7

Shielding Data – Vehicles

Location	Shot	Date	H + Hours	Reading – mr/hr		Ratio
				Inside	Outside	
8.5 mi. W. Watertown	Diablo	7/15	2.87	500.0	1000.0	2.0
9.5 mi. W. Watertown	Diablo	7/15	2.95	950.0	1420.0	1.5
2.0 mi. W. Watertown	Diablo	7/15	2.20	0.3	0.5	1.7
On Groom Rd. 25 mi. W. Jct. 25	Diablo	7/15	11.08	2.0	9.0	4.5
Groom Mine Corral	Diablo	7/15	11.37	9.0	21.0	2.3
Gate 400	Diablo	7/15	11.50	27.0	49.0	1.8
Hwy 38, 25 mi. N. of Jct. 25 – 38	Diablo	7/15	8.50	7.5	12.0	1.6
12.5 mi. N. of Jct.	Diablo	7/15	7.27	4.0	12.5	3.1
15.5 mi. N. of Jct.	Diablo	7/15	7.55	4.7	9.7	2.1
36 mi. N. of Jct.	Diablo	7/15	9.25	8.5	17.5	2.1
18.5 mi. N. of Jct.	Diablo	7/15	7.87	4.7	15.0	3.2
Gate 400	Diablo	7/15	11.50	27.0	49.0	1.8
1 mi. N. of Carp	Priscilla	6/24	8.50	2.5	5.2	2.1
2.5 mi. N. of Carp	Priscilla	6/24	8.67	3.5	8.7	2.5
49.8 mi. N. on Rd B from U.S. 95	Diablo	7/15	3.38	1.6	3.2	2.0
50.8 mi. N.	Diablo	7/15	3.48	10.0	18.0	1.8
51.8 mi. N.	Diablo	7/15	3.55	23.0	44.0	1.9
52.8 mi. N.	Diablo	7/15	3.67	38.0	110.0	2.9
53.8 mi. N.	Diablo	7/15	3.75	110.0	200.0	1.8
3.5 mi. NE of Gate 400	Diablo	7/15	3.83	140.0	230.0	1.6
Groom Rd, 12 mi. W. Jct. Hwy 25	Diablo	7/15	10.65	1.0	2.5	2.5
14 mi. W.	Diablo	7/15	10.72	1.5	5.0	3.3
16 mi. W.	Diablo	7/15	10.83	1.5	6.5	4.3
18 mi. W.	Diablo	7/15	10.92	2.0	5.5	2.8
Road B, 20.6 mi. N. of US 95	Priscilla	6/24	2.41	70.0	140.0	2.0
20.9 mi. N.	Priscilla	6/24	2.49	100.0	220.0	2.2
21.2 mi. N.	Priscilla	6/24	2.5	130.0	280.0	2.2
21.5 mi. N.	Priscilla	6/24	2.52	150.0	300.0	2.0
21.8 mi. N.	Priscilla	6/24	2.55	150.0	330.0	2.2
22.1 mi. N.	Priscilla	6/24	2.57	160.0	350.0	2.2
22.4 mi. N.	Priscilla	6/24	2.62	160.0	350.0	2.2
22.7 mi. N.	Priscilla	6/24	2.65	150.0	290.0	1.9
23.0 mi. N.	Priscilla	6/24	2.70	100.0	245.0	2.5
23.3 mi. N.	Priscilla	6/24	2.75	85.0	220.0	2.6
23.9 mi. N.	Priscilla	6/24	2.78	80.0	225.0	2.8
24.2 mi. N.	Priscilla	6/24	2.81	60.0	200.0	3.3
24.5 mi. N.	Priscilla	6/24	2.84	45.0	130.0	2.9
24.8 mi. N.	Priscilla	6/24	2.87	30.0	90.0	3.0
25.0 mi. N.	Priscilla	6/24	2.88	30.0	80.0	2.7
25.5 mi. N.	Priscilla	6/24	2.90	28.0	75.0	2.7
30.0 mi. N.	Priscilla	6/24	3.03	12.0	16.0	1.4

FIGURE 10.7 (Cont'd)

Location	Shot	Date	H + Hours	Reading — mr/hr		Ratio
				Inside	Outside	
30.5 mi. N.	Priscilla	6/24	3.08	7.5	14.0	1.9
31.0 mi. N.	Priscilla	6/24	3.15	6.0	13.0	2.2
31.5 mi. N.	Priscilla	6/24	3.22	4.0	11.0	2.8
32.0 mi. N.	Priscilla	6/24	3.27	4.5	11.0	2.4
33.0 mi. N.	Priscilla	6/24	3.39	3.8	10.0	2.6
34.0 mi. N.	Priscilla	6/24	3.47	6.0	10.0	1.7
35.0 mi. N.	Priscilla	6/24	3.55	7.0	13.0	1.9
36.0 mi. N.	Priscilla	6/24	3.64	6.0	9.5	1.6
37.0 mi. N.	Priscilla	6/24	3.74	3.0	6.0	2.0
Road C, 25.9 mi. NE of Jct. Rd C & Hidden Forest Rd (46.5 mi. NE Jct Rd C & Hwy 95)	Priscilla	6/24	4.42	40.0	65.0	1.6
As above	Priscilla	6/24	4.50	20.0	30.0	1.5
As above	Priscilla	6/24	4.58	80.0	90.0	1.1
As above	Priscilla	6/24	4.67	50.0	80.0	1.6
As above	Priscilla	6/24	4.75	70.0	90.0	1.3
As above	Priscilla	6/24	5.00	60.0	90.0	1.5
As above	Priscilla	6/24	5.08	60.0	90.0	1.5
As above	Priscilla	6/24	5.25	50.0	80.0	1.6
As above	Priscilla	6/24	5.42	30.0	70.0	2.3
As above	Priscilla	6/24	5.58	55.0	80.0	1.5
As above	Priscilla	6/24	5.75	55.0	80.0	1.5
As above	Priscilla	6/24	6.0	50.0	70.0	1.4
As above	Priscilla	6/24	10.50	21.0	28.0	1.3
As above	Priscilla	6/24	10.75	18.0	25.0	1.4
As above	Priscilla	6/24	11.00	17.0	25.0	1.5
As above	Priscilla	6/24	11.25	16.0	24.0	1.5
As above	Priscilla	6/24	11.50	19.0	24.0	1.3

CHAPTER XI

WATER AND MILK RESULTS

11.1 General.

In Figures 11.1 and 11.2 are presented the water and milk sampling results, respectively. The sampling location, dates the sample was collected and counted, and the beta activity expressed as uc/ml at the time of counting are given. In both tables, all samples collected prior to May 28, 1957 were used for the determination of average background values.

11.2 Results.

Figure 11.3 is a summary of all water and milk samples analyzed. (It includes results for potable and non-potable water as well as raw and processed milk.) Sixty-three water samples were used to determine the background of 3.3×10^{-7} uc/ml while 32 milk samples were used to determine a value of 1.4×10^{-6} uc/ml. During the operation, of the 155 water samples processed, 56 were above background while the same values for milk were 96 and 32. The total number of water and milk samples processed were 218 and 128, respectively.

The average beta activity in water measured in all samples having activity above background during the operation was 5.4×10^{-5} uc/ml at the time of counting. The maximum amount was 1.0×10^{-3} uc/ml at the time of counting. This sample was obtained from a puddle in Sparks, Nevada following rain-out from "Boltzmann". This value is given because of the interest expressed about rain-out. It should be apparent, however, that this bears no relation to radiation in potable water supplies and should not be considered in this regard. The maximum value found in a potable water supply was 4.7×10^{-6} uc/ml at the time of counting. This sample was collected from the Barstow, California distribution system on July 10, 1957 and counted July 11, 1957. A similar sample collected on July 24, 1957 indicated an activity level of background when counted on July 27, 1957.

Of the samples analyzed, there is a factor of almost 5,000 between the maximum beta activity measured in non-drinking water and that measured in water used for human consumption.

Another set of water samples have been collected in January and February following the test series. These results are presented in Figure 11.4. The sampling location, dates of collection and counting, and the beta activity in uc/ml at the time of counting are given. In addition, certain of these samples were processed for alpha activity and the results are indicated in terms of disintegrations per minute per milliliter of sample.

The average beta activity in milk measured in samples having activity above background during the operation was 3.8×10^{-5} uc/ml at the time of counting. The maximum amount measured, 3.5×10^{-4} uc/ml at the time of counting, was from a milk sample collected from the Fallon, Nevada area on June 29, 1957.

WATER SAMPLING RESULTS

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
Alamo, Nevada	Lower Pahranagat Lake	5/13	5/26	Background
		8/21	8/28	1.2×10^{-6}
	*Buckhorn Ranch (5 miles south of Alamo)	5/13	5/26	Background
		8/21	8/28	4.0×10^{-7}
	Upper Pahranagat Lake	5/13	5/24	Background
		8/21	8/28	Background
	*Alko Cafe (2 miles north of Alamo)	5/13	5/26	Background
		8/21	8/28	Background
	*Dot and Jim's Cafe (Alamo)	5/14	5/26	Background
		8/21	8/28	Background
	Ash Springs	5/13	5/26	Background
		8/21	8/28	4.4×10^{-7}
	Hiko Springs	5/14	5/26	Background
		8/21	8/28	Background
	Crystal Springs	5/14	5/26	Background
		8/21	8/28	7.3×10^{-7}
	*Stewart Hotel (Alamo)	5/13	5/25	Background
		8/21	8/28	8.4×10^{-7}
Barstow, California	Lower Haiwee Reservoir	5/13	5/26	Background
		6/8	6/22	Background
		7/8	7/11	Background
		8/9	8/13	3.4×10^{-7}
		9/9	9/14	Background
		9/30	10/16	Background
	Lake Arrowhead	5/12	5/26	Background
		7/10	7/11	3.1×10^{-6}
		7/23	7/27	Background
		8/26	8/28	Background
		9/13	9/18	Background
		9/30	10/16	Background
		10/7	10/16	Background

Figure 11.1

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting -- uc/ml
Barstow, California	*Municipal Supply -- Topper Motel, Barstow	5/29	5/30	Background
		7/10	7/11	4.7×10^{-6}
		7/24	7/27	Background
Beaver, Utah	*Milford Tap Water	5/13	5/25	Background
		7/9	7/12	Background
	*Chevron Station -- Beaver	7/25	7/27	1.1×10^{-6}
		8/14	8/21	Background
	5 Miles north of Minersville, Utah	8/14	8/21	Background
Bishop, California	Bishop City Reservoir	5/15	5/26	Background
		6/30	7/7	Background
		8/25	8/28	Background
	*Big Pine, California	5/15	5/26	Background
		8/25	8/28	Background
	Independence City Reservoir	5/15	5/25	Background
		6/29	7/10	Background
		8/25	8/28	Background
	*W. W. Rader	7/25	7/30	7.3×10^{-7}
Caliente, Nevada	*Caliente Tap Water	5/14	5/26	Background
		7/11	7/12	Background
		9/6	9/9	Background
	*Panaca, Nevada Tap Water	5/14	5/26	Background
		7/9	7/12	Background
		8/9	8/13	Background
		9/6	9/9	Background
	Water Hole, Conaway Ranch	7/9	7/12	Background
		8/9	8/13	Background
		9/6	9/9	Background
Cedar City, Utah	*Newcastle, Utah	5/15	5/25	Background
		8/10	8/12	3.4×10^{-7}
	Enterprise Reservoir	5/10	5/26	Background
		8/10	8/12	3.7×10^{-7}

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
Cedar City, Utah (Cont'd)	*Modena	5/15	5/25	Background
		8/10	8/12	3.4×10^{-7}
	*Cedar City Water Supply	5/15	5/25	Background
		7/10	7/12	Background
		8/10	8/12	Background
Ely, Nevada	*Ely Water Supply	5/12	5/24	Background
		5/30	6/4	Background
		6/19	6/26	Background
		7/16	7/17	4.9×10^{-7}
		8/19	8/21	Background
	*Kennecott Copper Co., McGill	5/10	5/25	Background
		5/30	6/4	Background
		6/19	6/26	3.8×10^{-7}
		7/16	7/17	Background
		8/19	8/21	Background
	*Consolidated Copper Co., Kimberly	5/10	5/24	Background
		5/30	6/4	Background
		6/19	6/26	Background
		7/16	7/17	Background
		8/19	8/21	3.0×10^{-6}
	*Ruth, Nevada	7/6	7/10	Background
	*Bradshaw	9/6	9/14	Background
		9/14	9/18	Background
Eureka, Nevada	*Saylers Service, Eureka	5/9	5/24	Background
		8/19	8/21	4.4×10^{-7}
	Belmont Mill Water	9/17	9/18	5.7×10^{-7}
	*Spring Supply by Belmont Mill	9/17	9/18	Background
	*Cassidy's Service, Austin	5/9	5/24	Background
		8/30	9/5	Background
Kingman, Arizona	Lake Mead – Kingman Wash Entrance	5/13	5/26	Background
		6/7	6/22	Background
		8/25	8/28	4.0×10^{-7}

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
Kingman, Arizona (Cont'd)	Davis Dam	5/11	5/26	Background
		8/24	8/28	Background
Las Vegas, Nevada	*Tap at Weaver's Chevron Station, So. Main and Charleston	5/14	5/26	Background
		6/5	6/7	Background
	*Corn Creek Ranch – Well No. One	8/25	8/28	Background
	*Jean, Nevada – Pop's Oasis	5/15	5/26	Background
		8/25	8/28	Background
Lincoln Mine, Nevada	Water Hole at Film Badge Sta. 358	5/12	5/25	Background
		8/27	9/8	4.0×10^{-7}
	Water Hole at Northwest Corner of Groom Lake	5/10	5/25	Background
		8/27	9/8	4.3×10^{-7}
	Water Hole, Ticabou Valley (4 miles south of Film Badge Sta. 358)	5/10	5/26	Background
		8/27	9/8	Background
	*Fallini Ranch Water Supply	5/11	5/25	Background
		8/27	9/8	Background
		8/27	9/8	3.7×10^{-6}
	*Lincoln Mine Domestic Water	5/12	5/26	Background
		8/27	9/8	Background
	*Lincoln Mine Wells, Composite	5/12	5/26	Background
		8/27	9/8	Background
	*Sharp Ranch Tap Water	5/24	5/30	Background
		8/27	9/8	Background
		8/30	9/5	Background
	*Spring at Bardoli Ranch	5/24	5/30	Background
		8/27	9/8	Background
	*Spring Creek at Uhalde Ranch	5/24	5/30	Background
		8/27	9/8	Background
	*Pine Creek Ranch Household Water	5/24	5/30	Background
	*J & B Ranch Tap Water	5/24	5/30	Background
		8/27	9/8	Background
	Dry Lake – Kawich Valley	6/23	7/1	4.9×10^{-6}

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
Mercury, Nevada	*Shoshone, California – Spring Water Supply	5/14	5/25	Background
	*Cold Creek Water	5/13	5/26	Background
		7/5	7/10	Background
		8/7	8/12	Background
	*Indian Springs Water	5/8	5/26	Background
		8/8	8/13	7.6×10^{-7}
		9/3	9/5	Background
	*Officer's Mess – Camp Desert Rock	8/8	8/13	Background
		9/3	9/5	4.3×10^{-7}
	*Enlisted Men's Mess – Camp Desert Rock	8/8	8/13	Background
	*VIP Mess – Camp Desert Rock	8/19	8/21	Background
	*Fountain – 600 Block, Camp Desert Rock	7/27	7/30	Background
		8/19	8/21	3.6×10^{-7}
		9/3	9/5	Background
	*12th Infantry 1st Battle Ground, Camp Desert Rock	8/19	8/21	Background
	Officers' Latrine, 100 Bldg., Camp Desert Rock	7/27	7/30	Background
	*Water Truck from Indian Springs to Camp Desert Rock	7/27	7/30	Background
	*Water Spout to Sump Pond – Watertown	7/15	7/17	Background
	*Tap Water, Trailer #32, Watertown	7/15	7/17	3.8×10^{-7}
	Sump Pond, Watertown	7/15	7/17	3.4×10^{-5}
	*Groom Mine Tap Water	10/15	10/16	Background
Mesquite, Nevada	Bunkerville Municipal Reservoir	5/13	5/26	Background
		6/21	6/26	Background
		7/24	7/27	5.9×10^{-7}
		8/23	8/28	1.2×10^{-6}
	Mesquite – Irrigation Ditch	5/13	5/25	Background
		6/21	6/26	Background
		7/24	7/27	9.4×10^{-7}
		8/24	8/28	Background
	*Mesquite Water Distribution System	5/13	5/25	Background
		6/21	6/26	1.1×10^{-6}
		7/24	7/27	7.8×10^{-7}
		8/24	8/28	8.8×10^{-7}

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
Overton, Nevada	*Herlihy Cottage, "C" St., Overton	5/14	5/25	Background
		6/21	6/26	Background
		8/10	8/12	Background
		10/8	10/16	Background
	Lake Mead, Overton, Overton Boat Dock	5/14	5/25	Background
		6/21	6/26	Background
		8/8	8/12	4.3×10^{-7}
		10/9	10/16	Background
	Muddy River, 9 miles west of Rte. 93	5/14	5/25	Background
		6/21	6/26	Background
		8/10	8/12	Background
		10/8	10/16	Background
	Irrigation Reservoir, Logandale	5/14	5/25	Background
		6/21	6/26	3.8×10^{-7}
		8/10	8/12	5.2×10^{-7}
		10/8	10/16	3.8×10^{-7}
Pioche, Nevada	*Pioche Water Supply	5/14	5/24	Background
		7/24	7/27	7.4×10^{-7}
	*Pete Lister's Home – Pioche	6/19	6/26	Background
		7/24	7/27	7.4×10^{-7}
	Ursine, Nevada Creek Water	5/13	5/25	Background
		6/19	6/26	Background
		7/23	7/27	1.1×10^{-6}
	*Robert Stewart's Ranch – Spring	6/19	6/26	Background
		7/21	7/27	9.4×10^{-7}
	Fish Kill Area	9/3	9/5	Background
	Eagle Valley Creek – 3 miles north of Ursine	9/3	9/5	Background
St. George, Utah	Santa Clara River at Gunlock	5/14	5/25	Background
		9/24	9/25	Background
	Stalk Pond, Washington	5/14	5/26	Background
		8/19	8/21	3.0×10^{-6}
		9/22	9/25	Background

Figure 11.1 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity At Time Of Counting – uc/ml
St. George, Utah(Cont'd)	*Rugged West Motel – St. George	5/15	5/24	Background
		9/22	9/25	Background
Tonopah, Nevada	Rabbit Spring, Goldfield	5/9	5/24	Background
		8/26	8/29	Background
	*Stone Cabin Ranch	5/8	5/25	Background
		8/26	8/29	5.0×10^{-7}
	*Warm Springs (Nye County)	5/9	5/26	Background
		8/26	8/29	3.8×10^{-7}
	*Pump Station – Rye Patch (Tonopah Water Supply)	5/7	5/24	Background
		8/26	8/29	3.5×10^{-7}
	*Roadside Park on U.S. 6, 14 miles west of Tonopah	5/11	5/24	Background
		8/26	8/29	Background
	Stock Water Point, Millets Ranch	5/10	5/24	Background
		8/27	8/29	Background
	*JV Bar Ranch, Lida Water Hole	5/13	6/5	5.2×10^{-7}
		8/25	8/29	Background
	Swimming Pool – Gibson Ranch, Beatty	7/9	7/11	Background
	*Source of Water, Gibson Ranch, Beatty	7/9	7/11	Background
	*Domestic Water, Fallini's Twin Springs Ranch	8/26	8/29	Background
	Twin Spring – Lower Fork Twin Spring Creek	8/20	8/29	1.3×10^{-5}
		8/28	9/5	9.1×10^{-7}
Tonopah, Nevada	Twin Spring – Stock Pond, 5 miles south of Ranch	8/20	8/29	6.6×10^{-6}
		8/28	9/5	3.2×10^{-6}
	Rainout – 61.5 miles east of Tonopah on Highway 6	8/23	8/29	2.7×10^{-4}
Special	Sierra Pacific Reservoir – Reno	5/29	6/2	3.6×10^{-6}
	Puddle in Sparks	5/28	6/2	1.0×10^{-3}
	Puddle at 5th and Sierra, Reno	5/28	6/2	7.7×10^{-4}
	Puddle on 11th Street, Reno	5/28	6/2	8.8×10^{-4}

* Indicates a true potable water supply. Unmarked samples are not potable water supplies, except in the case of reservoirs, and with these radiological decay and physical removal factors are operable before ultimate consumer use.

MILK SAMPLING RESULTS

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity at Time of Counting – uc/ml
Alamo, Nev.	Nelson Ranch House	8/21	9/4	Background
	Hansen Ranch House	5/21	5/27	Background
		8/21	9/4	1.5×10^{-6}
	Schofield Ranch	5/15	5/27	Background
		8/21	9/4	Background
	Buckhorn Ranch	5/15	5/27	Background
		8/21	9/4	Background
	Marion Stewart	5/15	5/30	Background
		8/21	9/4	Background
Beaver, Utah	Pearson's Dairy at Miners-	5/15	5/27	Background
	ville, Utah	7/7	7/13	Background
		7/25	7/30	Background
	Clark Smith Dairy	5/16	6/5	Background
	Hiland Dairy	5/17	6/6	Background
		6/6	6/22	Background
		6/20	6/27	Background
	Brooklawn Dairy	6/6	6/22	1.7×10^{-6}
Barstow, California	Tip Top Dairy	5/27	6/5	Background
		7/10	7/11	Background
		8/20	8/27	Background
		10/8	10/16	Background
Bishop, California	Bishop milk, Sierra Spring	5/15	5/30	Background
		6/29	7/7	1.6×10^{-6}
		8/25	9/4	3.5×10^{-6}
	Independence Dairy	5/15	5/30	Background
		6/29	7/7	2.7×10^{-6}
		8/25	9/4	Background
	Wanacott's Dairy	6/29	7/7	2.3×10^{-4}
Caliente, Nevada	Charles P. Mathews	5/14	5/27	Background
		7/10	7/13	Background
		8/9	8/13	Background
		9/6	9/10	Background
Cedar City, Utah	Arden Dairy	5/15	5/27	Background
		6/18	6/25	Background
		7/22	7/30	Background
		8/17	8/27	Background
	Parowan Hulet Farm	5/17	5/27	Background
		6/18	6/25	Background
		7/22	7/30	Background
		8/17	8/27	Background
	Newcastle Raw Milk	5/17	5/27	Background
		6/18	6/25	Background
		7/22	7/30	Background
		8/17	8/27	Background

Figure 11.2

Figure 11.2 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity at Time of Counting – uc/ml
Ely, Nevada	Vance MacKenzie at Lund	5/30	6/7	6.6×10^{-6}
		6/20	6/27	Background
		6/27	7/11	Background
		7/6	7/11	Background
		7/16	7/18	Background
		8/19	8/27	Background
	Gardner Scow at Lund	5/11	5/30	Background
		5/30	6/5	Background
		6/27	7/11	Background
		7/8	7/13	Background
		7/16	7/18	Background
		8/19	8/27	Background
	Marshall's Dairy	5/20	5/30	Background
		5/30	6/5	Background
		6/27	7/11	Background
		7/6	7/11	Background
		7/6	7/18	Background
		8/19	8/27	Background
	Bradshaw	9/14	9/17	1.4×10^{-4}
Kingman, Arizona	Kings Dairy – Raw milk from Hollet	6/3	6/5	Background
		8/26	9/4	Background
	Kings Dairy – Raw milk from McCall	8/26	9/4	1.5×10^{-6}
	Kings Dairy – Processed milk	5/15	5/27	Background
		6/3	6/5	3.1×10^{-6}
		8/26	9/4	Background
Las Vegas, Nevada	Hubbert's Dairy	5/16	5/24	Background
		8/28	9/4	Background
	LDS Welfare Farm	5/16	5/27	Background
		8/28	9/4	Background
	Hinie's Dairy	5/22	5/30	Background
		8/28	9/4	Background
	Anderson Dairy	5/22	5/30	Background
		8/28	9/4	1.9×10^{-6}
	Clark County Dairyman	5/22	5/29	Background
		8/28	9/4	2.5×10^{-6}
Lincoln Mine, Nevada	Fallini Ranch	8/27	9/10	2.5×10^{-4}
	J & B Ranch	8/30	9/10	1.1×10^{-4}
Mercury, Nevada	Elmer Bowman – Pahrump	5/14	5/27	Background
		7/9	7/11	Background
	Clark's Dairy – Mercury	5/20	5/24	Background
Mesquite, Nevada	Merrill Bunker Dairy – Bunkerville	5/15	5/27	Background
		6/21	6/27	Background
		7/24	7/30	Background
		8/22	9/4	Background

Figure 11.2 (Cont'd)

Zone	Sampling Location	Date of Collection	Date of Counting	Beta Activity at Time of Counting – uc/ml
Mesquite, Nevada (Cont'd)	Melburn Jensen Dairy	5/15	5/27	Background
		6/21	6/27	Background
		7/24	7/30	Background
		8/22	9/4	Background
	Hafen's Dairy	5/15	5/27	Background
		6/21	6/27	Background
		7/24	7/30	Background
		8/22	9/4	Background
Overton, Nevada	Fay Anderson Ranch	5/15	5/30	Background
		6/21	6/27	Background
		8/4	8/12	2.8×10^{-6}
		10/9	10/16	2.7×10^{-6}
	Ruben Whipple Farm	5/15	5/29	Background
		6/21	6/27	Background
		8/4	8/12	3.3×10^{-6}
		10/9	10/16	Background
	Cleolois Dairy – Warm Springs Valley	5/15	5/30	Background
		6/21	6/27	Background
		8/4	8/12	2.3×10^{-6}
		10/8	10/16	Background
St. George, Utah	Veyo Dairy	5/14	5/27	Background
		8/19	8/27	Background
		9/24	10/16	2.9×10^{-6}
	Cannon Dairy	5/14	5/30	Background
		9/24	10/16	Background
	Dixie Dairy	9/24	10/16	Background
Tonopah, Nevada	Fallon Area	6/29	7/7	3.5×10^{-4}
Special	Reno, Nevada Area	5/28	6/8	3.6×10^{-6}
		5/28	6/5	1.8×10^{-6}
		5/28	6/6	5.8×10^{-6}
		5/28	6/8	8.1×10^{-6}
		5/28	6/8	5.8×10^{-6}
		5/28	6/8	Background
		Not Known	6/13	1.3×10^{-5}
		Not Known	6/13	7.8×10^{-6}
		Not Known	6/13	3.8×10^{-5}
		Not Known	6/13	8.6×10^{-6}
		Not Known	6/27	1.8×10^{-6}
		Not Known	7/2	1.5×10^{-6}
		Not Known	6/27	1.5 x 10-6

SUMMARY OF WATER AND MILK RESULTS

Type Sample	No. of Background Samples Processed	Average Background Level Beta – uc/ml	No. of Samples Processed During Series	No. of Samples Above Background Processed During Series	Activity Levels Found Beta – uc/ml			Total No. of Samples Processed
					Minimum	Maximum	Average[1]	
Water	63	3.3×10^{-7}	155	56	Background	1.0×10^{-3}*	5.4×10^{-5}	218
Milk	32	1.4×10^{-6}	96	32	Background	3.5×10^{-4}**	3.8×10^{-5}	128

1 Average of those samples processed during the series which were above background.

* Sample of water puddle in Sparks, Nevada following rain-out.

** Sample of milk from the Fallon, Nevada area.

Figure 11.3

POST SERIES WATER SAMPLE DATA

Sampling Location	Date of Collection	Date of Counting	Beta Activity at Time of Counting uc/ml	Alpha Activity d/m/ml
Bishop City Reservoir	1/8	1/30	Background	Background
Big Pine, Calif.	1/8	1/30	Background	Background
Independence, Calif.	1/8	1/30	Background	Background
Caliente Tap Water	1/13	2/7	Background	
Panaca, Nev. Tap Water	1/13	2/7	Background	
Water Hole, Conaway Ranch	1/13	2/7	3.4×10^{-7}	
Ely Water Supply	1/12	1/30	Background	Background
Las Vegas Water Supply	1/31	2/7	Background	
Corn Creek Ranch Well #1	1/29	2/7	Background	
Jean, Nev.	1/30	2/7	Background	
Water Hole on Road "E"	1/22	2/7	Background	
Northwest of Groom Lake	1/22	2/25	Background	Background
Lincoln Mine Domestic Water	1/23	2/25	Background	Background
Lincoln Mine Wells	1/23	2/25	Background	Background
Sharp Ranch	1/23	2/25	Background	Background
Bardoli Ranch	1/25	2/25	Background	Background
Uhalde Ranch	1/25	2/25	Background	Background
J & B Ranch	1/26	2/7	Background	
Shoshone, Calif.	1/8	2/25	Background	Background
Cold Creek Water	2/3	2/25	Background	Background
Salt Creek, Death Valley	2/5	2/25	3.4×10^{-7}	Background
Emigrant Springs Ranch Station	2/5	2/25	Background	Background
Furnance Creek Ranch	2/5	2/25	Background	Background
Death Valley Headquaters	2/5	2/25	Background	Background
Rabbit Spring, Goldfield	1/15	2/7	Background	
Stone Cabin Ranch	1/14	2/7	Background	
Warm Springs, Nye County	1/14	2/7	Background	
Rye Patch Tonopah Water Supply	1/11	2/7	Background	
Roadside Park on U.S. 6, 14 miles west of Tonopah	1/10	1/30	Background	Background
Stock Water Point, Millets Ranch, Highway #8A	1/11	1/30	Background	Background
JV Bar Ranch, Lida	1/11	1/30	Background	Background
Swimming Pool at Gibson Ranch, Beatty	1/16	1/30	Background	Background
Source of Water at Gibson Ranch, Beatty	1/16	2/7	Background	
Domestic Water, Fallini Ranch (Twin Springs)	1/14	2/7	Background	
Twin Springs – lower fork of creek	1/14	2/7	Background	
Twin Springs – Stock pond, 5 miles south of ranch	1/14	2/7	Background	

Figure 11.4

CHAPTER XII

AIR SAMPLING RESULTS

12.1 General.

Figure 12.1 is a summary of all the air analyses obtained during PLUMBBOB. The detonation, number assigned to each detonation, date and time fired, the sampling location, the period of time samples, as well as the average beta activity in uc/m^3 for the routine 28 and 76-hour sampling periods are presented. In certain cases, a second detonation occurred before the normal sampling period had expired. In these cases, the first sampling period was concluded and a new one started at the time of the second detonation.

Values of 10^{-6} uc/m^3 and less are in the range of normal air radioactivity backgrounds measured before and during the operation. Therefore, results less than 10^{-6} uc/m^3 are not listed other than as 10^{-6} uc/m^3.

For several detonations the filters were processed for alpha activity and in these cases the results are presented in terms of disintegrations per minute per cubic meter of air samples.

In certain instances all of the scheduled samples were not available for counting. This was due to lost samples, Staplex motor failure, power failure, or bad weather. These interruptions which occurred during the normal sampling schedule are footnoted for each detonation.

12.2 Results.

Figure 12.2 presents the distribution of air sampling results for 28 and 76-hour periods. Data represented are selective in that those used are the ones where both averages were available for a given station for any specific detonation. Also, data for those time periods which varied widely from 28 and 76 hours were not used.

The distribution of each sample group is very similar. This fact would tend to indicate that prolonged sampling periods are not necessary unless you are interested in the time duration of concentrations above background. It should be noted that these data are gross and do not exclude the possibility of activity-time differences due to the distance the sampling station was from the site producing the activity, i.e., the time of arrival of fallout.

One could predict from these observations that the average beta activity concentration for a 76-hour period would be approximately what the average beta activity concentration was for a 28-hour period within the off-site area.

AIRBORNE RADIOACTIVITY

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 1 - Boltzmann 0445, 5/28/57		
Alamo, Nevada	0444 - 5/28	0930 - 5/29	2.7×10^{-6}
	0444 - 5/28	0938 - 5/31	3.2×10^{-5}
Barstow, California	0555 - 5/28	0825 - 5/29	1.4×10^{-5}
	0555 - 5/28	1235 - 5/31	3.0×10^{-5}
Beaver, Utah	0410 - 5/28	0900 - 5/29	1.7×10^{-5}
	0410 - 5/28	0930 - 5/31	4.6×10^{-6}
Bishop, California	0500 - 5/28	0900 - 5/29	1.9×10^{-4}
	0500 - 5/28	0900 - 5/31	1.2×10^{-3}
Caliente, Nevada	0425 - 5/28	0935 - 5/29	10^{-6}
	0425 - 5/28	0950 - 5/31	8.0×10^{-6}
Cedar City, Utah	0515 - 5/28	0900 - 5/29	1.0×10^{-5}
	0515 - 5/28	0700 - 5/30	6.9×10^{-6}
Ely, Nevada	0500 - 5/28	1030 - 5/29	6.4×10^{-4}
	0500 - 5/28	0955 - 5/31	5.1×10^{-6}
Eureka, Nevada	0510 - 5/28	2000 - 5/29	4.2×10^{-4}
	0510 - 5/28	2000 - 5/31	2.6×10^{-4}
Hiko, Nevada	0402 - 5/28	1115 - 5/29	1.0×10^{-4}
	0402 - 5/28	1120 - 5/31	1.0×10^{-4}
Indian Springs, Nevada	0445 - 5/28	0845 - 5/29	9.8×10^{-5}
	0445 - 5/28	1423 - 5/31	2.8×10^{-5}
Kingman, Arizona[1]	1655 - 5/29	0730 - 5/31	8.5×10^{-6}
Las Vegas, Nevada	0520 - 5/28	0905 - 5/29	1.4×10^{-5}
	0520 - 5/28	1000 - 5/31	4.1×10^{-5}
Lincoln Mine, Nevada	0455 - 5/28	0855 - 5/29	5.9×10^{-6}
	0455 - 5/28	0855 - 5/31	6.1×10^{-5}
Lund, Nevada	2015 - 5/28	1000 - 5/29	7.2×10^{-4}
	2015 - 5/28	0900 - 5/31	10^{-6}
Mercury, Nevada	0530 - 5/28	0700 - 5/29	2.2×10^{-4}
Mesquite, Nevada	0500 - 5/28	0908 - 5/29	3.5×10^{-4}
	0500 - 5/28	0915 - 5/30	2.0×10^{-5}
Nellis AFB, Nevada	0445 - 5/28	0845 - 5/29	2.7×10^{-5}
	0445 - 5/28	0845 - 5/31	3.1×10^{-5}
Overton, Nevada	0455 - 5/28	0855 - 5/29	6.1×10^{-6}
	0455 - 5/28	0855 - 5/31	1.5×10^{-5}

1 Monitors away from station at shot time.

Figure 12.1

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 1 - Boltzmann 0445, 5/28/57		
Pioche, Nevada	0530 - 5/28	0930 - 5/29	8.3×10^{-6}
	0530 - 5/28	0930 - 5/31	3.1×10^{-6}
St. George, Utah	0500 - 5/28	0900 - 5/29	6.0×10^{-6}
	0500 - 5/28	0900 - 5/31	9.7×10^{-6}
Tonopah, Nevada[1]	0530 - 5/28	1000 - 5/29	3.1×10^{-2}
	0530 - 5/28	1000 - 5/31	1.6×10^{-2}
Watertown, Nevada	0452 - 5/28	0855 - 5/29	1.9×10^{-6}
	0452 - 5/28	1125 - 5/31	8.2×10^{-6}
	Detonation 2 - Franklin 0455, 6/2/57		
Alamo, Nevada	0518 - 6/2	0950 - 6/3	8.6×10^{-4}
	0518 - 6/2	0952 - 6/4	5.8×10^{-4}
Barstow, California	0532 - 6/2	0825 - 6/4	2.9×10^{-4}
	0532 - 6/2	0600 - 6/5	2.3×10^{-4}
Beaver, Utah	0410 - 6/2	0900 - 6/3	6.2×10^{-3}
	0410 - 6/2	0500 - 6/5	2.6×10^{-3}
Bishop, California	0500 - 6/2	0900 - 6/3	9.3×10^{-4}
	0500 - 6/2	0900 - 6/4	5.6×10^{-4}
Caliente, Nevada	0455 - 6/2	0940 - 6/3	2.7×10^{-3}
	0455 - 6/2	0940 - 6/4	1.8×10^{-3}
Cedar City, Utah	0500 - 6/2	0900 - 6/3	2.3×10^{-3}
	0500 - 6/2	0450 - 6/5	1.0×10^{-3}
Ely, Nevada	0500 - 6/2	0855 - 6/3	1.5×10^{-3}
	0500 - 6/2	0445 - 6/5	7.1×10^{-4}
Eureka, Nevada	0500 - 6/2	0915 - 6/3	5.9×10^{-3}
	0500 - 6/2	2000 - 6/4	3.2×10^{-3}
Hiko, Nevada	0515 - 6/2	1058 - 6/3	2.1×10^{-3}
	0515 - 6/2	1138 - 6/4	1.4×10^{-3}
Indian Springs, Nevada	0455 - 6/2	0855 - 6/3	2.7×10^{-3}
	0455 - 6/2	1655 - 6/4	1.5×10^{-3}
Kingman, Arizona	0515 - 6/2	0915 - 6/3	1.4×10^{-3}
	0515 - 6/2	0445 - 6/5	9.0×10^{-4}
Las Vegas, Nevada	0500 - 6/2	0930 - 6/3	1.8×10^{-3}
	0500 - 6/2	0500 - 6/5	1.3×10^{-3}
Lincoln Mine, Nevada	0455 - 6/2	0855 - 6/3	2.4×10^{-3}
	0455 - 6/2	0455 - 6/5	1.2×10^{-3}

1 Power off for seven hours from 1000, 5/29 to 1700, 5/29.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 2 - Franklin 0455, 6/2/57		
Lund, Nevada	0455 - 6/2	0915 - 6/3	3.7×10^{-4}
	0455 - 6/2	0600 - 6/5	2.9×10^{-4}
Mercury, Nevada	0510 - 6/2	0755 - 6/3	4.5×10^{-4}
	0510 - 6/2	0425 - 6/5	8.5×10^{-4}
Mesquite, Nevada	0510 - 6/2	0855 - 6/3	2.8×10^{-3}
	0510 - 6/2	0855 - 6/4	1.1×10^{-3}
Nellis AFB, Nevada	0455 - 6/2	0855 - 6/3	2.8×10^{-3}
	0455 - 6/2	0441 - 6/5	2.2×10^{-3}
Overton, Nevada	0455 - 6/2	0855 - 6/3	2.9×10^{-3}
	0455 - 6/2	0500 - 6/5	1.1×10^{-3}
Pioche, Nevada	0500 - 6/2	0900 - 6/3	5.6×10^{-3}
	0500 - 6/2	0700 - 6/4	3.3×10^{-3}
St. George, Utah	0500 - 6/2	0900 - 6/3	1.1×10^{-3}
	0500 - 6/2	2023 - 6/4	5.8×10^{-4}
Tonopah, Nevada	0500 - 6/2	0900 - 6/3	2.2×10^{-3}
	0500 - 6/2	2145 - 6/4	1.1×10^{-3}
Watertown, Nevada	0455 - 6/2	0900 - 6/3	5.4×10^{-4}
	0455 - 6/2	0442 - 6/5	5.4×10^{-4}
	Detonation 3 - Lassen 0445, 6/5/57		
Alamo, Nevada	0555 - 6/5	1020 - 6/6	3.1×10^{-4}
	0555 - 6/5	0825 - 6/8	3.1×10^{-4}
Barstow, California	0600 - 6/5	0945 - 6/6	3.1×10^{-4}
	0600 - 6/5	1015 - 6/8	1.8×10^{-4}
Beaver, Utah	0500 - 6/5	0900 - 6/6	7.8×10^{-4}
	0500 - 6/5	0900 - 6/7	4.5×10^{-4}
Bishop, California	0500 - 6/5	0700 - 6/6	1.7×10^{-4}
	0500 - 6/5	0900 - 6/8	1.2×10^{-4}
Caliente, Nevada	0425 - 6/5	1805 - 6/6	1.4×10^{-4}
	0425 - 6/5	1055 - 6/8	1.9×10^{-4}
Cedar City, Utah	0450 - 6/5	0900 - 6/6	3.3×10^{-4}
	0450 - 6/5	0900 - 6/8	1.7×10^{-4}
Ely, Nevada	0445 - 6/5	0845 - 6/6	1.4×10^{-4}
	0445 - 6/5	0845 - 6/8	1.4×10^{-4}
Eureka, Nevada	0500 - 6/5	0900 - 6/6	2.0×10^{-4}
	0500 - 6/5	0900 - 6/8	1.4×10^{-4}
Hiko, Nevada	0508 - 6/5	0914 - 6/6	4.0×10^{-4}
	0508 - 6/5	0900 - 6/8	4.0×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 3 - Lassen 0445, 6/5/57		
Indian Springs, Nevada	0450 - 6/5	0915 - 6/6	2.4×10^{-4}
	0450 - 6/5	0845 - 6/8	2.4×10^{-4}
Kingman, Arizona	0445 - 6/5	0845 - 6/6	2.4×10^{-4}
	0445 - 6/5	0845 - 6/8	1.9×10^{-4}
Las Vegas, Nevada	0500 - 6/5	1515 - 6/6	1.9×10^{-4}
	0500 - 6/5	0900 - 6/8	1.9×10^{-4}
Lincoln Mine, Nevada	0455 - 6/5	0855 - 6/6	1.9×10^{-4}
	0455 - 6/5	0855 - 6/8	1.9×10^{-4}
Lund, Nevada	0600 - 6/5	0945 - 6/6	1.6×10^{-4}
	0600 - 6/5	1000 - 6/8	1.6×10^{-4}
Mercury, Nevada	0445 - 6/5	0845 - 6/6	1.2×10^{-3}
	0445 - 6/5	1345 - 6/8	4.5×10^{-4}
Mesquite, Nevada	0500 - 6/5	0921 - 6/6	6.1×10^{-4}
	0500 - 6/5	0906 - 6/8	3.0×10^{-4}
Nellis AFB, Nevada	0542 - 6/5	0600 - 6/6	2.4×10^{-4}
Overton, Nevada	0500 - 6/5	0845 - 6/6	2.5×10^{-4}
	0500 - 6/5	0845 - 6/8	2.5×10^{-4}
Pioche, Nevada	0445 - 6/5	0845 - 6/6	9.0×10^{-4}
	0445 - 6/5	0845 - 6/7	5.4×10^{-4}
St. George, Utah	0510 - 6/5	0900 - 6/6	1.5×10^{-3}
	0510 - 6/5	0900 - 6/7	8.2×10^{-4}
Tonopah, Nevada	0500 - 6/5	0930 - 6/6	2.9×10^{-4}
	0500 - 6/5	1030 - 6/7	2.3×10^{-4}
Watertown, Nevada	0455 - 6/5	1050 - 6/6	3.1×10^{-4}
	0455 - 6/5	0850 - 6/8	3.1×10^{-4}
	Detonation 4 - Wilson 0445, 6/18/57		
Alamo, Nevada	0500 - 6/18	0645 - 6/19	3.7×10^{-3}
	0500 - 6/18	0825 - 6/21	1.0×10^{-2}
Barstow, California	0537 - 6/18	0850 - 6/19	6.5×10^{-6}
	0537 - 6/18	0850 - 6/21	4.5×10^{-6}
Beaver, Utah	0450 - 6/18	0900 - 6/19	5.2×10^{-5}
	0450 - 6/18	0830 - 6/21	9.4×10^{-5}
Bishop, California	0500 - 6/18	0900 - 6/19	3.0×10^{-6}
	0500 - 6/18	1000 - 6/21	3.0×10^{-6}
Caliente, Nevada	0440 - 6/18	1000 - 6/19	2.7×10^{-4}
	0440 - 6/18	0930 - 6/21	1.3×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 4 - Wilson 0445, 6/18/57		
Cedar City, Utah	0445 - 6/18	0645 - 6/19	2.6×10^{-5}
	0445 - 6/18	1615 - 6/20	2.6×10^{-5}
Ely, Nevada	0500 - 6/18	0845 - 6/19	1.7×10^{-4}
	0500 - 6/18	0845 - 6/21	2.3×10^{-3}
Eureka, Nevada	0445 - 6/18	0845 - 6/19	6.6×10^{-6}
	0445 - 6/18	0845 - 6/21	5.0×10^{-4}
Hiko, Nevada	0445 - 6/18	0835 - 6/19	2.9×10^{-3}
	0445 - 6/18	0850 - 6/21	1.7×10^{-3}
Indian Springs, Nevada	0445 - 6/18	0855 - 6/19	6.8×10^{-4}
	0445 - 6/18	0800 - 6/21	7.1×10^{-4}
Kingman, Arizona	0500 - 6/18	1045 - 6/19	1.2×10^{-5}
	0500 - 6/18	2045 - 6/19	9.8×10^{-6}
Las Vegas, Nevada[1]	0500 - 6/18	0900 - 6/20	3.0×10^{-5}
Lincoln Mine, Nevada	0445 - 6/18	0845 - 6/19	1.7×10^{-2}
	0445 - 6/18	0445 - 6/21	7.7×10^{-3}
Lund, Nevada	0510 - 6/18	0845 - 6/19	1.3×10^{-3}
	0510 - 6/18	0845 - 6/21	1.9×10^{-3}
Mercury, Nevada	0520 - 6/18	0845 - 6/19	5.3×10^{-3}
	0520 - 6/18	0845 - 6/21	2.2×10^{-3}
Mesquite, Nevada	0445 - 6/18	0845 - 6/19	6.2×10^{-5}
	0445 - 6/18	0845 - 6/21	7.8×10^{-5}
Nellis AFB, Nevada	0450 - 6/18	2050 - 6/19	2.1×10^{-4}
Overton, Nevada	0452 - 6/18	0900 - 6/19	6.0×10^{-4}
	0452 - 6/18	0845 - 6/21	2.9×10^{-4}
Pioche, Nevada	0445 - 6/18	0900 - 6/19	1.4×10^{-3}
	0445 - 6/18	0900 - 6/21	1.1×10^{-3}
St. George, Utah	0510 - 6/18	0845 - 6/19	1.9×10^{-5}
	0510 - 6/18	1750 - 6/20	4.7×10^{-5}
Tonopah, Nevada	0445 - 6/18	0845 - 6/19	1.9×10^{-2}
	0445 - 6/18	0645 - 6/20	1.1×10^{-2}
Watertown, Nevada	0445 - 6/18	0900 - 6/19	2.3×10^{-2}
	0445 - 6/18	0900 - 6/20	1.4×10^{-2}
	Detonation 5 - Priscilla 0630, 6/24/57		
Alamo, Nevada	0630 - 6/24	1030 - 6/25	1.4×10^{-2}
	0630 - 6/24	1130 - 6/27	5.5×10^{-3}

1 Sampler out from 1300, 6/18 until 1600, 6/19.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 5 - Priscilla 0630, 6/24/57		
Barstow, California	0722 - 6/24	1830 - 6/24	4.3×10^{-5}
	0722 - 6/24	1034 - 6/27	8.9×10^{-6}
Beaver, Utah	0600 - 6/24	1030 - 6/25	4.1×10^{-3}
	0600 - 6/24	1000 - 6/27	1.8×10^{-3}
Bishop, California	0645 - 6/24	1030 - 6/25	2.5×10^{-6}
	0645 - 6/24	1030 - 6/27	6.8×10^{-6}
Caliente, Nevada	0630 - 6/24	1135 - 6/25	8.3×10^{-3}
	0630 - 6/24	1705 - 6/27	3.1×10^{-3}
Cedar City, Utah	0630 - 6/24	1030 - 6/25	4.5×10^{-3}
	0630 - 6/24	1030 - 6/27	1.8×10^{-3}
Ely, Nevada	0630 - 6/24	1030 - 6/25	4.5×10^{-6}
	0630 - 6/24	1030 - 6/27	3.6×10^{-6}
Eureka, Nevada	0630 - 6/24	2030 - 6/24	8.2×10^{-6}
	0630 - 6/24	1030 - 6/27	2.6×10^{-6}
Hiko, Nevada	0615 - 6/24	1130 - 6/25	6.7×10^{-3}
	0615 - 6/24	1200 - 6/27	2.5×10^{-3}
Indian Springs, Nevada	0630 - 6/24	1030 - 6/25	7.9×10^{-5}
	0630 - 6/24	0800 - 6/27	3.3×10^{-5}
Kingman, Arizona	0700 - 6/24	1030 - 6/25	3.0×10^{-6}
Las Vegas, Nevada	0700 - 6/24	1100 - 6/25	8.0×10^{-6}
	0700 - 6/24	1030 - 6/26	5.3×10^{-6}
Lincoln Mine, Nevada	0630 - 6/24	1030 - 6/25	1.2×10^{-5}
	0630 - 6/24	1030 - 6/27	7.6×10^{-6}
Lund, Nevada	0630 - 6/24	1030 - 6/25	3.9×10^{-5}
	0630 - 6/24	1030 - 6/27	1.5×10^{-5}
Mercury, Nevada	0630 - 6/24	1015 - 6/25	6.9×10^{-5}
	0630 - 6/24	1155 - 6/23	4.0×10^{-5}
Mesquite, Nevada	0645 - 6/24	1033 - 6/25	1.5×10^{-4}
	0645 - 6/24	1835 - 6/26	9.5×10^{-5}
Nellis AFB, Nevada	0630 - 6/24	1030 - 6/25	4.3×10^{-5}
	0630 - 6/24	1030 - 6/26	2.9×10^{-5}
Overton, Nevada	0630 - 6/24	1030 - 6/25	6.2×10^{-5}
	0630 - 6/24	1030 - 6/27	4.5×10^{-5}
Pioche, Nevada	0630 - 6/24	1030 - 6/25	1.8×10^{-3}
	0630 - 6/24	1030 - 6/27	7.1×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 5 - Priscilla 0630, 6/24/57		
St. George, Utah	0650 - 6/24	1025 - 6/25	9.8×10^{-3}
	0650 - 6/24	1100 - 6/27	3.9×10^{-3}
Tonopah, Nevada	0650 - 6/24	1030 - 6/25	1.4×10^{-5}
	0650 - 6/24	1030 - 6/27	8.2×10^{-6}
Watertown, Nevada	0653 - 6/24	1435 - 6/24	1.3×10^{-4}
	0653 - 6/24	0445 - 6/28	1.3×10^{-5}
	Detonation 6 - Coulomb A 1030, 7/1/57		
			Long Lived Alpha Activity-d/m/m3
Alamo, Nevada	1030 - 7/1	1430 - 7/2	0
	1030 - 7/1	1930 - 7/4	0
Barstow, California	1031 - 7/1	1035 - 7/2	0
Beaver, Utah	1045 - 7/1	1445 - 7/2	0
	1045 - 7/1	1445 - 7/4	0
Bishop, California	1103 - 7/1	1500 - 7/2	0
	1103 - 7/1	1500 - 7/4	0
Caliente, Nevada	1030 - 7/1	1300 - 7/2	0
	1030 - 7/1	2030 - 7/4	0
Cedar City, Utah	1030 - 7/1	1430 - 7/2	0
	1030 - 7/1	1430 - 7/4	0
Ely, Nevada	1030 - 7/1	1430 - 7/2	6.1×10^{-2}
	1030 - 7/1	1430 - 7/4	2.9×10^{-2}
Hiko, Nevada	1030 - 7/1	1600 - 7/2	0
	1030 - 7/1	1515 - 7/4	0
Kingman, Arizona	1030 - 7/1	1030 - 7/2	0
Las Vegas, Nevada	1025 - 7/1	1445 - 7/2	0
Lincoln Mine, Nevada	1030 - 7/1	1430 - 7/2	0
	1030 - 7/1	1430 - 7/3	0
Lund, Nevada	1130 - 7/1	1000 - 7/2	0
	1130 - 7/1	1515 - 7/4	0
Mesquite, Nevada	1030 - 7/1	1000 - 7/2	0
	1030 - 7/1	1430 - 7/4	0
Nellis AFB, Nevada	1055 - 7/1	1455 - 7/2	0
	1055 - 7/2	1455 - 7/4	0
Overton, Nevada	1030 - 7/1	1430 - 7/2	1.1×10^{-2}
	1030 - 7/1	1430 - 7/4	3.0×10^{-3}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Long Lived Alpha Activity-d/m/m3
	Detonation 6 - Coulomb A 1030, 7/1/57		
Pioche, Nevada	1030 - 7/1	1430 - 7/2	1.5×10^{-1}
	1030 - 7/1	1715 - 7/4	5.9×10^{-2}
St. George, Utah	1100 - 7/1	1145 - 7/2	5.6×10^{-3}
	1100 - 7/1	1445 - 7/4	1.9×10^{-3}
Tonopah, Nevada	1030 - 7/1	1430 - 7/2	0
	1030 - 7/1	1435 - 7/4	0
Watertown, Nevada	1030 - 7/1	1430 - 7/2	0
	1030 - 7/1	1430 - 7/4	0
	Detonation 7 - Hood 0440, 7/5/57		Beta Activity uc/m3
Alamo, Nevada	0445 - 7/5	0920 - 7/6	4.6×10^{-5}
	0445 - 7/5	0915 - 7/8	4.3×10^{-5}
Barstow, California	0511 - 7/5	1920 - 7/6	1.4×10^{-5}
	0511 - 7/5	0840 - 7/8	2.8×10^{-5}
Beaver, Utah	0500 - 7/5	0900 - 7/6	1.8×10^{-4}
	0500 - 7/5	0900 - 7/8	6.9×10^{-5}
Bishop, California	0500 - 7/5	0900 - 7/6	2.4×10^{-4}
	0500 - 7/5	1000 - 7/8	1.0×10^{-4}
Caliente, Nevada	0245 - 7/5	0855 - 7/6	5.5×10^{-5}
	0245 - 7/5	0910 - 7/8	3.9×10^{-5}
Cedar City, Utah	0440 - 7/5	1640 - 7/5	4.7×10^{-5}
	0440 - 7/5	0840 - 7/8	3.2×10^{-5}
Currant, Nevada	0930 - 7/5	1045 - 7/6	1.1×10^{-4}
	0930 - 7/5	1010 - 7/8	6.3×10^{-5}
Ely, Nevada	0440 - 7/5	0845 - 7/6	3.0×10^{-4}
	0440 - 7/5	0850 - 7/8	1.3×10^{-4}
Eureka, Nevada	0445 - 7/5	0845 - 7/6	6.1×10^{-5}
	0445 - 7/5	0845 - 7/8	3.1×10^{-5}
Hiko, Nevada	0540 - 7/5	0845 - 7/6	5.8×10^{-5}
	0540 - 7/5	0930 - 7/8	4.6×10^{-5}
Indian Springs, Nevada	0430 - 7/5	0840 - 7/6	1.8×10^{-4}
	0430 - 7/5	0840 - 7/8	1.0×10^{-4}
Kingman, Arizona	0430 - 7/5	0840 - 7/6	4.8×10^{-4}
	0430 - 7/5	0840 - 7/8	1.8×10^{-4}
Las Vegas, Nevada	0450 - 7/5	0850 - 7/6	4.1×10^{-5}
	0450 - 7/5	0850 - 7/8	3.8×10^{-5}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 7 - Hood 0440, 7/5/57		
Lincoln Mine, Nevada	0440 - 7/5	0840 - 7/6	6.9×10^{-4}
	0440 - 7/5	0840 - 7/8	3.0×10^{-4}
Lund, Nevada	0450 - 7/5	0900 - 7/6	3.6×10^{-4}
	0450 - 7/5	0905 - 7/8	1.6×10^{-4}
Mercury, Nevada	0440 - 7/5	0840 - 7/6	1.1×10^{-4}
	0440 - 7/5	0840 - 7/8	6.5×10^{-5}
Mesquite, Nevada	0440 - 7/5	0835 - 7/6	3.4×10^{-5}
	0440 - 7/5	0845 - 7/8	3.4×10^{-5}
Nellis AFB, Nevada	0440 - 7/5	0900 - 7/6	2.5×10^{-4}
	0440 - 7/5	0900 - 7/8	1.3×10^{-4}
Overton, Nevada	0440 - 7/5	0900 - 7/6	4.8×10^{-5}
	0440 - 7/5	0850 - 7/8	4.8×10^{-5}
Pioche, Nevada	0440 - 7/5	0840 - 7/6	3.0×10^{-4}
	0440 - 7/5	0840 - 7/8	1.5×10^{-4}
St. George, Utah	0505 - 7/5	0840 - 7/6	5.4×10^{-5}
	0505 - 7/5	0845 - 7/8	4.9×10^{-5}
Tonopah, Nevada	0630 - 7/5	0840 - 7/6	4.9×10^{-5}
	0630 - 7/5	0830 - 7/8	4.9×10^{-5}
Watertown, Nevada	0440 - 7/5	2040 - 7/5	1.6×10^{-4}
	0440 - 7/5	2040 - 7/8	7.6×10^{-5}
	Detonation 8 - Diablo 0430, 7/15/57		
Alamo, Nevada	0430 - 7/15	0830 - 7/16	1.0×10^{-4}
	0430 - 7/15	0830 - 7/18	7.4×10^{-5}
Barstow, California	0510 - 7/15	0835 - 7/16	4.0×10^{-5}
	0510 - 7/15	0840 - 7/16	4.0×10^{-5}
Beaver, Utah	0445 - 7/15	0845 - 7/16	1.8×10^{-4}
	0445 - 7/15	0845 - 7/18	1.0×10^{-4}
Bishop, California	0500 - 7/15	1000 - 7/16	1.1×10^{-5}
	0500 - 7/15	0900 - 7/18	9.8×10^{-6}
Caliente, Nevada	0320 - 7/15	1350 - 7/16	8.4×10^{-5}
	0320 - 7/15	0930 - 7/18	6.6×10^{-5}
Cedar City, Utah	0430 - 7/15	0830 - 7/16	4.9×10^{-5}
	0430 - 7/15	0830 - 7/18	3.0×10^{-5}
Currant, Nevada	0540 - 7/15	1300 - 7/16	5.6×10^{-2}
	0540 - 7/15	0830 - 7/18	2.4×10^{-2}
Ely, Nevada	0430 - 7/15	0830 - 7/16	4.4×10^{-2}
	0430 - 7/15	0830 - 7/18	1.6×10^{-2}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 8 - Diablo 0430, 7/15/57		
Eureka, Nevada	0430 - 7/15	0830 - 7/16	1.3×10^{-2}
	0430 - 7/15	0830 - 7/18	5.3×10^{-3}
Hiko, Nevada	0440 - 7/15	0845 - 7/16	1.1×10^{-3}
	0440 - 7/15	0445 - 7/18	4.7×10^{-4}
Indian Springs, Nevada	0420 - 7/15	0830 - 7/16	1.3×10^{-3}
	0420 - 7/15	0410 - 7/18	6.1×10^{-4}
Kingman, Arizona	0445 - 7/15	0830 - 7/16	5.1×10^{-5}
	0445 - 7/15	0830 - 7/18	3.3×10^{-5}
Las Vegas, Nevada	0430 - 7/15	0830 - 7/16	4.0×10^{-5}
	0430 - 7/15	0830 - 7/18	4.8×10^{-5}
Lincoln Mine, Nevada	0430 - 7/15	0830 - 7/16	9.1×10^{-2}
	0430 - 7/15	0830 - 7/18	3.6×10^{-2}
Lund, Nevada	0430 - 7/15	1145 - 7/16	7.8×10^{-3}
Mercury, Nevada	0430 - 7/15	0840 - 7/16	5.2×10^{-4}
	0430 - 7/15	0900 - 7/18	2.0×10^{-4}
Mesquite, Nevada	0440 - 7/15	0830 - 7/16	3.4×10^{-4}
	0440 - 7/15	0830 - 7/18	1.8×10^{-4}
Nellis AFB, Nevada	0430 - 7/15	0830 - 7/16	3.2×10^{-4}
	0430 - 7/15	0900 - 7/17	2.1×10^{-4}
Overton, Nevada	0430 - 7/15	0830 - 7/16	9.4×10^{-5}
	0430 - 7/15	0830 - 7/18	5.3×10^{-5}
Pioche, Nevada	0430 - 7/15	0830 - 7/16	2.4×10^{-3}
	0430 - 7/15	0830 - 7/18	9.2×10^{-4}
St. George, Utah	0445 - 7/15	0830 - 7/16	2.8×10^{-4}
	0445 - 7/15	0900 - 7/18	1.7×10^{-4}
Tonopah, Nevada	0455 - 7/15	0830 - 7/16	2.1×10^{-4}
	0455 - 7/15	0830 - 7/18	1.1×10^{-4}
Watertown, Nevada	0435 - 7/15	0830 - 7/16	2.8×10^{-2}
	0435 - 7/15	0830 - 7/18	1.1×10^{-2}
	Detonation 9 - John 0700, 7/19/57		
Alamo, Nevada	0700 - 7/19	1100 - 7/20	1.0×10^{-4}
	0700 - 7/19	1100 - 7/22	6.1×10^{-5}
Barstow, California	0804 - 7/19	1100 - 7/20	2.5×10^{-4}
	0804 - 7/19	1100 - 7/22	3.9×10^{-4}
Beaver, Utah	0700 - 7/19	1100 - 7/20	1.5×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 9 - John 0700, 7/19/57		
Bishop, California	0900 - 7/19	0900 - 7/20	7.1×10^{-5}
	0900 - 7/19	0900 - 7/22	6.4×10^{-5}
Caliente, Nevada	0710 - 7/19	1230 - 7/20	2.4×10^{-4}
	0710 - 7/19	1230 - 7/22	1.3×10^{-4}
Cedar City, Utah	0700 - 7/19	1100 - 7/20	1.5×10^{-4}
	0700 - 7/19	1100 - 7/22	1.0×10^{-4}
Currant, Nevada	0800 - 7/19	1530 - 7/20	3.4×10^{-4}
	0800 - 7/19	2200 - 7/22	2.0×10^{-4}
Ely, Nevada	0740 - 7/19	1100 - 7/20	4.6×10^{-4}
	0740 - 7/19	2240 - 7/21	2.6×10^{-4}
Eureka, Nevada	0730 - 7/19	0930 - 7/20	9.3×10^{-5}
	0730 - 7/19	0980 - 7/22	9.3×10^{-5}
Hiko, Nevada	0900 - 7/19	1330 - 7/20	8.9×10^{-5}
	0900 - 7/19	1020 - 7/22	6.8×10^{-5}
Indian Springs, Nevada	0700 - 7/19	0900 - 7/20	5.9×10^{-4}
	0700 - 7/19	1720 - 7/20	4.5×10^{-4}
Kingman, Arizona	0700 - 7/19	1100 - 7/20	7.4×10^{-5}
	0700 - 7/19	1100 - 7/22	5.0×10^{-5}
Las Vegas, Nevada	0700 - 7/19	1100 - 7/20	2.2×10^{-4}
	0700 - 7/19	1100 - 7/22	1.1×10^{-4}
Lincoln Mine, Nevada	0715 - 7/19	1100 - 7/20	2.4×10^{-3}
	0715 - 7/19	1730 - 7/22	9.3×10^{-4}
Lund, Nevada	0700 - 7/19	1440 - 7/20	6.2×10^{-4}
	0700 - 7/19	1100 - 7/22	3.1×10^{-4}
Mercury, Nevada	0730 - 7/19	1000 - 7/20	1.9×10^{-4}
	0730 - 7/19	1630 - 7/22	9.3×10^{-5}
Mesquite, Nevada	0720 - 7/19	1100 - 7/20	2.1×10^{-4}
	0720 - 7/19	1100 - 7/22	8.5×10^{-5}
Nellis AFB, Nevada	0700 - 7/19	1100 - 7/20	1.9×10^{-4}
	0700 - 7/19	1100 - 7/22	1.0×10^{-4}
Overton, Nevada	0700 - 7/19	1100 - 7/20	1.9×10^{-4}
	0700 - 7/19	1100 - 7/22	1.2×10^{-4}
Pioche, Nevada	0700 - 7/19	1100 - 7/20	1.5×10^{-4}
	0700 - 7/19	1100 - 7/22	7.6×10^{-5}
St. George, Utah	0740 - 7/19	1000 - 7/20	3.5×10^{-4}
	0740 - 7/19	1100 - 7/22	1.7×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 9 - John 0700, 7/19/57		
Tonopah, Nevada	0725 - 7/19	1100 - 7/20	9.5×10^{-5}
	0725 - 7/19	1100 - 7/22	8.4×10^{-5}
Watertown, Nevada	0700 - 7/19	2100 - 7/20	1.8×10^{-4}
	0700 - 7/19	2100 - 7/22	9.3×10^{-5}
	Detonation 10 - Kepler 0450, 7/24/57		
Alamo, Nevada	0515 - 7/24	0700 - 7/25	2.5×10^{-5}
Barstow, California	0525 - 7/24	0705 - 7/25	4.4×10^{-5}
Beaver, Utah	0500 - 7/24	0645 - 7/25	7.5×10^{-5}
Bishop, California	0500 - 7/24	0630 - 7/25	2.3×10^{-3}
Caliente, Nevada	0345 - 7/24	0630 - 7/25	2.4×10^{-4}
Cedar City, Utah	0450 - 7/24	0630 - 7/25	1.3×10^{-6}
Currant, Nevada	0550 - 7/24	0730 - 7/25	1.6×10^{-3}
Ely, Nevada	0450 - 7/24	0630 - 7/25	6.7×10^{-5}
Eureka, Nevada	0500 - 7/24	0630 - 7/25	3.7×10^{-3}
Hiko, Nevada	0500 - 7/24	0650 - 7/25	1.2×10^{-4}
Indian Springs, Nevada	0450 - 7/24	0630 - 7/25	3.4×10^{-4}
Kingman, Arizona	0500 - 7/24	0640 - 7/25	1.8×10^{-5}
Las Vegas, Nevada	0450 - 7/24	0630 - 7/25	5.3×10^{-5}
Lincoln Mine, Nevada	0450 - 7/24	0630 - 7/26	7.5×10^{-3}
Lund, Nevada	0450 - 7/24	0630 - 7/25	2.3×10^{-4}
Mercury, Nevada	0450 - 7/24	0630 - 7/25	6.7×10^{-4}
Mesquite, Nevada	0500 - 7/24	0650 - 7/25	9.8×10^{-5}
Nellis AFB, Nevada	0450 - 7/24	0630 - 7/25	1.0×10^{-4}
Overton, Nevada	0450 - 7/24	0630 - 7/25	8.8×10^{-5}
Pioche, Nevada	0450 - 7/24	0630 - 7/25	6.6×10^{-5}
St. George, Utah	0530 - 7/24	0700 - 7/25	1.3×10^{-4}
Tonopah, Nevada	0508 - 7/24	0650 - 7/25	7.5×10^{-2}
Watertown, Nevada	0450 - 7/24	0630 - 7/25	6.5×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m3
	Detonation 11 - Owens 0630, 7/25/57		
Alamo, Nevada	0700 - 7/25	1030 - 7/26	1.5×10^{-4}
	0700 - 7/25	1000 - 7/28	1.2×10^{-4}
Barstow, California	0705 - 7/25	1105 - 7/26	1.9×10^{-4}
	0705 - 7/25	1127 - 7/27	1.2×10^{-4}
Beaver, Utah	0645 - 7/25	1045 - 7/26	3.6×10^{-5}
	0645 - 7/25	1045 - 7/28	2.2×10^{-5}
Bishop, California	0700 - 7/25	1000 - 7/26	1.7×10^{-4}
	0700 - 7/25	1030 - 7/28	1.1×10^{-4}
Caliente, Nevada	0635 - 7/25	1030 - 7/26	2.1×10^{-4}
	0635 - 7/25	1100 - 7/27	1.6×10^{-4}
Cedar City, Utah	0630 - 7/25	1030 - 7/26	1.3×10^{-4}
	0630 - 7/25	1030 - 7/28	1.0×10^{-4}
Currant, Nevada	0730 - 7/25	1130 - 7/26	1.6×10^{-1}
	0730 - 7/25	1106 - 7/28	5.9×10^{-2}
Ely, Nevada	0630 - 7/25	1030 - 7/26	1.4×10^{-2}
	0630 - 7/25	1030 - 7/28	5.4×10^{-3}
Eureka, Nevada	0630 - 7/25	1030 - 7/26	9.2×10^{-2}
	0630 - 7/25	1030 - 7/28	3.5×10^{-2}
Hiko, Nevada[1]	0650 - 7/25	1030 - 7/26	2.3×10^{-4}
	0650 - 7/25	1110 - 7/28	1.5×10^{-4}
Indian Springs, Nevada	0630 - 7/25	1130 - 7/26	7.8×10^{-4}
	0630 - 7/25	0800 - 7/27	4.5×10^{-4}
Kingman, Arizona	0640 - 7/25	1030 - 7/26	2.0×10^{-4}
	0640 - 7/25	1040 - 7/28	9.4×10^{-5}
Las Vegas, Nevada	0630 - 7/25	1830 - 7/25	1.9×10^{-4}
Lincoln Mine, Nevada	0630 - 7/25	0830 - 7/26	2.4×10^{-3}
	0630 - 7/25	1030 - 7/28	9.1×10^{-4}
Lund, Nevada	0630 - 7/25	1030 - 7/26	2.7×10^{-2}
	0630 - 7/25	1010 - 7/28	1.1×10^{-2}
Mercury, Nevada	0630 - 7/25	1030 - 7/26	2.8×10^{-4}
	0630 - 7/25	1030 - 7/28	1.2×10^{-4}
Mesquite, Nevada	0700 - 7/25	1030 - 7/26	1.2×10^{-4}
	0700 - 7/25	1030 - 7/28	7.3×10^{-5}
Nellis AFB, Nevada[2]	0630 - 7/25	1030 - 7/26	2.4×10^{-4}
	0630 - 7/25	1030 - 7/27	1.6×10^{-4}

1 Power off twice during period 1030, 7/26 to 1110, 7/28 and values are estimated.
2 Sample from 1030, 7/26 to 1545, 7/26 lost due to rain.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 11 - Owens 0630, 7/25/57		
Overton, Nevada	0630 - 7/25	1030 - 7/26	3.0×10^{-4}
	0630 - 7/25	1030 - 7/28	1.5×10^{-4}
Pioche, Nevada	0630 - 7/25	1030 - 7/26	2.3×10^{-4}
St. George, Utah	0700 - 7/25	1100 - 7/26	3.8×10^{-5}
	0700 - 7/25	1030 - 7/28	3.8×10^{-5}
Tonopah, Nevada	0650 - 7/25	1035 - 7/26	7.4×10^{-3}
	0650 - 7/25	0915 - 7/28	2.8×10^{-3}
Watertown, Nevada	0630 - 7/25	0730 - 7/26	5.2×10^{-3}
	0630 - 7/25	0730 - 7/28	2.0×10^{-3}
	Detonation 12 - Stokes 0525, 8/7/57		
Alamo, Nevada	0600 - 8/7	0930 - 8/8	9.5×10^{-6}
	0600 - 8/7	1025 - 8/10	6.6×10^{-6}
Barstow, California	0608 - 8/7	0925 - 8/8	1.7×10^{-6}
	0608 - 8/7	0925 - 8/10	7.1×10^{-6}
Beaver, Utah	0530 - 8/7	0930 - 8/8	7.5×10^{-5}
	0530 - 8/7	0930 - 8/9	4.3×10^{-5}
Bishop, California	0525 - 8/7	0925 - 8/8	1.1×10^{-5}
	0525 - 8/7	0925 - 8/10	1.1×10^{-5}
Caliente, Nevada	0525 - 8/7	1010 - 8/8	2.9×10^{-5}
	0525 - 8/7	1015 - 8/10	1.4×10^{-5}
Cedar City, Utah	0525 - 8/7	0925 - 8/8	1.2×10^{-5}
	0525 - 8/7	0725 - 8/10	7.3×10^{-6}
Currant, Nevada	0525 - 8/7	0430 - 8/8	1.2×10^{-4}
	0525 - 8/7	1150 - 8/10	4.0×10^{-5}
Ely, Nevada	0525 - 8/7	0925 - 8/8	5.5×10^{-6}
	0525 - 8/7	0825 - 8/10	4.2×10^{-6}
Eureka, Nevada	0540 - 8/7	0940 - 8/8	1.4×10^{-2}
	0540 - 8/7	0740 - 8/10	5.7×10^{-3}
Hiko, Nevada	0540 - 8/7	0925 - 8/8	6.3×10^{-6}
	0540 - 8/7	0940 - 8/10	4.5×10^{-6}
Indian Springs, Nevada	0530 - 8/7	0830 - 8/8	4.1×10^{-5}
	0530 - 8/7	0830 - 8/10	1.6×10^{-5}
Kingman, Arizona	0600 - 8/7	0900 - 8/8	3.0×10^{-5}
Las Vegas, Nevada	0535 - 8/7	0935 - 8/8	3.0×10^{-6}
	0535 - 8/7	1130 - 8/10	4.8×10^{-6}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 12 - Stokes 0525, 8/7/57		
Lincoln Mine, Nevada	0525 - 8/7	1045 - 8/8	3.8×10^{-5}
	0525 - 8/7	0925 - 8/10	2.0×10^{-5}
Lund, Nevada[1]	0525 - 8/7	1700 - 8/7	7.6×10^{-5}
	0525 - 8/7	1055 - 8/10	1.7×10^{-5}
Mercury, Nevada	0725 - 8/7	0930 - 8/8	3.3×10^{-6}
	0725 - 8/7	0930 - 8/10	3.3×10^{-6}
Mesquite, Nevada	0530 - 8/7	0930 - 8/8	8.1×10^{-6}
	0530 - 8/7	0930 - 8/10	5.2×10^{-6}
Nellis AFB, Nevada	0525 - 8/7	0925 - 8/8	7.4×10^{-6}
	0525 - 8/7	0925 - 8/10	6.6×10^{-6}
Overton, Nevada	0525 - 8/7	0925 - 8/8	1.9×10^{-5}
	0525 - 8/7	0925 - 8/10	9.8×10^{-6}
Pioche, Nevada[2]	0530 - 8/7	0930 - 8/8	1.9×10^{-5}
	0530 - 8/7	0930 - 8/10	1.4×10^{-5}
St. George, Utah	0545 - 8/7	0925 - 8/8	5.5×10^{-6}
	0545 - 8/7	0800 - 8/10	5.1×10^{-6}
Tonopah, Nevada	0535 - 8/7	0925 - 8/8	9.3×10^{-6}
	0535 - 8/7	0925 - 8/10	9.3×10^{-6}
Watertown, Nevada	0525 - 8/7	0930 - 8/9	2.9×10^{-4}
	0525 - 8/7	0930 - 8/10	1.6×10^{-4}
	Detonation 13 - Shasta 0500, 8/18/57		
Alamo, Nevada	0500 - 8/18	0900 - 8/19	1.2×10^{-2}
	0500 - 8/18	0900 - 8/21	4.2×10^{-3}
Barstow, California	1000 - 8/18	0900 - 8/19	2.9×10^{-6}
	1000 - 8/18	0900 - 8/21	2.7×10^{-6}
Beaver, Utah	0350 - 8/18	0900 - 8/19	1.3×10^{-5}
	0350 - 8/18	0900 - 8/21	6.5×10^{-6}
Bishop, California	0500 - 8/18	0900 - 8/19	1.0×10^{-5}
	0500 - 8/18	0900 - 8/21	1.0×10^{-5}
Caliente, Nevada	0500 - 8/18	1000 - 8/19	7.9×10^{-5}
	0500 - 8/18	0900 - 8/20	4.5×10^{-5}
Cedar City, Utah	0500 - 8/18	0900 - 8/19	1.9×10^{-6}
	0500 - 8/18	0900 - 8/21	1.4×10^{-6}
Currant, Nevada[3]	0730 - 8/18	1408 - 8/21	3.7×10^{-3}
Ely, Nevada	0515 - 8/18	0930 - 8/19	1.6×10^{-2}
	0515 - 8/18	0830 - 8/21	6.3×10^{-3}

1 Sampler out from 1700, 8/7 to 0335, 8/8.
2 Motor failure on sample from 0930, 8/8 to 0930, 8/9.
3 Power failure from 1352, 8/18 to 1520, 8/19.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 13 - Shasta 0500, 8/18/57		
Eureka, Nevada	0515 - 8/18	0915 - 8/19	8.1×10^{-2}
	0515 - 8/18	0730 - 8/21	5.0×10^{-2}
Hiko, Nevada	0525 - 8/18	0930 - 8/19	1.5×10^{-2}
	0525 - 8/18	0900 - 8/21	5.7×10^{-3}
Indian Springs, Nevada	0500 - 8/18	0900 - 8/19	5.0×10^{-5}
	0500 - 8/18	0900 - 8/20	3.0×10^{-5}
Kingman, Arizona	0500 - 8/18	0900 - 8/19	1.6×10^{-5}
	0500 - 8/18	0900 - 8/20	9.5×10^{-6}
Las Vegas, Nevada	0500 - 8/18	0900 - 8/19	4.9×10^{-6}
	0500 - 8/18	0900 - 8/21	2.2×10^{-6}
Lincoln Mine, Nevada	0600 - 8/18	0900 - 8/19	1.7×10^{-2}
	0600 - 8/18	0945 - 8/21	6.4×10^{-3}
Mesquite, Nevada	0500 - 8/18	0900 - 8/19	2.2×10^{-6}
	0500 - 8/18	0115 - 8/21	2.2×10^{-6}
Nellis AFB, Nevada	0500 - 8/18	0900 - 8/19	4.7×10^{-6}
	0500 - 8/18	0900 - 8/21	3.0×10^{-6}
Overton, Nevada	0500 - 8/18	0900 - 8/19	2.6×10^{-6}
	0500 - 8/18	0900 - 8/21	2.6×10^{-6}
Pioche, Nevada	0500 - 8/18	0900 - 8/19	5.9×10^{-3}
	0500 - 8/18	1700 - 8/20	2.8×10^{-3}
St. George, Utah	0600 - 8/18	0900 - 8/19	1.6×10^{-3}
	0600 - 8/18	0900 - 8/21	1.6×10^{-3}
Tonopah, Nevada	0519 - 8/18	0900 - 8/19	1.4×10^{-5}
	0519 - 8/18	0900 - 8/21	1.2×10^{-5}
Watertown, Nevada	0500 - 8/18	1130 - 8/20	6.4×10^{-5}
	0500 - 8/18	1130 - 8/21	4.7×10^{-5}
	Detonation 14 - Doppler 0530, 8/23/57		
Alamo, Nevada	0630 - 8/23	1130 - 8/24	1.7×10^{-5}
	0630 - 8/23	0930 - 8/26	8.7×10^{-6}
Barstow, California	0600 - 8/23	0935 - 8/24	4.9×10^{-6}
	0600 - 8/23	0930 - 8/26	8.0×10^{-6}
Beaver, Utah	0545 - 8/23	1030 - 8/24	9.5×10^{-6}
	0545 - 8/23	0935 - 8/26	5.4×10^{-6}
Bishop, California	0530 - 8/23	0930 - 8/24	1.0×10^{-5}
	0530 - 8/23	0930 - 8/26	5.5×10^{-6}
Caliente, Nevada	0530 - 8/23	1020 - 8/24	2.2×10^{-5}
	0530 - 8/23	0920 - 8/26	9.6×10^{-6}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 14 - Doppler 0530, 8/23/57		
Cedar City, Utah	0535 - 8/23	0930 - 8/24	2.5×10^{-6}
	0535 - 8/23	0930 - 8/25	2.5×10^{-6}
Currant, Nevada	0630 - 8/23	1000 - 8/24	1.8×10^{-3}
	0630 - 8/23	1000 - 8/26	6.7×10
Ely, Nevada	0530 - 8/23	0900 - 8/24	8.7×10^{-3}
	0530 - 8/23	1100 - 8/26	3.3×10^{-3}
Eureka, Nevada	0545 - 8/23	0945 - 8/24	5.7×10^{-3}
	0545 - 8/23	0815 - 8/26	2.4×10^{-3}
Hiko, Nevada	0545 - 8/23	0930 - 8/24	1.8×10^{-5}
	0545 - 8/23	0925 - 8/26	1.8×10^{-5}
Indian Springs, Nevada	0410 - 8/23	0930 - 8/24	9.5×10^{-5}
	0410 - 8/23	0930 - 8/26	3.7×10^{-5}
Kingman, Arizona	0530 - 8/23	0930 - 8/24	1.2×10^{-5}
	0530 - 8/23	0930 - 8/26	1.2×10^{-5}
Las Vegas, Nevada	0530 - 8/23	0930 - 8/24	1.5×10^{-5}
	0530 - 8/23	0930 - 8/26	8.6×10^{-6}
Lincoln Mine, Nevada	0550 - 8/23	0930 - 8/24	2.3×10^{-5}
	0550 - 8/23	0930 - 8/26	2.0×10^{-5}
Lund, Nevada	0530 - 8/23	1050 - 8/24	8.7×10^{-3}
	0530 - 8/23	0900 - 8/26	3.3×10^{-3}
Mercury, Nevada[1]	0530 - 8/23	0930 - 8/24	5.3×10^{-6}
Mesquite, Nevada	0530 - 8/23	0930 - 8/24	3.2×10^{-5}
	0530 - 8/23	0930 - 8/26	3.1×10^{-5}
Nellis AFB, Nevada	0530 - 8/23	0930 - 8/24	1.1×10^{-5}
	0530 - 8/23	1015 - 8/26	7.8×10^{-6}
Overton, Nevada	0530 - 8/23	0930 - 8/24	1.8×10^{-5}
	0530 - 8/23	0930 - 8/26	9.3×10^{-5}
Pioche, Nevada	0530 - 8/23	0730 - 8/24	4.0×10^{-6}
	0530 - 8/23	0800 - 8/25	2.9×10^{-6}
St. George, Utah[2]	0550 - 8/23	0930 - 8/24	8.2×10^{-6}
	0550 - 8/23	0930 - 8/26	8.2×10^{-6}
Tonopah, Nevada	0545 - 8/23	0930 - 8/24	1.1×10^{-5}
	0545 - 8/23	0930 - 8/26	9.4×10^{-6}
Watertown, Nevada	0530 - 8/23	0930 - 8/24	9.0×10^{-5}
	0530 - 8/23	0930 - 8/26	3.8×10^{-5}

1 Motor failure sometime after 0930, 8/24.
2 Volume assumed for period 1800, 8/23 to 0930, 8/24.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 15 - Franklin Prime 0540, 8/30/57		
Alamo, Nevada	0630 - 8/30	0550 - 8/31	4.5×10^{-4}
Barstow, California	0555 - 8/30	0535 - 8/31	7.2×10^{-6}
Beaver, Utah	0607 - 8/30	0620 - 8/31	9.2×10^{-4}
Bishop, California	0540 - 8/30	0530 - 8/31	1.7×10^{-5}
Caliente, Nevada	0445 - 8/30	0520 - 8/31	1.2×10^{-3}
Cedar City, Utah	0550 - 8/30	0540 - 8/31	1.0×10^{-5}
Ely, Nevada	0540 - 8/30	0600 - 8/31	1.1×10^{-3}
Eureka, Nevada	0530 - 8/30	0550 - 8/31	2.0×10^{-2}
Hiko, Nevada	0550 - 8/30	0555 - 8/31	1.2×10^{-4}
Indian Springs, Nevada	0540 - 8/30	0530 - 8/31	8.6×10^{-6}
Kingman, Arizona	0540 - 8/30	0800 - 8/31	2.7×10^{-5}
Las Vegas, Nevada	0540 - 8/30	0530 - 8/31	4.6×10^{-6}
Lincoln Mine, Nevada	0540 - 8/30	0700 - 8/31	4.9×10^{-4}
Lund, Nevada	0540 - 8/30	0530 - 8/31	1.4×10^{-3}
Mercury, Nevada	0540 - 8/30	0545 - 8/31	1.4×10^{-5}
Mesquite, Nevada	0540 - 8/30	0530 - 8/31	1.1×10^{-5}
Nellis AFB, Nevada	0540 - 8/30	0530 - 8/31	2.4×10^{-4}
Overton, Nevada	0540 - 8/30	0530 - 8/31	8.5×10^{-6}
Pioche, Nevada	0550 - 8/30	0540 - 8/31	3.2×10^{-5}
St. George, Utah	0550 - 8/30	0600 - 8/31	1.5×10^{-5}
Tonopah, Nevada	0558 - 8/30	0545 - 8/31	7.1×10^{-4}
Watertown, Nevada	0540 - 8/30	1740 - 8/30	9.2×10^{-6}
	Detonation 16 - Smoky 0530 - 8/31/57		
Alamo, Nevada	0550 - 8/31	0930 - 9/1	3.1×10^{-2}
Barstow, California	0535 - 8/31	0930 - 9/1	3.9×10^{-5}
	0535 - 8/31	0930 - 9/2	2.4×10^{-5}
Beaver, Utah	0620 - 8/31	0935 - 9/1	1.8×10^{-4}
Bishop, California	0530 - 8/31	0930 - 9/1	2.3×10^{-5}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 16 - Smoky 0530 - 8/31/57		
Caliente, Nevada	0520 - 8/31	1130 - 9/1	2.4×10^{-3}
Cedar City, Utah	0540 - 8/31	0930 - 9/1	7.4×10^{-3}
Currant, Nevada	0630 - 8/31	1200 - 9/1	2.8×10^{-3}
	0630 - 8/31	0640 - 9/2	2.1×10^{-3}
Ely, Nevada	0600 - 8/31	0945 - 9/1	1.1×10^{-3}
	0600 - 8/31	0540 - 9/2	1.1×10^{-3}
Eureka, Nevada	0550 - 8/31	1150 - 9/1	4.4×10^{-3}
Hiko, Nevada	0555 - 8/31	0945 - 9/1	6.6×10^{-3}
Indian Springs, Nevada	0530 - 8/31	0930 - 9/1	6.9×10^{-4}
	0530 - 8/31	0530 - 9/2	1.3×10^{-3}
Kingman, Arizona	0945 - 8/31	1000 - 9/1	3.1×10^{-5}
	0945 - 8/31	0545 - 9/2	3.1×10^{-5}
Las Vegas, Nevada	0540 - 8/31	0930 - 9/1	4.2×10^{-4}
	0540 - 8/31	0540 - 9/2	8.9×10^{-4}
Lincoln Mine, Nevada	0700 - 8/31	0900 - 9/1	4.3×10^{-3}
	0700 - 8/31	0540 - 9/2	3.5×10^{-3}
Lund, Nevada	0530 - 8/31	1100 - 9/1	2.2×10^{-3}
	0530 - 8/31	0540 - 9/2	2.7×10^{-3}
Mercury, Nevada	0545 - 8/31	1410 - 9/1	7.7×10^{-4}
	0545 - 8/31	0545 - 9/2	3.1×10^{-3}
Mesquite, Nevada	0530 - 8/31	0930 - 9/1	1.8×10^{-2}
Nellis AFB, Nevada	0530 - 8/31	0930 - 9/1	1.3×10^{-3}
	0530 - 8/31	0540 - 9/2	1.4×10^{-3}
Overton, Nevada	0530 - 8/31	0930 - 9/1	2.5×10^{-3}
	0530 - 8/31	0540 - 9/2	4.2×10^{-3}
Pioche, Nevada	0540 - 8/31	0940 - 9/1	1.9×10^{-3}
	0540 - 8/31	0540 - 9/2	4.8×10^{-3}
St. George, Utah	0600 - 8/31	0930 - 9/1	3.4×10^{-2}
	0600 - 8/31	0530 - 9/2	2.1×10^{-2}
Tonopah, Nevada	0545 - 8/31	0837 - 9/1	6.9×10^{-4}
	0545 - 8/31	0558 - 9/2	5.6×10^{-4}
Watertown, Nevada	0530 - 8/31	0530 - 9/1	2.8×10^{-3}
	Detonation 17 - Galileo 0540, 9/2/57		
Alamo, Nevada	0645 - 9/2	0945 - 9/3	2.9×10^{-2}
	0645 - 9/2	0930 - 9/5	1.1×10^{-2}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 17 - Galileo 0540, 9/2/57		
Barstow, California	0545 - 9/2	0940 - 9/3	1.0×10^{-4}
	0545 - 9/2	0940 - 9/5	5.1×10^{-5}
Beaver, Utah	0530 - 9/2	0950 - 9/3	2.8×10^{-3}
	0530 - 9/2	0925 - 9/5	1.1×10^{-3}
Bishop, California	0540 - 9/2	0940 - 9/3	1.74×10^{-3}
	0540 - 9/2	0940 - 9/5	7.1×10^{-4}
Caliente, Nevada	0545 - 9/2	0945 - 9/3	4.9×10^{-2}
	0545 - 9/2	0945 - 9/5	1.7×10^{-2}
Cedar City, Utah	0540 - 9/3	1030 - 9/3	1.5×10^{-3}
	0540 - 9/2	0430 - 9/4	9.6×10^{-4}
Currant, Nevada	0640 - 9/2	1110 - 9/3	1.9×10^{-2}
	0640 - 9/2	1725 - 9/5	9.1×10^{-3}
Ely, Nevada	0540 - 9/2	2400 - 9/2	5.7×10^{-2}
	0540 - 9/2	1120 - 9/5	1.4×10^{-2}
Eureka, Nevada	0600 - 9/2	0940 - 9/3	2.1×10^{-2}
	0600 - 9/2	0940 - 9/5	1.2×10^{-2}
Hiko, Nevada	0545 - 9/2	0940 - 9/3	3.5×10^{-3}
	0545 - 9/2	1500 - 9/5	2.3×10^{-3}
Indian Springs, Nevada	0530 - 9/2	0930 - 9/3	3.7×10^{-3}
	0530 - 9/2	1040 - 9/4	1.9×10^{-3}
Kingman, Arizona	0540 - 9/2	0900 - 9/3	2.2×10^{-4}
	0540 - 9/2	0900 - 9/5	1.1×10^{-4}
Las Vegas, Nevada	0540 - 9/2	0940 - 9/3	3.6×10^{-3}
	0540 - 9/2	0940 - 9/5	1.4×10^{-3}
Lincoln Mine, Nevada	0540 - 9/2	0940 - 9/3	1.2×10^{-2}
	0540 - 9/2	0940 - 9/4	5.4×10^{-3}
Lund, Nevada	0540 - 9/2	0920 - 9/3	4.0×10^{-2}
	0540 - 9/2	1310 - 9/5	2.4×10^{-2}
Mercury, Nevada	0545 - 9/2	1800 - 9/2	6.0×10^{-3}
Mesquite, Nevada	0540 - 9/2	0940 - 9/3	9.0×10^{-3}
	0540 - 9/2	0940 - 9/5	3.4×10^{-3}
Nellis AFB, Nevada	0540 - 9/2	0940 - 9/3	8.4×10^{-3}
	0540 - 9/2	0940 - 9/5	3.2×10^{-3}
Overton, Nevada	0540 - 9/2	0940 - 9/3	4.5×10^{-2}
	0540 - 9/2	0940 - 9/5	1.6×10^{-2}
Pioche, Nevada	0540 - 9/2	0940 - 9/3	1.9×10^{-2}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 17 - Galileo 0540, 9/2/57		
St. George, Utah	0540 - 9/2	0940 - 9/3	2.2×10^{-2}
	0540 - 9/2	0830 - 9/5	7.2×10^{-3}
Tonopah, Nevada	0558 - 9/2	1056 - 9/3	2.7×10^{-3}
	0558 - 9/2	0920 - 9/5	1.5×10^{-3}
Watertown, Nevada	0540 - 9/2	0930 - 9/3	9.0×10^{-3}
	0540 - 9/2	0930 - 9/4	5.0×10^{-3}
	Detonation 18 - Wheeler 0545, 9/6/57		
	Coulomb B 1305, 9/6/57		
Alamo, Nevada	0545 - 9/6	1020 - 9/7	2.3×10^{-4}
	0545 - 9/6	0605 - 9/8	4.2×10^{-4}
Barstow, California	0550 - 9/6	0945 - 9/7	2.3×10^{-5}
	0550 - 9/6	0605 - 9/8	$1.6 - 10^{-6}$
Beaver, Utah	0610 - 9/6	1000 - 9/7	6.5×10^{-4}
	0610 - 9/6	1000 - 9/8	4.5×10^{-4}
Bishop, California	0545 - 9/6	0945 - 9/7	8.7×10^{-5}
	0545 - 9/6	0600 - 9/8	1.3×10^{-3}
Caliente, Nevada	0545 - 9/6	0945 - 9/7	9.1×10^{-4}
	0545 - 9/6	0600 - 9/8	6.6×10^{-4}
Cedar City, Utah	0550 - 9/6	0910 - 9/7	7.3×10^{-3}
	0550 - 9/6	0610 - 9/8	5.8×10^{-3}
Currant, Nevada	0845 - 9/6	1135 - 9/7	5.4×10^{-4}
Ely, Nevada	0540 - 9/6	0900 - 9/7	3.9×10^{-4}
	0540 - 9/6	0600 - 9/8	2.6×10^{-4}
Eureka, Nevada	0610 - 9/6	0920 - 9/7	4.9×10^{-4}
	0610 - 9/6	0630 - 9/8	5.0×10^{-4}
Hiko, Nevada	0550 - 9/6	0935 - 9/7	2.7×10^{-2}
	0550 - 9/6	0600 - 9/8	1.5×10^{-2}
Indian Springs, Nevada	0545 - 9/6	0855 - 9/7	1.6×10^{-4}
	0545 - 9/6	0600 - 9/8	2.6×10^{-4}
Kingman, Arizona	0545 - 9/6	0945 - 9/7	4.9×10^{-5}
	0545 - 9/6	0600 - 9/8	3.6×10^{-5}
Las Vegas, Nevada	0545 - 9/6	0945 - 9/7	1.2×10^{-5}
	0545 - 9/6	0600 - 9/8	2.2×10^{-5}
Lincoln Mine, Nevada	0545 - 9/6	0915 - 9/7	4.1×10^{-3}
	0545 - 9/6	0600 - 9/8	3.6×10^{-3}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	To	Beta Activity uc/m^3
Detonation 18 - Wheeler 0545, 9/6/57			
Coulomb B 1305, 9/6/57			
Lund, Nevada	0545 - 9/6	1345 - 9/7	2.6×10^{-4}
	0545 - 9/6	0630 - 9/8	1.9×10^{-4}
Mesquite, Nevada	0545 - 9/6	0945 - 9/7	1.3×10^{-4}
	0545 - 9/6	0600 - 9/8	2.1×10^{-4}
Overton, Nevada	0545 - 9/6	0950 - 9/7	2.3×10^{-4}
	0545 - 9/6	0600 - 9/8	2.1×10^{-4}
Pioche, Nevada[1]	0600 - 9/6	0800 - 9/7	2.4×10^{-4}
	0600 - 9/6	0615 - 9/8	2.6×10^{-4}
St. George, Utah	0600 - 9/6	0945 - 9/7	2.7×10^{-4}
	0600 - 9/6	0600 - 9/8	2.7×10^{-4}
Tonopah, Nevada	0600 - 9/6	0940 - 9/7	4.3×10^{-3}
	0600 - 9/6	0550 - 9/8	2.5×10^{-3}
Detonation 19 - La Place 0600, 9/8/57			
Alamo, Nevada	0600 - 9/8	1000 - 9/9	1.9×10^{-3}
	0600 - 9/8	1100 - 9/11	8.3×10^{-4}
Barstow, California	0605 - 9/8	1000 - 9/9	6.3×10^{-5}
	0605 - 9/8	1000 - 9/11	1.1×10^{-4}
Bishop, California	0600 - 9/8	1000 - 9/9	2.8×10^{-3}
	0600 - 9/8	1000 - 9/11	1.6×10^{-3}
Caliente, Nevada	0600 - 9/8	1000 - 9/9	5.8×10^{-3}
	0600 - 9/8	0500 - 9/11	3.3×10^{-3}
Cedar City, Utah	0610 - 9/8	0900 - 9/9	1.6×10^{-3}
	0610 - 9/8	0935 - 9/11	6.3×10^{-4}
Currant, Nevada	0730 - 9/8	1305 - 9/9	1.9×10^{-3}
	0730 - 9/8	1230 - 9/11	7.2×10^{-4}
Ely, Nevada	0600 - 9/8	0845 - 9/9	2.2×10^{-3}
	0600 - 9/8	0950 - 9/11	8.2×10^{-4}
Eureka, Nevada	0630 - 9/8	0930 - 9/9	6.4×10^{-3}
	0630 - 9/8	1115 - 9/11	2.5×10^{-3}
Hiko, Nevada	0605 - 9/8	1000 - 9/9	4.2×10^{-3}
	0605 - 9/8	1000 - 9/11	1.7×10^{-3}
Indian Springs, Nevada	0600 - 9/8	1000 - 9/9	1.4×10^{-3}
	0600 - 9/8	1000 - 9/10	6.7×10^{-4}
Kingman, Arizona	0600 - 9/8	1000 - 9/9	3.9×10^{-5}
	0600 - 9/8	1000 - 9/11	2.4×10^{-5}

1 Power off from 1400, 9/7 until 1640, 9/7.

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 19 - La Place 0600, 9/8/57		
Las Vegas, Nevada	0600 - 9/8	1000 - 9/9	4.0×10^{-4}
	0600 - 9/8	1000 - 9/11	2.7×10^{-4}
Lincoln Mine, Nevada	0600 - 9/8	0900 - 9/9	1.1×10^{-3}
	0600 - 9/8	1000 - 9/11	1.1×10^{-3}
Mercury, Nevada	0620 - 9/8	1005 - 9/9	1.1×10^{-4}
Mesquite, Nevada	0600 - 9/8	1000 - 9/9	1.6×10^{-2}
	0600 - 9/8	1000 - 9/11	6.4×10^{-3}
Nellis AFB, Nevada	0600 - 9/8	1000 - 9/9	4.1×10^{-5}
	0600 - 9/8	1000 - 9/11	9.0×10^{-5}
Overton, Nevada	0600 - 9/8	1000 - 9/9	1.2×10^{-4}
	0600 - 9/8	1000 - 9/11	8.6×10^{-5}
Pioche, Nevada	0615 - 9/8	0915 - 9/9	4.9×10^{-3}
St. George, Utah	0600 - 9/8	1100 - 9/9	1.6×10^{-2}
	0600 - 9/8	1000 - 9/11	6.7×10^{-3}
Tonopah, Nevada	0600 - 9/8	1020 - 9/9	4.1×10^{-3}
	0600 - 9/8	1000 - 9/10	2.5×10^{-3}
Watertown, Nevada	0600 - 9/8	0800 - 9/9	2.2×10^{-4}
	0600 - 9/8	0800 - 9/11	1.8×10^{-4}
	Detonation 20 - Fizeau 0945, 9/14/57		
Alamo, Nevada	1000 - 9/14	1345 - 9/15	9.8×10^{-5}
	1000 - 9/14	0610 - 9/16	9.4×10^{-5}
Barstow, California	0950 - 9/14	1345 - 9/15	1.4×10^{-4}
	0950 - 9/14	0555 - 9/16	9.0×10^{-5}
Beaver, Utah	1100 - 9/14	1200 - 9/15	4.0×10^{-5}
	1100 - 9/14	0500 - 9/16	3.4×10^{-5}
Bishop, California	0945 - 9/14	1345 - 9/15	2.1×10^{-4}
	0945 - 9/14	0550 - 9/16	1.3×10^{-4}
Caliente, Nevada	0930 - 9/14	1345 - 9/15	6.8×10^{-5}
	0930 - 9/14	0550 - 9/16	4.1×10^{-5}
Cedar City, Utah	0950 - 9/14	1335 - 9/15	3.3×10^{-5}
	0950 - 9/14	0550 - 9/16	2.8×10^{-5}
Currant, Nevada	1045 - 9/14	2055 - 9/15	9.3×10^{-4}
	1045 - 9/14	0650 - 9/16	7.2×10^{-4}
Ely, Nevada	0945 - 9/14	0850 - 9/15	2.3×10^{-5}
	0945 - 9/14	0545 - 9/16	5.3×10^{-5}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 20 - Fizeau 0945, 9/14/57		
Eureka, Nevada	1018 - 9/14	0930 - 9/15	4.1×10^{-5}
	1018 - 9/14	0650 - 9/16	1.5×10^{-4}
Hiko, Nevada	1005 - 9/14	1345 - 9/15	1.0×10^{-5}
	1005 - 9/14	0610 - 9/16	1.3×10^{-5}
Kingman, Arizona	0945 - 9/14	1345 - 9/15	4.4×10^{-5}
	0945 - 9/14	0550 - 9/16	3.5×10^{-5}
Las Vegas, Nevada	0530 - 9/14	1700 - 9/15	4.0×10^{-5}
	0530 - 9/14	0550 - 9/16	3.2×10^{-5}
Lincoln Mine, Nevada	1000 - 9/14	1045 - 9/15	1.7×10^{-4}
	1000 - 9/14	0615 - 9/16	1.1×10^{-4}
Lund, Nevada	0945 - 9/14	0550 - 9/15	2.2×10^{-3}
Mercury, Nevada	0950 - 9/14	2155 - 9/15	3.0×10^{-4}
	0950 - 9/14	0600 - 9/16	2.3×10^{-4}
Mesquite, Nevada	0945 - 9/14	1345 - 9/15	1.1×10^{-4}
	0945 - 9/14	0600 - 9/16	6.9×10^{-5}
Nellis AFB, Nevada	0945 - 9/14	1345 - 9/15	6.8×10^{-5}
	0945 - 9/14	0550 - 9/16	5.1×10^{-5}
Overton, Nevada	1030 - 9/14	1345 - 9/15	6.0×10^{-5}
	1030 - 9/14	0550 - 9/16	5.5×10^{-5}
Pioche, Nevada	1030 - 9/14	1030 - 9/15	1.3×10^{-4}
	1030 - 9/14	0600 - 9/16	8.1×10^{-5}
St. George, Utah	1000 - 9/14	1345 - 9/15	8.6×10^{-5}
	1000 - 9/14	0550 - 9/16	7.9×10^{-5}
Tonopah, Nevada	1030 - 9/14	1045 - 9/15	1.7×10^{-2}
	1030 - 9/14	0610 - 9/16	8.7×10^{-3}
Watertown, Nevada	0945 - 9/14	0945 - 9/15	8.8×10^{-5}
	0945 - 9/14	0600 - 9/16	6.5×10^{-5}
	Detonation 21 - Newton 0550, 9/16/57		
Alamo, Nevada	0610 - 9/16	0950 - 9/17	1.3×10^{-5}
	0610 - 9/16	0950 - 9/19	1.3×10^{-5}
Barstow, California	0555 - 9/16	0950 - 9/17	4.6×10^{-5}
	0555 - 9/16	1050 - 9/19	4.2×10^{-5}
Beaver, Utah	0610 - 9/17	0950 - 9/17	3.1×10^{-5}
Bishop, California	0550 - 9/16	0950 - 9/17	1.5×10^{-5}
	0550 - 9/16	0950 - 9/19	1.5×10^{-5}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	To	Beta Activity uc/m^3
	Detonation 21 - Newton 0550, 9/16/57		
Caliente, Nevada	0550 - 9/16	1150 - 9/17	1.1×10^{-5}
	0550 - 9/16	2220 - 9/18	1.1×10^{-5}
Cedar City, Utah	0550 - 9/16	0950 - 9/17	2.3×10^{-5}
	0550 - 9/16	1430 - 9/19	1.5×10^{-5}
Currant, Nevada	0650 - 9/16	1220 - 9/17	5.7×10^{-4}
	0650 - 9/16	1130 - 9/19	2.3×10^{-4}
Ely, Nevada	0550 - 9/16	1015 - 9/17	1.2×10^{-4}
	0550 - 9/16	0955 - 9/19	7.0×10^{-5}
Eureka, Nevada	0650 - 9/16	0550 - 9/17	9.9×10^{-5}
	0650 - 9/16	0520 - 9/18	9.9×10^{-5}
Hiko, Nevada	0610 - 9/16	0950 - 9/17	2.7×10^{-5}
	0610 - 9/16	1220 - 9/19	1.8×10^{-5}
Indian Springs, Nevada	0540 - 9/16	2230 - 9/16	3.4×10^{-5}
Kingman, Arizona	0550 - 9/16	0950 - 9/17	3.9×10^{-5}
	0550 - 9/16	0950 - 9/19	2.4×10^{-5}
Las Vegas, Nevada	0550 - 9/16	0950 - 9/17	7.5×10^{-6}
	0550 - 9/16	0950 - 9/18	7.5×10^{-6}
Lincoln Mine, Nevada	0615 - 9/16	0950 - 9/17	1.7×10^{-4}
	0615 - 9/16	0950 - 9/19	8.0×10^{-5}
Lund, Nevada	0550 - 9/16	1105 - 9/17	5.2×10^{-4}
	0550 - 9/16	1220 - 9/19	2.0×10^{-4}
Mercury, Nevada	0600 - 9/16	0955 - 9/17	3.4×10^{-5}
	0600 - 9/16	1100 - 9/19	3.4×10^{-5}
Mesquite, Nevada	0600 - 9/16	1000 - 9/17	1.0×10^{-3}
	0600 - 9/16	1015 - 9/19	3.8×10^{-4}
Nellis AFB, Nevada	0550 - 9/16	0950 - 9/17	1.0×10^{-5}
	0550 - 9/16	0950 - 9/19	1.0×10^{-5}
Overton, Nevada	0550 - 9/16	0950 - 9/17	2.2×10^{-5}
	0550 - 9/16	0950 - 9/19	2.2×10^{-5}
Pioche, Nevada	0600 - 9/16	0600 - 9/17	1.7×10^{-4}
St. George, Utah	0550 - 9/16	0950 - 9/17	3.8×10^{-5}
	0550 - 9/16	1000 - 9/19	3.3×10^{-5}
Tonopah, Nevada	0610 - 9/16	1145 - 9/17	5.23×10^{-4}
Watertown, Nevada	0600 - 9/16	1000 - 9/17	1.1×10^{-3}
	0600 - 9/16	1030 - 9/19	4.3×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 22 - Whitney 0530, 9/23/57		
Alamo, Nevada	0535 - 9/23	1030 - 9/24	1.8×10^{-5}
	0535 - 9/23	0945 - 9/26	4.5×10^{-5}
Barstow, California	0535 - 9/23	0930 - 9/24	1.1×10^{-4}
	0535 - 9/23	0930 - 9/26	5.9×10^{-5}
Beaver, Utah	0545 - 9/23	1730 - 9/23	9.2×10^{-5}
Bishop, California	0545 - 9/23	0945 - 9/24	2.2×10^{-5}
Caliente, Nevada	0510 - 9/23	0730 - 9/24	2.3×10^{-5}
Cedar City, Utah	0530 - 9/23	0930 - 9/24	3.2×10^{-5}
	0530 - 9/23	1615 - 9/26	4.4×10^{-5}
Currant, Nevada	0630 - 9/23	1030 - 9/24	9.5×10^{-4}
	0630 - 9/23	0630 - 9/25	7.5×10^{-4}
Ely, Nevada	0530 - 9/23	0930 - 9/24	7.2×10^{-5}
	0530 - 9/23	0930 - 9/25	7.2×10^{-5}
Eureka, Nevada[1]	0745 - 9/23	0945 - 9/24	8.9×10^{-3}
	0745 - 9/23	0905 - 9/25	5.5×10^{-3}
Hiko, Nevada	0530 - 9/23	0930 - 9/24	9.0×10^{-5}
	0530 - 9/23	1015 - 9/26	1.1×10^{-4}
Indian Springs, Nevada	0530 - 9/23	0930 - 9/24	2.4×10^{-4}
Kingman, Arizona	0530 - 9/23	0930 - 9/24	3.5×10^{-4}
	0530 - 9/23	0930 - 9/26	2.2×10^{-4}
Las Vegas, Nevada	2230 - 9/22	0930 - 9/24	1.3×10^{-5}
	2230 - 9/22	1900 - 9/26	9.3×10^{-5}
Lincoln Mine, Nevada	0530 - 9/23	0930 - 9/24	4.2×10^{-5}
	0530 - 9/23	0930 - 9/26	1.4×10^{-4}
Lund, Nevada	0530 - 9/23	0930 - 9/24	1.1×10^{-5}
	0530 - 9/23	0545 - 9/25	1.1×10^{-5}
Mercury, Nevada	1130 - 9/22	1250 - 9/24	1.68×10^{-5}
	1130 - 9/22	1525 - 9/26	7.26×10^{-5}
Mesquite, Nevada	0600 - 9/23	1000 - 9/24	8.7×10^{-5}
	0600 - 9/23	1000 - 9/26	5.6×10^{-5}
Overton, Nevada	0530 - 9/23	0930 - 9/24	8.9×10^{-5}
	0530 - 9/23	0930 - 9/26	8.1×10^{-5}
Pioche, Nevada	0700 - 9/23	0800 - 9/24	8.1×10^{-5}
St. George, Utah	0515 - 9/23	0930 - 9/24	2.1×10^{-4}
	0515 - 9/23	1000 - 9/26	2.0×10^{-4}

1 Volume assumed on sample run from 1800, 9/28 to 1000, 9/29 as motor failed during this period.

Figure 12.1 (Cont'd)

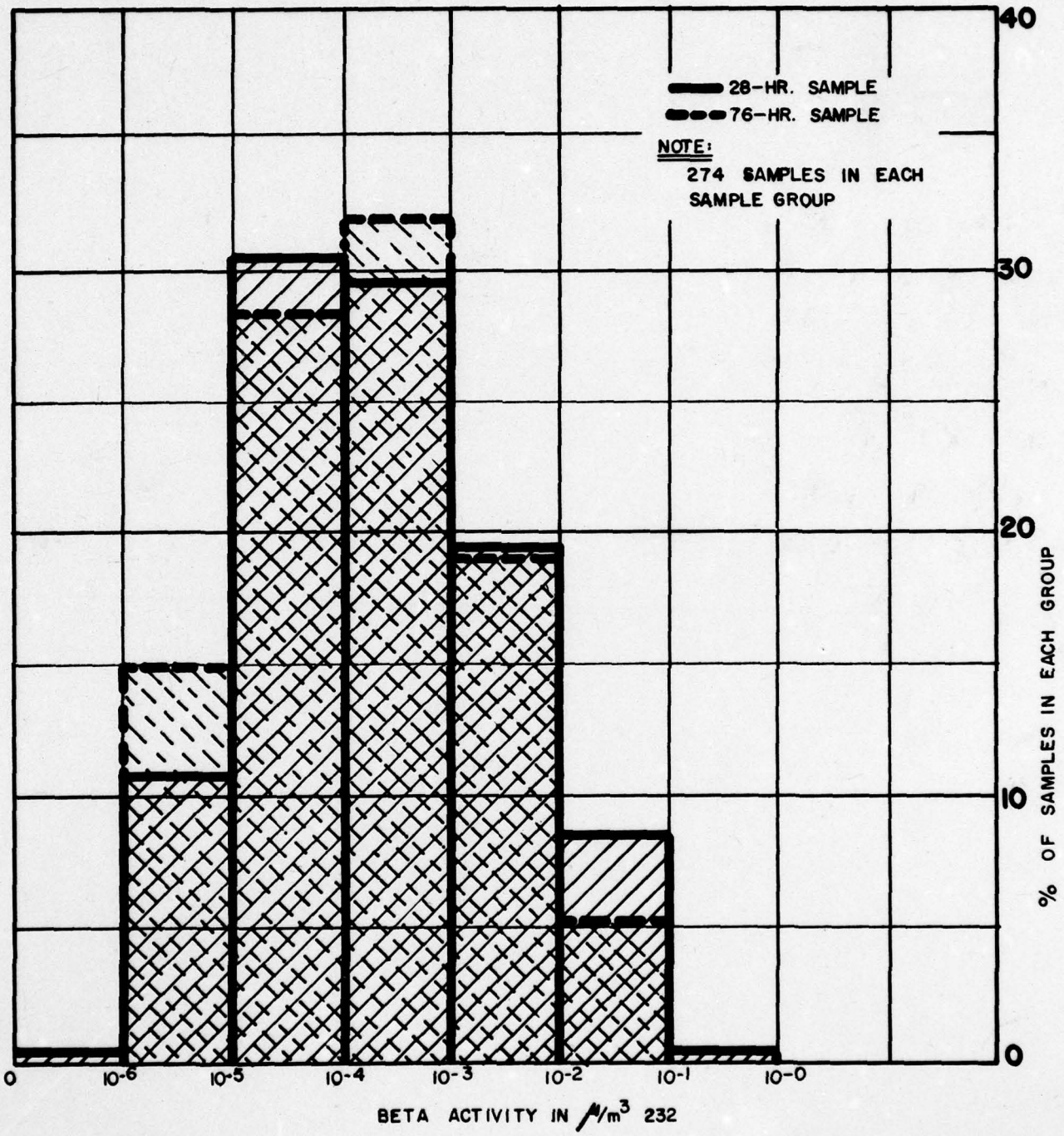
Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 22 - Whitney 0530, 9/23/57		
Tonopah, Nevada	0512 - 9/23	1000 - 9/24	4.2×10^{-2}
	0512 - 9/23	0930 - 9/27	1.7×10^{-2}
Watertown, Nevada	0538 - 9/23	0930 - 9/24	6.3×10^{-5}
	Detonation 23 - Charleston 0600, 9/28/57		
Alamo, Nevada	0615 - 9/28	1000 - 9/29	5.2×10^{-5}
	0615 - 9/28	1000 - 10/1	2.6×10^{-4}
Barstow, California	0605 - 9/28	1000 - 9/29	7.9×10^{-6}
	0605 - 9/28	1000 - 10/1	7.4×10^{-6}
Beaver, Utah	0700 - 9/28	1000 - 9/29	4.2×10^{-5}
Bishop, California	0600 - 9/28	1000 - 9/29	2.2×10^{-5}
	0600 - 9/28	1700 - 10/1	1.2×10^{-5}
Caliente, Nevada	0610 - 9/28	0955 - 9/29	4.4×10^{-5}
	0610 - 9/28	1010 - 10/1	2.1×10^{-4}
Cedar City, Utah	0600 - 9/28	1000 - 9/29	3.1×10^{-5}
	0600 - 9/28	1400 - 10/1	3.5×10^{-4}
Currant, Nevada	0600 - 9/28	1100 - 9/29	5.1×10^{-5}
	0600 - 9/28	0830 - 9/30	8.7×10^{-4}
Ely, Nevada	0600 - 9/28	1000 - 9/29	3.5×10^{-5}
	0600 - 9/28	1000 - 10/1	2.7×10^{-4}
Eureka, Nevada	0615 - 9/28	1000 - 9/29	4.3×10^{-4}
Hiko, Nevada	0610 - 9/28	1000 - 9/29	6.2×10^{-5}
	0610 - 9/28	1000 - 10/1	4.0×10^{-4}
Indian Springs, Nevada	0600 - 9/28	1830 - 9/29	3.9×10^{-4}
Kingman, Arizona	0600 - 9/28	1000 - 9/29	3.6×10^{-5}
	0600 - 9/28	1000 - 10/1	5.4×10^{-4}
Las Vegas, Nevada	0545 - 9/28	1800 - 9/28	2.2×10^{-3}
Lincoln Mine, Nevada	0600 - 9/28	1000 - 9/29	5.4×10^{-5}
	0600 - 9/28	0600 - 9/31	2.7×10^{-4}
Lund, Nevada	0700 - 9/28	1200 - 9/29	5.8×10^{-5}
	0700 - 9/28	1030 - 9/30	1.2×10^{-3}
Mercury, Nevada	0830 - 9/28	1400 - 9/28	9.4×10^{-5}
	0830 - 9/28	1640 - 10/1	2.5×10^{-4}
Mesquite, Nevada	0600 - 9/28	1000 - 9/29	4.4×10^{-4}
	0600 - 9/28	1000 - 10/1	5.2×10^{-4}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 23 - Charleston 0600, 9/28/57		
Overton, Nevada	0600 - 9/28	1040 - 9/29	3.1×10^{-4}
	0600 - 9/28	2000 - 10/1	7.0×10^{-4}
Pioche, Nevada	0630 - 9/28	0900 - 9/29	2.8×10^{-4}
St. George, Utah	0630 - 9/28	1000 - 9/29	9.9×10^{-5}
	0630 - 9/28	0800 - 10/1	3.4×10^{-4}
Tonopah, Nevada	0412 - 9/28	0900 - 9/29	1.5×10^{-3}
Watertown, Nevada	0600 - 9/28	1000 - 9/29	1.6×10^{-4}
	0600 - 9/28	1000 - 10/1	7.8×10^{-5}
	Detonation 24 - Morgan 0500, 10/7/57		
Alamo, Nevada	0515 - 10/7	0900 - 10/8	1.8×10^{-3}
	0515 - 10/7	0830 - 10/10	7.7×10^{-4}
Barstow, California	0505 - 10/7	0900 - 10/8	2.1×10^{-5}
Beaver, Utah	0500 - 10/7	0600 - 10/8	2.1×10^{-4}
	0500 - 10/7	0600 - 10/9	2.4×10^{-4}
Bishop, California	0500 - 10/7	0900 - 10/8	1.7×10^{-5}
	0500 - 10/7	0900 - 10/10	1.2×10^{-5}
Cedar City, Utah	0500 - 10/7	1000 - 10/8	2.2×10^{-4}
	0500 - 10/7	1000 - 10/10	1.1×10^{-4}
Caliente, Nevada	0450 - 10/7	0900 - 10/8	5.3×10^{-4}
	0450 - 10/7	0930 - 10/10	2.1×10^{-4}
Ely, Nevada	0500 - 10/7	0900 - 10/8	3.6×10^{-5}
	0500 - 10/7	0900 - 10/10	2.7×10^{-4}
Hiko, Nevada	0630 - 10/7	1020 - 10/8	3.6×10^{-4}
	0630 - 10/7	1200 - 10/10	2.1×10^{-3}
Indian Springs, Nevada	0500 - 10/7	1600 - 10/7	2.2×10^{-4}
	0500 - 10/7	1000 - 10/9	5.3×10^{-4}
Kingman, Arizona	0500 - 10/7	0900 - 10/8	1.2×10^{-4}
	0500 - 10/7	0900 - 10/9	8.2×10^{-5}
Las Vegas, Nevada	0455 - 10/7	0900 - 10/8	1.9×10^{-4}
	0455 - 10/7	1325 - 10/9	1.2×10^{-4}
Lincoln Mine, Nevada	0500 - 10/7	0900 - 10/8	2.8×10^{-3}
	0500 - 10/7	1130 - 10/10	1.4×10^{-3}
Lund, Nevada	0600 - 10/7	1100 - 10/8	1.6×10^{-4}
	0600 - 10/7	0900 - 10/10	4.1×10^{-3}

Figure 12.1 (Cont'd)

Sampler Location	Sampling Period From	Sampling Period To	Beta Activity uc/m^3
	Detonation 24 - Morgan 0500, 10/7/57		
Mercury, Nevada	0555 - 10/7	1855 - 10/7	4.4×10^{-3}
Mesquite, Nevada	0500 - 10/7	0900 - 10/8	6.3×10^{-5}
	0500 - 10/7	0900 - 10/9	6.4×10^{-5}
Nellis AFB, Nevada	0500 - 10/7	0900 - 10/8	2.0×10^{-4}
	0500 - 10/7	0900 - 10/9	1.6×10^{-4}
Pioche, Nevada	0530 - 10/7	0930 - 10/8	1.1×10^{-4}
	0530 - 10/7	0930 - 10/9	9.9×10^{-5}
St. George, Utah	0500 - 10/7	0530 - 10/8	9.5×10^{-5}
	0500 - 10/7	1000 - 10/10	3.5×10^{-5}
Tonopah, Nevada	0520 - 10/7	0905 - 10/8	1.0×10^{-5}
Watertown, Nevada	0500 - 10/7	0900 - 10/8	5.4×10^{-4}
	0500 - 10/7	0900 - 10/10	1.7×10^{-4}



DISTRIBUTION OF SELECTED AIR SAMPLING RESULTS FOR 28 & 76-HOUR PERIODS

Figure 12.2

CHAPTER XIII

CONTINUOUS RECORDERS

13.1 General.

Continuous recorders provided much information as to the time of arrival of fallout, the time of buildup, the peak reading, and the time elapsed until background readings were obtained again.

As the recorders were placed in populated locations and thus in a sense shielded from fallout by administrative decision of the Test Organization, there were only nine instances when the instrument indicated more than one mr/hr. at the peak.

13.2 Results.

The data from each recorder chart (where a maximum of one mr/hr or greater was obtained) have been plotted on log-log graph paper. Of the seven graphs plotted, the decay factor range from -1.50 to -2.94.

Graphs were plotted by utilizing the visual best line of fit. The time intervals encompassed in each case are quite varied. From 0.1 mr/hr. (the minimum response of the recorder) through the maximum reading and returning to 0.1 mr/hr., the time elapsed varies between H + 2 and H + 600 hours. The following tabulation lists the shot, the decay factor, and the elapsed time for that factor.

Shot	Decay Factor	Elapsed Time In H + Hours
Boltzmann	-1.50	4.0 to 32
Hood	-1.56	2.2 to 32
Diablo	-2.44	6.6 to 42
	-1.56	4.5 to 600
Smoky	-1.55	7.5 to 86
	-2.94	6.9 to 27
	-2.00	10.5 to 150

The log-log graph of the Lincoln Mine recorder for "Diablo" is presented as Figure 13.1. This graph is typical of the plots and shows fairly good fit of the line.

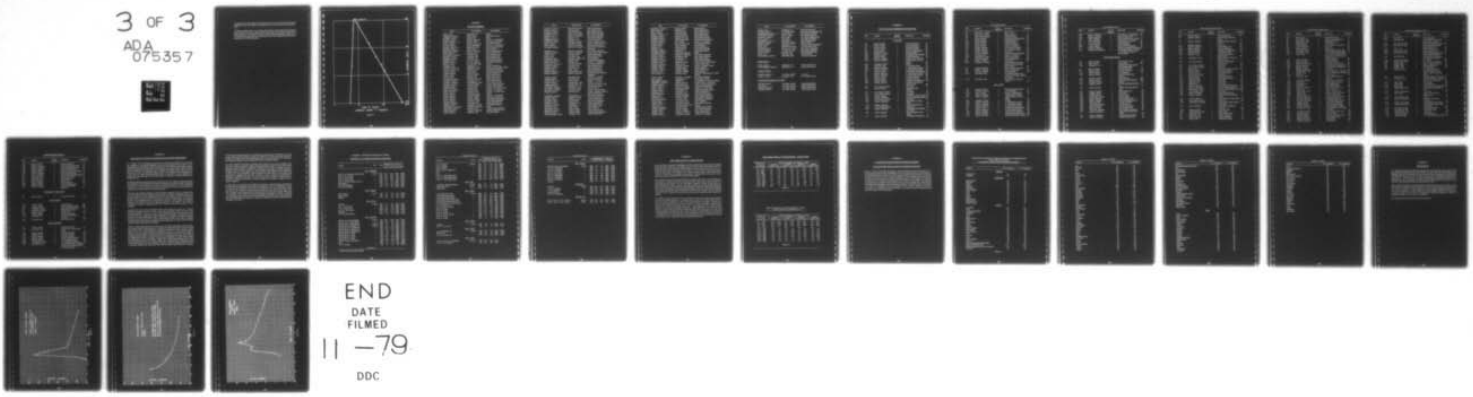
The chart of the recorder is driven by a sunchronous timing motor which has to operate on a frequency of 60 cycles to maintain accuracy. The charts were time-checked and dated at least once every 48 hours to insure proper operation of the instrument.

The chart paper is a linear paper whereas the trace on the recorder is actuated by a logarithmic output. Therefore, the chart has a logarithmic curve plotted on linear paper. The chart is two inches wide and the range of intensities was from 0.1 mr/hr. to 1000 mr/hr.

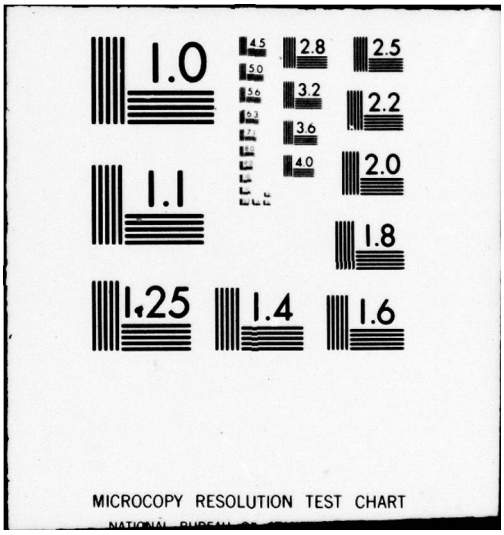
The data from these curves was extracted visually and by judgement. The log-log plots were obtained from this extracted data.

AD-A075 357 NEVADA TEST ORGANIZATION (AEC) MERCURY OFF-SITE RADI--ETC F/G 18/3
OPERATION PLUMBBOB OFF-SITE RADIOLOGICAL SAFETY REPORT. NEVADA --ETC(U)
1957 O R PLACAK , M W CARTER , R A GILMORE
UNCLASSIFIED OTO-57-3 NL

3 OF 3
ADA
075357



END
DATE
FILMED
11 -79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART

The recorder had a time constant of 100 seconds at the low end of the scale and decreased by a factor of 10 for each decade. The overall accuracy of the instrument was approximately ± 5%.

Continuous recorders served a very useful public relations purpose and yielded interesting data. Because of the type of output and chart stated above, the extraction of this data is difficult. However, it is possible to design a system that eliminates these objections and will provide very useful data. It is recommended that these instruments should become a permanent part of off-site operations.

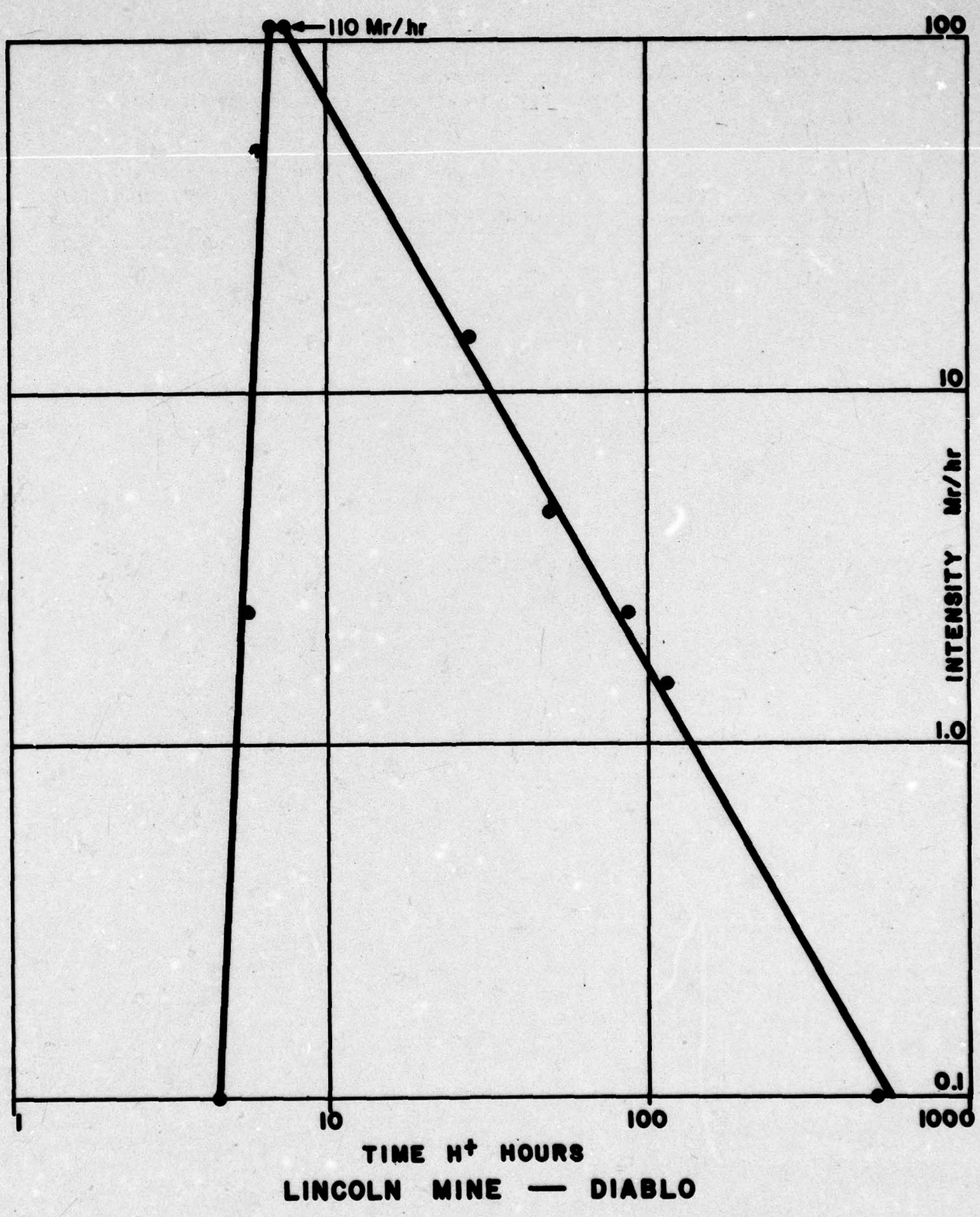

110 Mr/hr
100
10
1.0
0.1
INTENSITY Mr/hr
1
10
100
1000
TIME H+ HOURS
LINCOLN MINE — DIABLO

Figure 13.1

APPENDIX I

OFF-SITE PERSONNEL

Name	City and State	Job Affiliation
ADAIR, John L.	Gainesville, Fla.	Student
ANDERSON, Richard J.	Bemidji, Minn.	Public Health Service
ANDREWS, Vernon E.	Eureka, Calif.	Student
ARONSON, John N.	Madison, Wisconsin	Teacher, U. of Wisconsin
BAKER, Everette F., Jr.	Bellevue, Wash.	State Health Department
BALES, Ronald E.	Salt Lake City, Utah	Public Health Service
BALTZO, Ralph M.	Seattle, Washington	Teacher, U. of Washington
BARKER, Blaine B., Jr.	Minneapolis, Minn.	State Health Department
BENTLEY, Wesley D.	Dallas, Texas	Private Industry
BERNAUER, George F.	Madison, Wisconsin	State Health Department
BEVIS, Herbert A.	Monterey, Calif.	Public Health Service
BLANCHARD, Richard A.	Oak Ridge, Tenn.	Public Health Service
BOHNSLAV, Paul T.	Cincinnati, Ohio	Public Health Service
BORDNER, Robert H.	Cincinnati, Ohio	Public Health Service
BRENNAN, Ray A.	Denver, Colorado	State Health Department
BREWER, Monroe F.	St. Louis, Missouri	City Health Department
BROWN, H. Jess	Salt Lake City, Utah	Teacher
BURGESS, Iran K.	Washington, D. C.	Public Health Service
CARAWAY, Prentice A.	Stephenville, Texas	Teacher, Tarleton State College
CHURCH, James L., Jr.	Nashville, Tenn.	State Health Department
CLARK, George W.	Athens, Ohio	Teacher, Ohio University
CLARKE, Robert L.	Kansas City, Mo.	Public Health Service
COHEN, Jules B.	Denver, Colorado	Public Health Service
COLE, James W.	Baltimore, Md.	Baltimore & Ohio RR
COLEMAN, Richard D.	Salt Lake City, Utah	Public Health Service
CUNNIFF, Patrick F.	Washington, D. C.	Public Health Service
DAVIDSON, Charles M.	Signal Mountain, Tenn.	Tenn. Valley Authority
DeFRAIN, Orville D.	Lincoln, Nebraska	County Health Department
DeMARINIS, Frank	Cleveland, Ohio	Teacher, Fenn College
DRAKE, Charles H.	Pullman, Wash.	Teacher, Wash. State College
DREVDAHL, Elmer R.	Tucson, Arizona	Teacher, U. of Arizona
EGRY, C. Robert	South Bend, Ind.	Teacher, U. of Notre Dame
ELDER, Robert L.	Philomath, Oregon	Student
EVANS, Thomas A.	Lincoln, Nebraska	Teacher, U. of Nebraska
FETZ, Richard H.	Atlanta, Georgia	State Health Department
FLORA, David H.	Durango, Colorado	County Health Department
FRAGA, Gilbert W.	Carmichael, Calif.	State Health Department
GEILKER, Charles D.	Cincinnati, Ohio	Public Health Service
GORDON, Larry J.	Albuquerque, N. Mex.	City Health Department
GREENBLATT, Gordon M.	Milwaukee, Wisconsin	Student
HALLMARK, Gene H.	Modesto, Calif.	County Health Department
HARRIS, Carroll F.	Stillwater, Oklahoma	Teacher, Oklahoma A & M
HASS, Gerhardt C.	Berkeley, Calif.	State Health Dept.

Name	City and State	Job Affiliation
HOLADAY, Duncan A.	Salt Lake City, Utah	Public Health Service
HAUSER, Thomas R.	Cincinnati, Ohio	Public Health Service
HAYWARD, Robert P.	Pierre, South Dakota	State Health Department
HENDERSON, Carl E.	Santa Fe, New Mexico	State Health Department
HENSHAW, Jack A.	Nashville, Tennessee	State Health Department
HERLIHY, James F.	Simsgury, Conn.	City Health Department
HERRINGER, Elmer J.	Washington, D. C.	Public Health Service
HODNETT, Ernest M.	Stillwater, Oklahoma	Teacher, Oklahoma A & M
HOWE, William A.	Carbondale, Illinois	Teacher, Southern Illinois U.
HURST, William D.	Tazewell, Tennessee	State Health Department
JACOBSON, George L.	Rapid City, S. Dakota	Teacher, School of Mines & Technology
JENNINGS, Joe D.	Smithville, Tennessee	State Health Department
JOHNSON, Oliver H.	Pullman, Washington	Teacher, Wash. State College
JONES, John D.	Cincinnati, Ohio	Public Health Service
KAHN, Bernd	Oak Ridge, Tenn.	Public Health Service
KAUFMAN, Sumner	Hastings-on-Hudson, NY	Private Industry
KINGSBURY, Harlan W.	Braintree, Mass.	City Health Department
KISIEL, Chester C.	Pittsburgh, Pa.	Teacher, U. of Pittsburgh
KOZUSZEK, Theodore K.	Kenosha, Wisconsin	City Health Department
KRIEGER, Herman L.	Cincinnati, Ohio	Public Health Service
KRONER, Robert C.	Cincinnati, Ohio	Public Health Service
KROPP, Virgil L.	Dallas, Texas	Public Health Service
KUSNETZ, Howard L.	Salt Lake City, Utah	Public Health Service
KUZDAS, Charles D.	Madison, Wisconsin	Wisconsin Alumni Research Foundation
LACKEY, James B.	Gainesville, Fla.	Teacher, U. of Florida
LARSEN, Ralph I.	Cincinnati, Ohio	Public Health Service
LEDBETTER, Joe O.	Austin, Texas	Teacher, U. of Texas
LEPAK, Joseph W.	Salt Lake City, Utah	Teacher, U. of Utah
LOEHR, Raymond C.	Fairview Park, Ohio	Teacher, Case Inst. of Tech.
LONGAKER, Ralph K.	Washington, D. C.	Public Health Service
MacDONALD, Russell W.	Dade City, Florida	Private Industry
MacLEMAN, Everett L.	New Haven, Conn.	Teacher, Yale University
MAKENS, Royal F.	Houghton, Mich.	Teacher, Michigan College of Mining & Technology
MARCHESE, Anthony S.	Poughkeepsie, N. Y.	State Health Department
MARTIN, James E.	Chapel Hill, Tenn.	Public Health Service
MATHEWS, Dean S.	San Bruno, Calif.	Public Health Service
MAUGHAN, Cyril P.	Preston, Idaho	City Health Department
McBRIDE, John R.	Washington, D. C.	Public Health Service
McGRORY, Joseph B.	Washington, D. C.	Public Health Service
McMULLEN, Don J.	Orinda, Calif.	State Highway Dept.
MELGREN, Willis H.	Ozark, Missouri	Frisco Railway
MEREDITH, James C.	Atlanta, Georgia	Public Health Service
MEYER, Orville L.	Wheaton, Illinois	County Health Department
MIDDLEBROOKS, Eddie J.	Cincinnati, Ohio	Public Health Service

Name	City and State	Job Affiliation
MITCHELL, Charles H.	Tucson, Arizona	Private Industry
MILLS, William A.	Washington, D. C.	Public Health Service
NEILL, Robert H.	Atlanta, Georgia	Public Health Service
NELSON, Donald J., Jr.	Idaho Falls, Idaho	Public Health Service
NELSON, Francis L.	Hickman Mills, Mo.	Public Health Service
NUSSBAUM, Morris A.	Kingston, New York	City Health Department
OLMSTED, Roger O.	Port Angeles, Wash.	District Health Department
ORCUTT, Richard G.	Reno, Nevada	Teacher, U. of Nevada
PALMER, Jack S.	Salt Lake City, Utah	State Health Department
PATE, Charles W.	Tulsa, Oklahoma	Private Industry
PERRIN, Joe L.	Chicago, Illinois	Public Health Service
PICKLES, Louis W.	Peoria, Illinois	City Health Department
PIOTTER, Ronald E.	Washington, D. C.	Public Health Service
PRITCHARD, Murry T.	Kansas City, Missouri	Student
PRUCHA, Arnold A.	Sacramento, California	State Health Department
RASCHKA, George J.	Minneapolis, Minn.	State Health Department
RECHEN, Henry J. L.	Washington, D. C.	Public Health Service
REINHART, Warren H.	New Orleans, La.	State Health Department
ROBOHN, Walter F.	Manhattan, Kansas	Teacher, Kansas State College
RODNEY, Leonard M.	Dallas, Texas	Public Health Service
ROSSER, Shirley E.	Lynchburg, Virginia	Teacher, Lynchburg College
RUCKER, Vernon L.	Topeka, Kansas	Santa Fe Railway
RUPPERT, Edwin L.	Arlington, Virginia	Public Health Service
SADLER, Jack W.	Crossett, Arkansas	Private Industry
SAPP, Julian F. Sr.	Nashville, Tenn.	Nashville, Chattanooga & St. Louis Railway
SEAGLE, Edgar F.	Charlotte, N. Carolina	City Health Department
SEAL, Morgan S.	Washington, D. C.	Public Health Service
SELHEIMER, Charles W.	Chicago, Ill.	Ill. Institute of Technology, Teacher
SENGBUSCH, Howard G.	Buffalo, New York	Teacher, State U. of New York
SCHEIN, Martin W.	State College, Pa.	Teacher, Pennsylvania State U.
SHARPE, Thomas J.	Hickory, N. Carolina	County Health Department
SHILTS, Walter L.	South Bend, Indiana	Teacher, U. of Notre Dame
SHINER, Andrew J.	Falls Church, Va.	Central Intelligence Agency
SILHANEK, Jay S.	Washington, D. C.	Public Health Service
SKODJE, Marvin T.	Minneapolis, Minn.	State Health Department
SMITH, Ray C.	Tacoma, Washington	County Health Department
SNYDER, Glen W.	Hillsboro, Oregon	County Health Department
SOLOYANIS, George	Camp Hill, Penn.	State Welfare Department
STONE, Ralph	Los Angeles, Calif.	Private Industry
SUNDIN, Robert E.	Cheyenne, Wyoming	State Health Department
TAFT, Paul F.	Thompson Station, Tenn.	Student
TANIMOTO, Ralph H.	Honolulu, Hawaii	Territory Dept. of Health
TeSELLE, Eugene A.	Denver, Colorado	State Health Department
THOMAS, Fred W.	Florence, Alabana	Tenn. Valley Authority
THOMAS, Lyle D.	Bayonne, New Jersey	Public Health Service
TINDAL, Robert T.	Tuscaloosa, Alabana	Teacher, U. of Alabama

Name	City and State	Job Affiliation
TRAINA, Paul J.	Washington, D. C.	Public Health Service
VACCARO, Ralph F.	W. Fallmouth, Mass.	Woods Hole Oceanographic Inst.
VanDEVENDER, Virgil C., Jr.	Jackson, Miss.	State Health Department
VanNATTAN, William R.	Denver, Colorado	State Health Department
VOGTMAN, Donald B.	Boise, Idaho	U.S. Fish & Wildlife Service
WAHL, Andrew J.	Boise, Idaho	City Health Department
WANNINGER, Lester A., Jr.	Washington, D. C.	Public Health Service
WENZEL, William J.	Great Falls, Montana	Private Industry
WHITE, David G.	Washington, D. C.	Teacher, George Washington U.
WILEY, Adam	Monterey Park, Calif.	City Health Department
WILLIAMS, Giles M.	Gastonia, N. Carolina	State Dept. of Agriculture
WILSON, Edward F.	N. Little Rock, Ark.	State Health Department
WOLLE, Robert H.	Knoxville, Tenn.	State Health Department
WONG, Lan J.	Cincinnati, Ohio	Private Industry
ZICKEFOOSE, Charles S.	Walla Walla, Wash.	City Health Department
Medical Officers		
STAHL, Walter L.	Washington, D. C.	Public Health Service
van der SMISSEN, Eugene T.	Washington, D. C.	Public Health Service
Veterinary Officers		
JOHNSON, Edward L.	Las Vegas, Nevada	U. S. Army
WOLFF, Arthur H.	Cincinnati, Ohio	Public Health Service
Permanent Staff Assigned to Las Vegas		
CARTER, Melvin W.	Las Vegas, Nevada	Public Health Service
COX, Norma	Las Vegas, Nevada	Public Health Service
GILMORE, Richard A.	Las Vegas, Nevada	Public Health Service
PLACAK, Oliver R.	Las Vegas, Nevada	Public Health Service

APPENDIX II

PUBLIC RELATIONS PRESENTATIONS USING FILMS

Date	Location	No. of Showings	Type Group	Attendance
		A is for Atom		
4-5	Mercury, Nevada	1	DOD-Task Group 57	18
4-17	Mercury, Nevada	1	Test Site Personnel	10
5-1	Mercury, Nevada	1	Test Site Personnel	30
5-8	Mercury, Nevada	1	Test Site Personnel	23
5-16	Alamo, Nevada	1	High & Jr. High Students	75
5-20	Bunkerville, Nevada	1	Jr. High Students	30
5-20	Mesquite, Nevada	1	Elementary School Students	15
5-22	Mercury, Nevada	1	Rad-Safe Personnel	20
5-23	Barstow, California	1	Cameron School Teachers	5
5-24	Barstow, California	1	Cameron School, 5th & 6th Grades	60
5-24	Logandale, Nevada	1	Students	40
5-27	Cedar City, Utah	1	Civil Defense Group	30
5-27	Barstow, California	3	Jr. High Science Classes	90
5-28	Barstow, California	3	Jr. High Science Classes	85
6-3	Overton, Nevada	1	Moapa Valley High Students	100
6-3	Barstow, California	4	Sr. High Science Classes	120
6-4	Barstow, California	3	Sr. High Science Classes	105
6-6	Mercury, Nevada	1	Test Site Personnel	25
6-13	Mercury, Nevada	1	Test Site Personnel	22
6-19	Bishop, California	1	Volunteer Fire Department	22
6-23	Kingman, Arizona	1	Chamber of Commerce & General Public	100
6-28	Lee's Canyon, Nevada	1	Boy Scouts	45
7-3	Mercury, Nevada	1	Contractor & DOD Personnel	7
7-4	Lee's Canyon, Nevada	1	Boy Scouts	87
7-11	Lee's Canyon, Nevada	1	Boy Scouts	75
7-11	Mercury, Nevada	1	Contractor & DOD Personnel	14
7-18	Barstow, California	1	Thomson Elementary School	140
7-23	Lee's Canyon, Nevada	1	Boy Scouts	15
7-24	Barstow, California	1	High School & Jr. High School	66
7-24	Hinkley, California	1	School Teacher Review	4
7-25	Lee's Canyon Nevada	1	Boy Scouts	50
7-25	Hinkley, California	1	Elementary School Students and Parents	36
7-25	Yermo, California	1	School Teachers & Army Officer	9
8-1	Yermo, California	1	Yermo School - Elementary	52

A is for Atom (Cont'd)

Date	Location	No. of Showings	Type Group	Attendance
8-2	Estes Park, Colorado	1	YMCA Preview	7
8-3	Estes Park, Colorado	1	YMCA Conference	75
8-5	Camp Irwin, California	1	Elementary School	53
8-7	Yermo, California	1	Yermo School - Evening, Adult	10
8-7	Dighton, Kansas	1	Neighborhood Group	35
8-15	Yermo, California	1	General Audience	20
8-15	Mercury, Nevada	1	Contractor Personnel	11
8-17	Mercury, Nevada	1	Project 37 Personnel	16
8-31	Bishop, California	1	Tri-County Fair Visitors	110
9-1	Bishop, California	1	Tri-County Fair Visitors	65
9-3	Barstow, California	1	Lions Club	30
9-7	Barstow, California	1	Service & Civilian Personnel	32
9-25	St. George, Utah	1	Chamber of Commerce	50
9-25	Independence, Calif.	1	FCDA - County Group	60
10-1	Big Pine, California	1	High School Students	90
10-7	Bishop, California	1	PTA Meeting	250
10-30	Vermillion, S. Dakota	1	Medical Students & Doctors, University of South Dakota Medical School	55
11-8	Needles, California	1	Bank of America Employees	17
11-8	Needles, California	1	Masonic Organization	60
11-8	Needles, California	1	Fire Department	30
11-8	New Haven, Conn.	1	Yale Student Chapter of Am. Society of Civil Engrs. Officers and Advisor	5
11-12	New Haven, Conn.	1	Yale - Students, Faculty & Visitors	30

Atomic Energy

5-20	Mesquite, Nevada	1	Elementary School Students	15
5-21	Bunkerville, Nevada	1	Jr. High Students	30
5-16	Alamo, Nevada	1	High & Jr. High Students	75
5-23	Barstow, California	1	Cameron School Teachers	5
5-24	Barstow, California	1	Cameron School, 5th & 6th Grades	60
5-24	Logandale, Nevada	1	Students	40
5-27	Barstow, California	3	Jr. High Science Classes	90
5-28	Barstow, California	3	Jr. High Science Classes	85
6-3	Barstow, California	4	Sr. High Science Classes	120
6-3	Overton, Nevada	1	Moapa Valley High Students	100
6-4	Barstow, California	3	Sr. High Science Classes	105
6-19	Bishop, California	1	Volunteer Fire Department	22
7-18	Barstow, California	1	Thompson Elementary School	140
7-24	Bishop, California	1	State Highway Dept. Personnel	25

Atomic Energy (Cont'd)

Date	Location	No. of Showings	Type Group	Attendance
7-24	Barstow, California	1	High School & Jr. High School	66
7-24	Hinkley, California	1	School Teacher Review	4
7-25	Yermo, California	1	School Teachers & Army Officer	9
8-1	Yermo, California	1	Yermo School – Elementary	52
8-5	Camp Irwin, Calif.	1	Elementary School	53
8-15	Yermo, California	1	General Audience	20
8-30	Mercury, Nevada	1	Project 38 Vets & Students	25
9-7	Barstow, California	1	Service & Non-Service Personnel	32
11-8	New Haven, Connecticut	1	Yale Student Chapter Am. Society of Civil Engrs. Officers and Faculty Advisor	5

Atomic Tests in Nevada

4-5	Mercury, Nevada	1	Task Group 57 – DOD	18
4-17	Alamo, Nevada	1	Towns People	150
4-23	Washington, D. C.	1	Radiological Health Program, Public Health Service	8
5-1	Mercury, Nevada	1	Test Site Personnel	50
5-8	Mercury, Nevada	1	Test Site Personnel	23
5-11	Overton, Nevada	1	Fire Department	28
5-13	Mesquite, Nevada	1	Preview by High School Principal	1
5-14	Watertown, Nevada	2	Base Personnel	207
5-15	Overton, Nevada	1	Moapa Valley High Students	400
5-17	Logandale, Nevada	1	Students	40
5-19	Kingman, Arizona	1	St. John's Methodist Breakfast Club	40
5-21	Cedar City, Utah	1	College of So. Utah Physics Class	8
5-21	Bishop, California	1	Bishop Rotary Club	40
5-21	Tonopah, Nevada	1	Rotary Club	22
5-21	Goldfield, Nevada	1	Towns People	18
5-22	Lincoln Mine, Nevada	1	Theater Patrons	30
5-22	Bishop, California	1	Bishop Highway Patrol	25
5-23	Bishop, California	1	Bishop Toastmaster's Club	18
5-24	Mercury, Nevada	1	Test Site Personnel	20
5-24	Lincoln Mine, Nevada	1	Theater Patrons	40
5-24	Bishop, California	1	Big Pine High School	60
5-27	Cedar City, Utah	1	Civil Defense Group	30
5-28	Mono Lake, California	1	Mono Chamber of Commerce	65
6-3	Barstow, California	1	Thomson School, 5th & 6th Grades	100
6-4	Barstow, California	1	Cameron School Teachers	6
6-5	Barstow, California	1	Ridgecrest Rotary Club	30

Atomic Tests in Nevada (Cont'd)

Date	Location	No. of Showings	Type Group	Attendance
6-6	Mercury, Nevada	1	Test Site Personnel	25
6-6	Barstow, California	1	Cameron School, 5th & 6th Grades	85
6-7	Barstow, California	1	Henderson School, 5th & 6th Grades	110
6-11	Kingman, Arizona	1	Lions Club	55
6-12	Barstow, California	1	Barstow Rotary Club	50
6-13	Mercury, Nevada	1	Test Site Personnel	22
6-19	Bishop, California	1	Volunteer Fire Department	22
6-19	Mercury, Nevada	1	CETG-FCDA Group	55
6-23	Kingman, Arizona	1	Chamber of Commerce & General Public	100
6-25	Independence, Calif.	1	Guests & Wives of Mono-Inyo Medical Assoc.	21
6-26	Las Vegas, Nevada	1	Business & Professional Women's Club	90
6-28	Lee's Canyon, Nevada	1	Boy Scouts	45
7-4	Lee's Canyon, Nevada	1	Boy Scouts	87
7-9	Beaver, Utah	1	Chamber of Commerce (Junior)	21
7-3	Mercury, Nevada	1	DOD Representatives	9
7-3	Mercury, Nevada	1	Test Site Personnel	7
7-11	Lee's Canyon, Nevada	1	Boy Scouts	75
7-11	Mercury, Nevada	1	Test Site Personnel	14
7-12	Mercury, Nevada	1	DOD Medical Personnel	12
7-15	Cedar City, Utah	1	Lions Club	75
7-15	Panguitch, Utah	1	Lions Club	30
7-17	Milford, Utah	1	Lions Club	15
7-18	Barstow, California	1	Thomson Elementary School	140
7-18	Santa Fe, New Mexico	1	N. Mex. District Health Dept.	30
7-21	Benton Station, Calif.	1	Owen's Valley Stockmen's Assoc.	35
7-23	Lee's Canyon, Nevada	1	Boy Scouts	15
7-24	Hinkley, California	1	School Teacher Review	4
7-25	Hinkley, California	1	Elementary School Students & Parents	36
7-25	Yermo, California	1	School Teachers & Army Officer	9
7-25	Lee's Canyon, Nevada	1	Boy Scouts	50
7-26	Deep Springs, California	1	Deep Springs College Students and Faculty	40
7-30	Yermo, California	1	Yermo School-Students & Teachers	53
7-30	Mercury, Nevada	1	FCDA Observers	23
7-30	Colorado Springs, Colo.	1	Family Group	6
8-2	Estes Park, Colo.	1	YMCA Preview Group	7
8-3	Estes Park, Colo.	1	YMCA Conference	75
8-3	Mercury, Nevada	1	Military Physicians	9
8-4	Beaver, Utah	1	Neighborhood Group	10

Atomic Tests in Nevada (Cont'd)

Date	Location	No. of Showings	Type Group	Attendance
8-5	Beaver, Utah	1	Neighborhood Group	19
8-6	Port Angeles, Wash.	1	Olympic Health Department	9
8-6	Port Angeles, Wash.	1	Neighborhood Group	12
8-7	Dighton, Kansas	1	Family Group	35
8-7	Yermo, California	1	Yermo School, Evening Adult	10
8-8	Port Angeles, Wash.	1	Lions Club	30
8-8	Dighton, Kansas	1	Rotary Club	55
8-12	Port Angeles, Wash.	1	Olympic Health Hospital Staff	31
8-12	Port Angeles, Wash.	1	Olympic Health Hospital Staff	9
8-12	Seattle, Wash.	1	Univ. of Wash. National Science Foundation —College & High School Instructors	53
8-15	Yermo, California	1	General Audience	20
8-15	Mercury, Nevada	1	Test Site Personnel	11
8-20	Fish Lake Valley, Cal.	1	4-H Club at School in Dyer	48
8-30	Bishop, California	1	Tri-County Fair-General Public	75
8-30	Mercury, Nevada	1	Project 38 Vets and Students	25
9-3	Barstow, California	1	Lions Club	30
9-6	San Bernardino, Calif.	1	County Health Dept. Personnel	40
9-7	Barstow, Calif.	1	Service & Non-Service Personnel	32
9-11	Peoria, Ill.	1	Women's Club	53
9-15	Cleveland, Ohio	1	Fenn College Students & Teachers	12
9-18	Las Vegas, Nevada	1	Chiropractor's Association	25
9-18	Moab, Utah	1	Health & Safety Council	15
9-19	Cleveland, Ohio	1	Men's Organization	30
9-19	Moab, Utah	1	High School Students	35
9-19	Rovanna, California	1	Lions Club – Pine Creek	19
9-24	Vernal, Utah	1	Clinic for Nurses	21
9-25	Independence, Calif.	1	FCDA – County Group	60
9-26	Logan, Utah	1	District Health Dept. Staff	10
9-30	Gallup, N. Mex.	1	District 2 Health Dept.	18
10-1	Salt Lake City, Utah	1	Knights of the Round Table	30
10-1	Big Pine, California	1	High School Students	90
10-2	Salt Lake City, Utah	1	City Health Dept. Lab Staff	12
10-3	Caliente, Nevada	1	Grammar School Students	60
10-4	Caliente, Nevada	1	Grammar School Students	60
10-4	Kingston, New York	1	City of Kingston Lab Staff	16
10-4	Albuquerque, N. Mex.	1	City Health Dept. and District Sanitarians	25
10-4	Las Vegas, Nevada	1	Democratic Women's Club	80
10-7	Caliente, Nevada	1	General Public	50
10-7	Caliente, Nevada	1	Lincoln County High School	180
10-7	Kingston, New York	1	Civil Defense Class	11
10-7	Bishop, California	1	PTA Meeting	250
10-9	Rovanna, California	1	PTA Meeting	75

Atomic Tests in Nevada (Cont'd)

Date	Location	No. of Showings	Type Group	Attendance
10-11	Ely, Nevada	1	PTA and Students	60
10-16	Cleveland, Ohio	1	Case Institute of Technology Civil Engr. Dept. Staff	5
10-21	Salt Lake City, Utah	1	Public Health Representatives	30
10-23	Salt Lake City, Utah	1	Personnel of 328th General Hospital (Reserve)	50
10-24	Ogden, Utah	1	City Health Dept. Staff	15
10-25	Salt Lake City, Utah	1	Church Couples Club	24
10-28	Salt Lake City, Utah	1	PHS Occupational Health Field Station Staff and Families	15
10-28	Cleveland, Ohio	1	Case Institute of Technology Civil Engineering Students	61
10-28	Marion, South Dakota	1	PTA Group	65
10-29	San Francisco, Calif.	2	Div. of Highway Employees	65
11-8	Needles, Calif.	1	Bank of America Employees	17
11-8	Needles, Calif.	1	Masonic Organization	60
11-8	Needles, Calif.	1	Fire Department	30
11-8	New Haven, Conn.	1	Yale Student Chapter of American Society of Civil Engrs., Officers and Faculty Advisor	5
11-9	Belen, N. Mex.	1	Catholic Daughters of America	40
11-12	New Haven, Conn.	1	Yale Student Chapter of American Society of Civil Engineers	30
11-13	Boise, Idaho	1	Elk's Lodge	85
11-14	Boise, Idaho	1	City Employees	35
11-14	Boise, Idaho	1	City Employees & Business Men	30
11-14	Independence, Calif.	1	Owens Valley Unified School PTA	38
11-18	Santa Fe, New Mexico	1	PTA Group	50
11-19	Boise, Idaho	1	Mayor, City Councilmen, Business Men	19
11-20	Salt Lake City, Utah	1	Nurses	20
11-21	Santa Fe, New Mexico	1	Society of Professional Engineers	35
11-21	Santa Fe, New Mexico	1	Berean Baptist Church Group	40
11-21	Santa Fe, New Mexico	1	Berean Baptist Group at State Penitentiary	100
11-26	Las Vegas, Nevada	1	High School Students	75
12-11	Salt Lake City, Utah	2	Church Men's Club	75
7-22	Beryl Junction, Utah	1	Lions Club	30
7-31	Camp Irwin, Calif.	1	Elementary School	44
8-31	Bishop, California	1	Tri-County Fair-General Public	60

Bikini Radiological Laboratory

Date	Location	No. of Showings	Type Group	Attendance
4-17	Mercury, Nevada	1	Test Site Personnel	10
7-22	Barstow, California	1	Thomson Elementary School	30
7-23	Barstow, California	1	Thomson Elementary School	30
7-24	Hinkley, California	1	School Teachers Review	4
7-25	Yermo, California	1	School Teachers & Army Officer	9
7-26	Hinkley, California	1	Hinkley School Students	27
8-1	Yermo, California	1	Yermo School-Elementary Grades	52
8-3	Estes Park, Colo.	1	YMCA Preview Group	7
8-5	Camp Irwin, Calif.	1	Elementary School	53
8-7	Dighton, Kansas	1	Family Group	35
8-15	Yermo, California	1	General Audience	20
8-29	Mercury, Nevada	1	Vets & Radiobiologists	18
9-7	Barstow, California	1	Service & Non-Service Personnel	32

Fundamentals of Radioactivity

5-8	Mercury, Nevada	1	Test Site Personnel	23

Power Unlimited

5-14	Overton, Nevada	1	Fire Department	28
5-15	Overton, Nevada	1	Moapa Valley High School	400
5-17	Logandale, Nevada	1	Logandale School Students	40
8-2	Estes Park, Colorado	1	YMCA Preview Group	7
8-7	Dighton, Kansas	1	Family Group	35
8-17	Mercury, Nevada	1	Project 37 Personnel	16
9-15	Cleveland, Ohio	1	Fenn College Students & Teachers	12
9-19	Cleveland, Ohio	1	Men's Organization	30

Primer on Monitoring

5-9	Mercury, Nevada	1	Test Site Personnel	25
5-21	Cedar City, Utah	1	College of So. Utah Physics Class	8
5-22	Mercury, Nevada	1	Test Site Personnel	20
6-6	Mercury, Nevada	1	Test Site Personnel	25
6-13	Mercury, Nevada	1	Test Site Personnel	22
8-2	Mercury, Nevada	1	FCDA & CETG Personnel	30
8-29	Mercury, Nevada	1	Vets & Radiobiologists	18
10-30	San Francisco, Calif.	2	Div. of Highway Employees	65
11-8	New Haven, Conn.	1	Yale Student Chapter of American Society of Civil Engrs. Officers and Faculty Advisor	5

APPENDIX III

COMPARISON OF AN/PDR-39 AND BECKMAN MX-5 MONITORING INSTRUMENTS

At a meeting of the Test Manager's Committee for the Evaluation of Radiation Doses held after the completion of Operation PLUMBBOB, some data were introduced which seemed to show drastic differences in the radiation doses obtained by GM-type instruments and ionization chamber instruments. The instruments used were not the same type as are used in normal off-site monitoring and the calibration of the instruments was accomplished with radium sources whereas it is the custom to use cobalt, and infrequently radium, sources in the calibration of off-site instruments. If such data were widely disseminated and accepted, it could lead to serious implications regarding all of the monitoring data accumulated since the initiation of testing activities at the Nevada Test Site.

Since these questions were raised, the off-site monitoring logs were scanned and those observations which might give comparative data between GM-type instruments and ionization chamber instruments were extracted. These comparisons are shown in the attached table. They should be considered in relation to any other data that is put forth before any hasty decisions are made regarding the validity of use of various types of monitoring instruments.

These data were obtained incidental to normal monitoring operations. They were obtained under the exact conditions of field monitoring, using the types of monitoring instruments that are used in such monitoring. They are unprejudiced in that they were obtained in normal use without any attempt to prove or disprove a point, but merely as a matter of convenience or of curiosity on the part of the individual monitors. The instruments used in the off-site program were calibrated somewhat more carefully than on-site instruments because of the inability to return them for servicing as frequently as instruments used on the Test Site. Each scale was given a 5-point calibration.

The data shown in the table were obtained under a great variety of conditions – times of detonations, distances from the Test Site, a wide range of intensity levels in the area in which they are compared (0 – 20 mr/hr.) – by about 20 or 30 different monitors and not with one or two instruments, but with a rather large number of instruments of both types. The instrument numbers are given in the table to illustrate this point. Although it is not recorded in the table, the monitors had small sources and were able to make rough calibration checks in the field and different monitoring teams made numerous comparisons of their instruments. We believe that the numbers shown are quite reliable under field conditions.

Actually, in field monitoring there are many reasons why different instruments should not agree. These would include saturated GM tubes since many of these instruments had to be carried through high radiation fields, small differences in calibration, differences in energy responses, contamination of one or the other instruments, individual differences in the use and reading of instruments, and even changes in geometry when using one instrument or the other. For example, the normal monitoring procedure is to walk away from the car at least 25 feet before taking a reading. Any readings taken close to a vehicle or other object are fallacious. If one man were comparing the instruments, he could do this taking a reading with a AN/PDR-39 (commonly called a T1-B), return the instrument to the car, pick up an MX-5, and go back and take a comparative reading. It is possible in doing this to get a different correlation, a different height from the ground, more or less body shielding, and other factors that could conceivably cause differences in readings.

All of these are recognized and there are probably other potential points of difference. As a case in point, when it became necessary to change an instrument, it was at a period when fallout was occurring, the radiation field was changing rapidly, and even the differences in time of measurement might have appeared to cause disagreement between instrument readings.

It is quite remarkable then that the agreement shown between the two sets of readings in the table are as close as illustrated. Without performing statistical analyses of these data, simple frequency analysis appears to be sufficient to illustrate the fact that, in using the type of instruments we do in the manner in which we use them, agreement is quite good. Eighty comparative readings are shown, of these 42½% are in exact agreement, 37½% indicate a lower reading with the GM counter, and 20% indicate a higher reading with the GM counter. In many cases, small differences in readings throw them into one class or another. Although our instruments are calibrated as thoroughly as possible, we normally assume that the accuracy is within 10%. If we applied this 10% plus or minus factor to these comparisons, the majority of readings would be exactly comparable.

It seldom pays to be dogmatic about anything and if there are in fact differences between these two types of instrument readings, they should be investigated. If they are investigated, it should be done under the conditions of use and with the instruments of use. It is perhaps unfair even at this date to make comparisons against fission products which are months old and which might have a different energy spectrum than the fission products counted and measured within hours of a detonation. It is certainly unwise, without complete documentation, to attempt to discredit all of the measurements taken by a variety of organizations since 1951. These data as illustrated and accumulated without any thought to comparison of instruments appears to illustrate that the correlation is very good.

Comparison – AN/PDR-39 and Beckman Mx-5 Readings

INCIDENTAL TO PLUMBBOB MONITORING OPERATIONS

Location	Date	Time	Reading-mr/hr		Instr. No.	
			T1-B	Mx-5	T1-B	Mx-5
Shot – Boltzmann						
3.2 mi. W Jct. Groom & Area 13 Roads	5/28/57	0620	20.0	19.0	2977	17502
26 mi. S. Jct. 8A & 50	"	1312	19.0	20.0	624	17476*
39 mi. S. Jct. 8A & 50	"	1350	19.0	20.0	624	17476
41 mi. S. Jct. 8A & 50	"	1354	19.0	20.0	624	17476
10 mi. S. of Warm Springs on Hwy 13	"	1420	4.5	4.3	5789	17542
Warm Springs	"	1440	2.0	2.0	5789	17542
8 mi. NW of Standard	"	1115	10.0	10.0	5789	17542
10 mi. NW of Standard	"	1125	1.0	1.0	5789	17542
Shot – Franklin						
Kawich Valley	6/2/57	1120	6.0	4.0	812	17525
Kawich Valley	"	1149	8.0	8.0	812	17525
Standard	"	1155	8.0	8.0	812	17525
Shot – Wilson						
Gate 385	6/18/57	0715	12.0	10.0	2039	17499
4 mi. W. Groom Lake	"	0638	5.0	6.0	2039	17499
5 mi. W. Groom Lake	"	0643	14.0	15.0	2039	17499
5.5 mi. W. Groom Lake	"	0645	20.0	17.0	2039	17499
Gate 385	"	0711	12.0	10.0	2039	17499
Jct. Groom & Delta Rds.	"	0738	3.0	3.0	2039	17499
Shot – Priscilla						
Hwy 93, 5 mi. N. Kane Springs	6/24/57	1105	22.0	20.0	3135	17549
Hwy 93, 5 mi. N. Kane Springs	"	2130	15.0	14.0	3135	17549
Hwy 93, 5 mi. N. Kane Springs	6/25/57	0840	7.0	6.0	3135	17549
Hwy 93, 36 mi. N. Glendale Jct.	6/24/57	1542	6.0	5.0	5820	17517
Hwy 93, 38 mi. N. Glendale Jct.	"	1552	14.0	15.2	5820	17517
Hwy 93, 42 mi. N. Glendale Jct.	"	1615	13.0	10.2	5820	17517
Hwy 93, 44 mi. N. Glendale Jct.	"	1620	2.8	2.0	5820	17517
Hwy 93, 20 mi. S. Alamo	"	1730	1.6	1.1	5820	17517
Hwy 93, 22 mi. S. Alamo	"	1735	6.0	6.0	5820	17517
Hwy 93, 26 mi. S. Alamo	"	1742	13.0	12.5	5820	17517
Hwy 93, 28 mi. S. Alamo	"	1746	4.6	4.0	5820	17517
Road C, 14 mi. S. Jct. with 93	"	1643	16.0	16.0	2977	17502
Elgin	"	1524	1.3	1.0	847	34595
1 mi. S. of Elgin	"	1608	2.1	2.5	847	34595

Figure III-I

*Checked periodically against 34600.

Figure III-I (Cont'd)

Location	Date	Time	Reading-mr/hr		Instr. No.	
			T1-B	Mx-5	T1-B	Mx-5
2 mi. S. of Elgin	6/24/57	1614	2.8	2.5	847	34595
3 mi. S. of Elgin	"	1618	3.2	3.0	847	34595
4.9 mi. S. Elgin	"	1624	3.2	3.0	847	34595
Hwy 91, 3 mi. S. Kanarraville	"	1751	1.2	1.2	1207	17512
Veyo	"	1640	6.0	6.0	609	17523
Veyo	"	1715	4.5	4.5	609	17523
4.5 mi. N. Kane Springs Wash.	"	1100	10.5	10.0	3135	17459
2.5 mi. N. Kane Springs Wash.	"	1145	4.0	4.0	3135	17459
4.5 mi. N. Kane Springs Wash.	"	1445	21.0	20.0	3135	17459
	Shot – Hood					
Lincoln Mine PHS Headquarters	7/5/57	0927	3.0	3.0	5804	17480
Lincoln Mine Wells	7/5/57	0940	3.0	3.0	5804	17480
Dodge Camp	"	1215	1.3	1.3	5804	17480
	Shot – Diablo					
Lincoln Mine Post Office	7/15/57	0945	6.0	6.0	5804	17536
Lincoln Mine School House	"	0953	14.0	14.0	5804	17536
Lincoln Mine School House	"	0957	15.0	16.0	5804	17536
Lincoln Mine Upper Trailer Court	"	1000	15.0	15.0	5804	17536
Lincoln Mine Upper Trailer Court	"	1010	18.0	20.0	5804	17536
Nev. 25, 16.9 mi. W. Hancock Summit	"	0950	18.0	18.0	906	17538
5 mi. E. Dodge Camp	"	1627	14.0	18.0	906	17538
U.S. 93, 24 mi. N. Pioche	"	1455	4.5	4.5	1593	17532
29 mi. N. Pioche	"	1505	6.0	7.5	1593	17532
31 mi. N. Pioche	"	1515	6.0	8.5	1593	17532
35 mi. N. Pioche	"	1535	10.0	10.0	1593	17532
37 mi. N. Pioche, FB 766	"	1540	7.0	8.5	1593	17532
60 mi. N. Pioche	"	1655	1.4	1.3	1593	17532
65 mi. N. Pioche	"	1705	1.2	1.0	1593	17532
	Shot – Kepler					
Coaldale	7/24/57	1750	9.5	9.5	2400	17522
25 mi. E. Jct. 6 & 47	"	1833	8.0	7.0	2400	17522
	Shot – Owens					
10 mi. SW FB Sta. 346	7/25/57	1044	19.0	17.0	5575	17463
FB Sta. 347	"	1100	9.0	9.0	5575	17463
2 mi. from FB Sta. 347	"	1125	15.0	15.0	5575	17463
	Shot – Smoky					
U.S. 91, 3.8 mi. N. of Littlefield	8/31/57	1243	18.0	18.0	2977	--
4.5 mi. N. of Littlefield	"	1244	20.0	20.0	2977	--

Figure III-I (Cont'd)

Location	Date	Time	Reading-mr/hr		Instr. No.	
			T1-B	Mx-5	T1-B	Mx-5
	Shot – Fizeau					
Hwy 95, 16 mi. N. of Goldfield	9/14/57	1834	2.0	2.0	2694	17519
17 mi. N. of Goldfield	"	1838	1.5	1.5	2694	17519
18 mi. N. of Goldfield	"	1840	1.6	1.8	2694	17519
19 mi. N. of Goldfield	"	1844	2.0	2.1	2694	17519
20 mi. N. of Goldfield	"	1846	1.8	2.0	2694	17519
21 mi. N. of Goldfield	"	1850	2.1	2.0	2694	17519
22 mi. N. of Goldfield	"	1852	3.3	3.0	2694	17519
23 mi. N. of Goldfield	"	1854	3.7	3.5	2694	17519
Tonopah	"	1903	4.7	4.0	2694	17519
	Shot Whitney					
Goldfield	9/23/57	1320	10.0	10.0	2694	17519
0.6 mi. S. Goldfield	"	1330	10.0	10.0	2694	17519
1 mi. S. Goldfield	"	1333	10.0	10.0	2694	17519
Goldfield Summit	"	1345	12.0	12.0	2694	17519
0.5 mi. N. of Goldfield	"	1430	11.0	10.2	2694	17519
	Shots 16 – 18					
Road C, 22 mi. S. of Jct. with 93	9/5/57	1300	19.0	19.0	2977	17535
Road C, 22 mi. S. of Jct. with 93	9/7/57	1030	10.0	10.0	2977	17490

APPENDIX IV

BETA-GAMMA RATIOS AT VARIOUS HEIGHTS

During the course of Operation PLUMBBOB, an extensive amount of data was obtained regarding survey instrument readings at various heights above the terrain. These readings were taken with both the shield open and closed at the specified heights which varied from six to thirty-six inches. These data were initially obtained for two reasons; one, since there has always been questions regarding relationship of the readings at our normal monitoring height of about three feet as compared to those close to the ground; and, secondly, in the hope that some estimate of beta-gamma ratios might be obtained by this relatively crude procedure.

For the benefit of those who might be interested in readings of this type, two selected groups of observations are presented. One group was taken at Butler's Ranch and the other on Road C, 22 miles south of the junction with U.S. 93. The radiation responsible for these readings was essentially from Shot XVI, "Smoky"; however, since they extended over a period of approximately one month, there might have been minor incremental additions of radioactive material from subsequent shots. In the main, however, these data represent readings taken at the same spots sequentially at the heights indicated and with the shield both open and closed. Primarily, then they represent readings of the type stated over a period of time during which the original material deposited was decayed.

If readings of this type should be of value or interest to anyone, more extensive data in the off site files can be made available. For the purpose of this report, the two series of data referred to above are presented in Figures IV-1 and IV-2. No detailed analysis of this data is attempted here; however, obvious statements can be made. Certainly it is true that the readings increase as the distance above the terrain decreases. This is true for both gamma and beta + gamma readings, although it is probably more striking in the beta + gamma readings. If one accepts the rather dubious conclusion that the difference between the open shield reading and the closed shield reading represents valid beta data, then it would be possible from these data to arrive at values for beta-gamma ratios in the field over a one-month decay period of the radioactive material. It is probably not fair to accept these data as true quantitative values for this parametor but they may be useful to give a qualitative feeling regarding beta-gamma ratios.

BETA-GAMMA RATIOS AT VARIOUS HEIGHTS – BUTLER RANCH

Reading (mr/hr) At Indicated Time and Date	Distance of Reading above Terrain – Inches							
	36 Inches		24 Inches		12 Inches		6 Inches	
	Closed	Open	Closed	Open	Closed	Open	Closed	Open
9/4 – 1500	6.0	17.0	6.2	20.0	7.0	>20.0	8.0	>20.0
9/6 – 0700	4.5	11.5	5.0	12.0	5.0	15.0	5 3	18.0
9/8 – 0800	4.0	7.0	4.0	9.0	4.4	11.0	4.75	12.0
9/10 – 0955	3.5	7.0	3.5	8.0	3.5	11.0	3.5	14.0
9/12 – 1615	2.0	10.0	2.0	10.5	2.5	12.0	2.5	14.0
9/16 – 1700	2.0	3.5	2.5	4.0	2.5	4.5	2.5	4.9
9/19 – 1545	2.0	3.5	2.0	4.5	2.0	5.5	2.5	7.0
9/22 – 0930	1.1	3.5	1.3	3.5	1.5	4.25	1.7	5.0
9/27 – 1645	0.75	1.8	0.8	2.0	0.85	2.8	1.0	3 5
10/4 – 1100	0.5	1.1	0.6	1.3	0.7	1.6	0.7	1.8

Figure IV-1

BETA-GAMA RATIOS AT VARIOUS HEIGHTS – ROAD C, 22 MILES SOUTH OF JUNCTION U.S. 93

Reading (mr/hr) At Indicated Time and Date	Distance of Reading above Terrain – Inches							
	36 Inches		24 Inches		12 Inches		6 Inches	
	Closed	Open	Closed	Open	Closed	Open	Closed	Open
9/5 – 1300	19.0	>20.0	19.0	>20.0	19.5	>20.0	20.0	>20.0
9/6 – 1215	13.0	>20.0	16.0	>20.0	18.0	>20.0	19.0	>20.0
9/7 – 1030	10.5	19.0	12.0	>20.0	14.0	>20.0	15.0	>20.0
9/10 – 1135	9.5	–	9.5	–	10.0	–	11.0	–
9/12 – 1430	6.0	11.0	6.5	12.0	7.0	14.0	7.0	14.0
9/15 – 1440	4.5	8.5	5.0	10.0	5.0	12.0	5.5	14.0
9/18 – 1230	4.5	9.0	4.5	12.0	4.5	14.0	5.0	15.0
9/22 – 1645	3.8	8.5	4.2	10.5	4.5	16.0	5.5	>20.0
9/27 – 1545	3.0	6.2	3.1	8.0	3.5	11.5	4.0	15.0
9/30 – 1630	2.8	5.0	2.8	6.0	3.0	7.5	3.0	10.0
10/4 – 1530	1.9	3.6	2.5	4.0	2.6	4.8	2.8	5.0

Figure IV-2

APPENDIX V

ACCUMULATED DOSAGES DURING OPERATIONS PLUMBBOB

RESULTING FROM EXTRAPOLATION OF MONITORING READINGS

Figure V-1 lists the cumulated dosages that various communities received resulting from off-site monitoring operations during PLUMBBOB. The doses given represent the best estimates of the off-site organization due to their own records and are contained in this appendix for the purpose of completing a report on off-site monitoring operations. On this one phase of off-site monitoring operations, these values should be considered unofficial since the Test Manager has appointed a committee for the evaluation of radiation doses. The purpose of this committee is to consider all available data, including off-site monitoring data, off-site film badge data, monitoring data obtained by other organizations, and monitoring data obtained by aerial monitoring, for the purpose of arriving at a consolidated official and authentic record of off-site exposures. The values arrived at by this committee after due consideration of all available data will consitute the final and official record of off-site exposures.

ACCUMULATED EXPOSURE IN TERMS OF ESTIMATED AND INFINITE DOSE FOR POPULATED PLACES AS COMPUTED FROM OFF-SITE MONITORING READINGS

Location	E.D. (roentgens)	I.D. (roentgens)
ARIZONA		
Beaver Dam	.21	.40
Littlefield	.25	.47
CALIFORNIA		
Benton Station	.05	.09
Blairsden	.08	.16
Bishop	.04	.07
Chalfant	.01	.02
Deep Spring	.02	.04
Furnance Creek	.01	.01
Laws	.04	.07
Oasis	.05	.10
Portola	.15	.29
Quincy	.10	.19
Spring Garden	.08	.16
Stovepipe Wells	.01	.03
Scotty's Castle	.01	.01
NEVADA		
A & B Mine	2.37	4.39
Alamo	.02	.03
Amorgosa Hot Springs	.01	.03
Ash Springs	.01	.03
Austin	.14	.28
Baker	.10	.20
Bardoli Ranch	.28	.53
Basalt	.17	.33
Belew Ranch	.30	.57
Beatty	.10	.18
Belmont	.69	1.29
Buckhorn Ranch	.04	.07
Butler Ranch	3.22	5.85
Cactus Springs	.03	.05
Carp	.20	.37
Coaldale	.45	.87
Cove	.04	.06
Crystal Springs	.08	.16
Currant	.27	.51
Desert Game Refuge Headquarters	.01	.02
Dodge Construction Camp	2.19	3.97
Dodge Construction Camp (new location)	.01	.01
Duckwater	.02	.04

Figure V-1

Figure V-1 (Cont'd)

Location	E.D. (roentgens)	I.D. (roentgens)
Dyer	.05	.09
El Dorado	.36	.72
Elgin	.03	.05
Ely	.43	.85
Eureka	.41	.80
Fallini Ranch	.78	1.44
Fallon	.13	.25
Farrier	.08	.15
Fernly	.10	.19
Fish Lake	.03	.07
Gabbs	.04	.08
Galt	2.86	5.30
Geyser Ranch	.37	.74
Glendale	.08	.14
Goldfield	.64	1.25
Goldpoint	.17	.31
Groom Mine	2.12	3.80
Hawthorne	.12	.24
Hazen	.09	.19
Hiko	.05	.10
Hoya	1.41	2.60
Indian Springs	.09	.17
Kimberly	.05	.11
Lathrop Wells	.02	.03
Leith	.10	.19
Lida	.19	.36
Lincoln Mine	1.25	2.32
Lockes	.32	.61
Logandale	.03	.06
Lund	.28	.55
Luning	.02	.04
Manhattan	.14	.26
M and M Mine	2.34	4.34
Mesquite	.08	.16
McGill	.05	.10
Millett	.32	.64
Mina	.13	.25
Moapa	.07	.12
Montgomery Pass	.15	.30
New Ruth	.03	.06
Nyala	.17	.33
Overton	.01	.02
Parman's Ranch	.78	1.47
Panaca	.03	.06
Pioche	.03	.06
Preston	.31	.61

Figure V-1 (Cont'd)

Location	E.D. (roentgens)	I.D. (roentgens)
Rattlesnake Maintenance Station	.24	.46
Reno	.05	.09
Reveille Mill	3.40	6.22
Round Mountain	.17	.33
Rox	.21	.38
Ruby Hill Mine	.40	.80
Rhyolite	.01	.03
Schurz	.13	.26
Silver Peak	.38	.72
Sodaville	.02	.05
Southpaw Mine	.41	.78
Stone Cabin Ranch	.42	.79
Stonehouse Ranch	1.27	2.40
Sunnyside	.27	.52
Tonopah	.62	1.19
Tonopah Ballistics Range	.41	.75
Uhalde Ranch	.29	.54
Walch Pine Creek Ranch	.21	.39
Wadsworth	.10	.19
Warm Springs	.29	.55
Warm Springs Ranch	.04	.08
Watertown	.97	1.74
Whipple Ranch	.08	.15
UTAH		
Alton	.02	.04
Anderson Junction	.40	.79
Beryl	.02	.04
Beryl Junction	.04	.09
Bryce Canyon	.01	.02
Cedar City	.12	.23
Central	.29	.52
Circleville	.05	.10
Enterprise	.05	.09
Garrison	.10	.20
Glendale	.06	.12
Grafton	.07	.14
Gunlock	.24	.46
Harrisburg Junction	.11	.22
Hamilton Fort	.12	.24
Hatch	.04	.07
Hillsdale	.09	.18
Hurricane	.08	.16
Ivins	.50	.95
Kanarraville	.47	.92
La Verkin	.01	.02

Figure V-1 (Cont'd)

Location	E.D. (roentgens)	I.D. (roentgens)
Leeds	.54	1.05
Long Valley Junction	.01	.02
Marysvale	.01	.01
Modena	.02	.04
Mount Carmel	.02	.05
Mount Carmel Junction	.01	.02
New Castle	.04	.08
New Harmony	.04	.07
Orderville	.05	.10
Orton Junction	.07	.13
Panguitch	.36	.74
Paragonah	.01	.03
Parowan	.01	.03
Pintura	.62	1.21
Rockville	.07	.14
St. George	.50	.96
Santa Clara	.47	.90
Shivwits	.54	1.03
Springdale	.05	.11
Summit	.01	.03
Torquerville	.17	.33
Veyo	.65	1.25
Virgin	.08	.15
Washington	.13	.25
Zion Lodge	.07	.15

APPENDIX VI

TIME-INTENSITY

At a fixed point during early fallout and through part of the subsequent decay period, at this point readings were taken at various time intervals. From these data, time versus intensity (time-intensity) curves have been plotted. The time intervals during which readings were taken varied from 2.25 hours to 30 hours. The time of arrival for various shots, as indicated by this information, varied from H + 2.5 hours to H + 12.0 hours. The time elapsed during buildup ranged from one-half hour to six hours. The distance at which the readings were taken was at a minimum of about 20 miles and the maximum distance was approximately 170 miles.

There were three separate sets of data obtained at different locations on Shot "Diablo". These three locations, at distances of approximately 20, 40, and 70 miles, indicated time of arrivals of H + 2.5, H + 4.0, and H + 6.5 hours, respectively. The time elapsed during buildup was 0.5, 2.0, and 1.5 hours respectively. At these locations, the peak readings assumed on the graphs were 110 mr/hr., 50 mr/hr., and 11.5 mr/hr. The graphs of the information obtained on "Diablo" are included as Figures VI-1, VI-2, and VI-3, respectively.

No conclusions have been drawn from this data at this time.

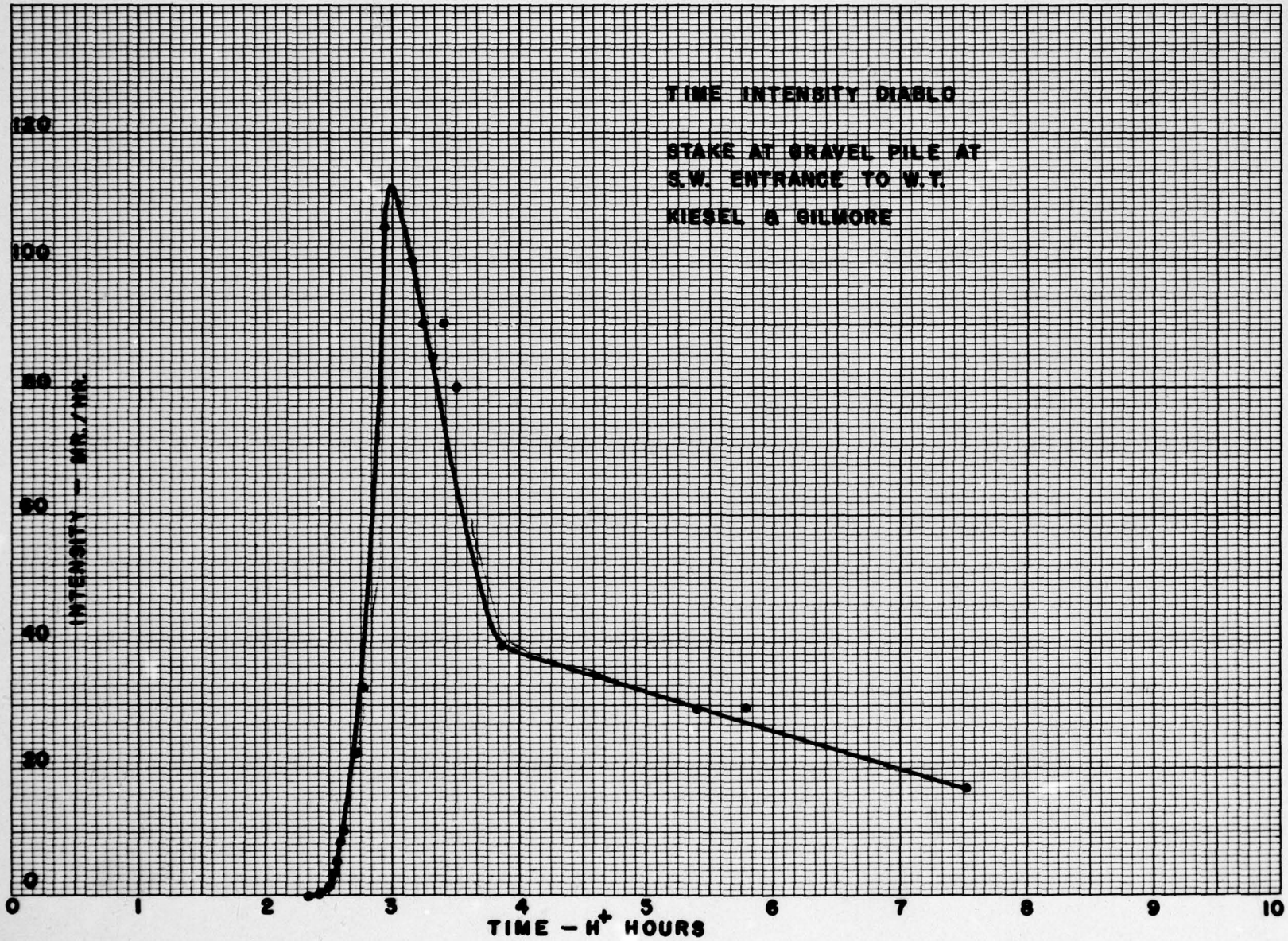

TIME INTENSITY DIABLO
STAKE AT GRAVEL PILE AT
S.W. ENTRANCE TO W.T.
KIESEL & GILMORE
INTENSITY - MR./HR.
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
TIME - H+ HOURS

Figure VI-1

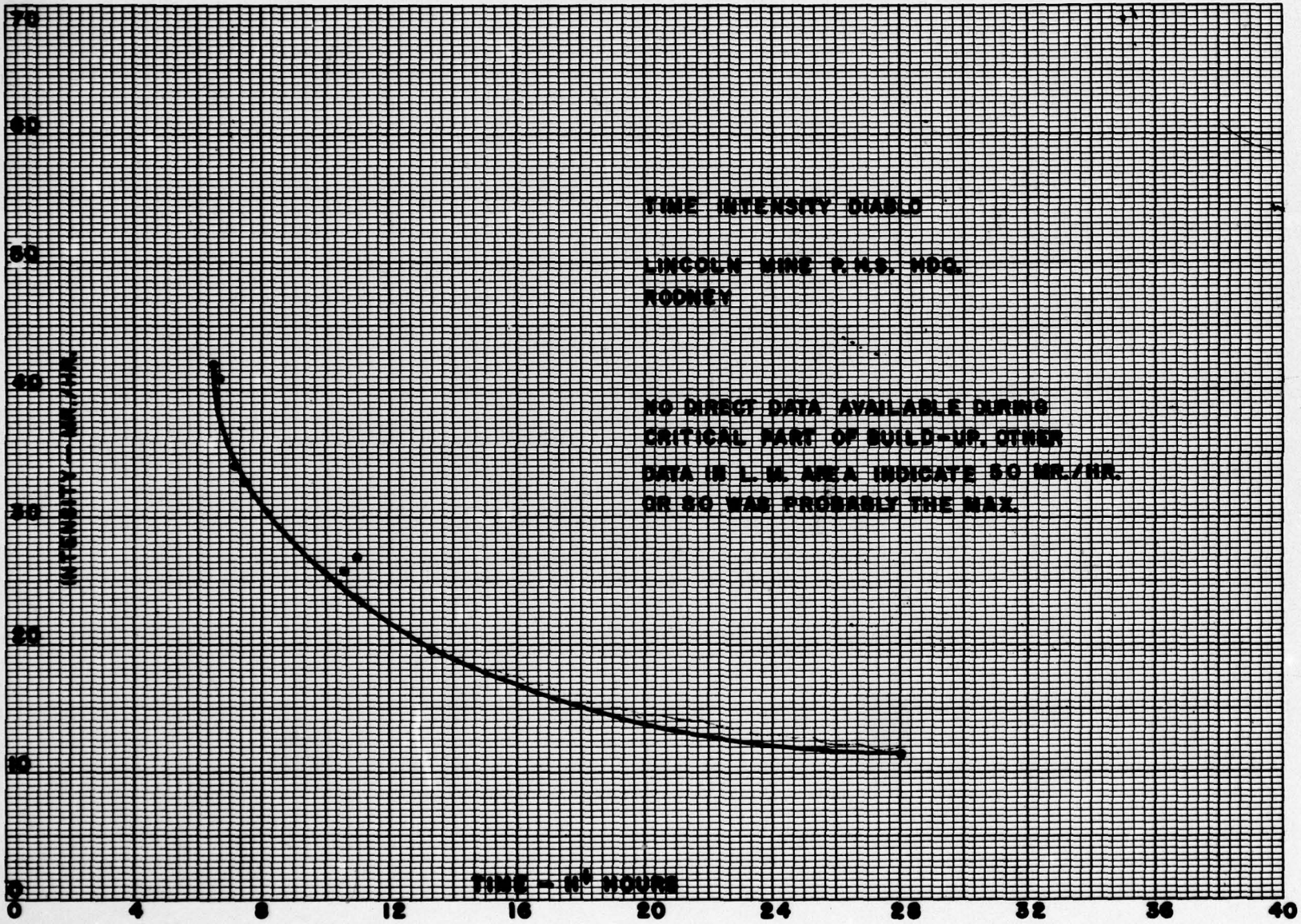

TIME INTENSITY DIABLO
LINCOLN MINE P.M.S. NO. 1
ROONEY
NO DIRECT DATA AVAILABLE DURING CRITICAL PART OF BUILD-UP. OTHER DATA IN L. M. AREA INDICATE 50 MR./HR. OR SO WAS PROBABLY THE MAX.
INTENSITY - MR./HR.
TIME - 10³ HOURS
0
10
20
30
40
50
60
70
0
4
8
12
16
20
24
28
32
36
40

Figure VI-2

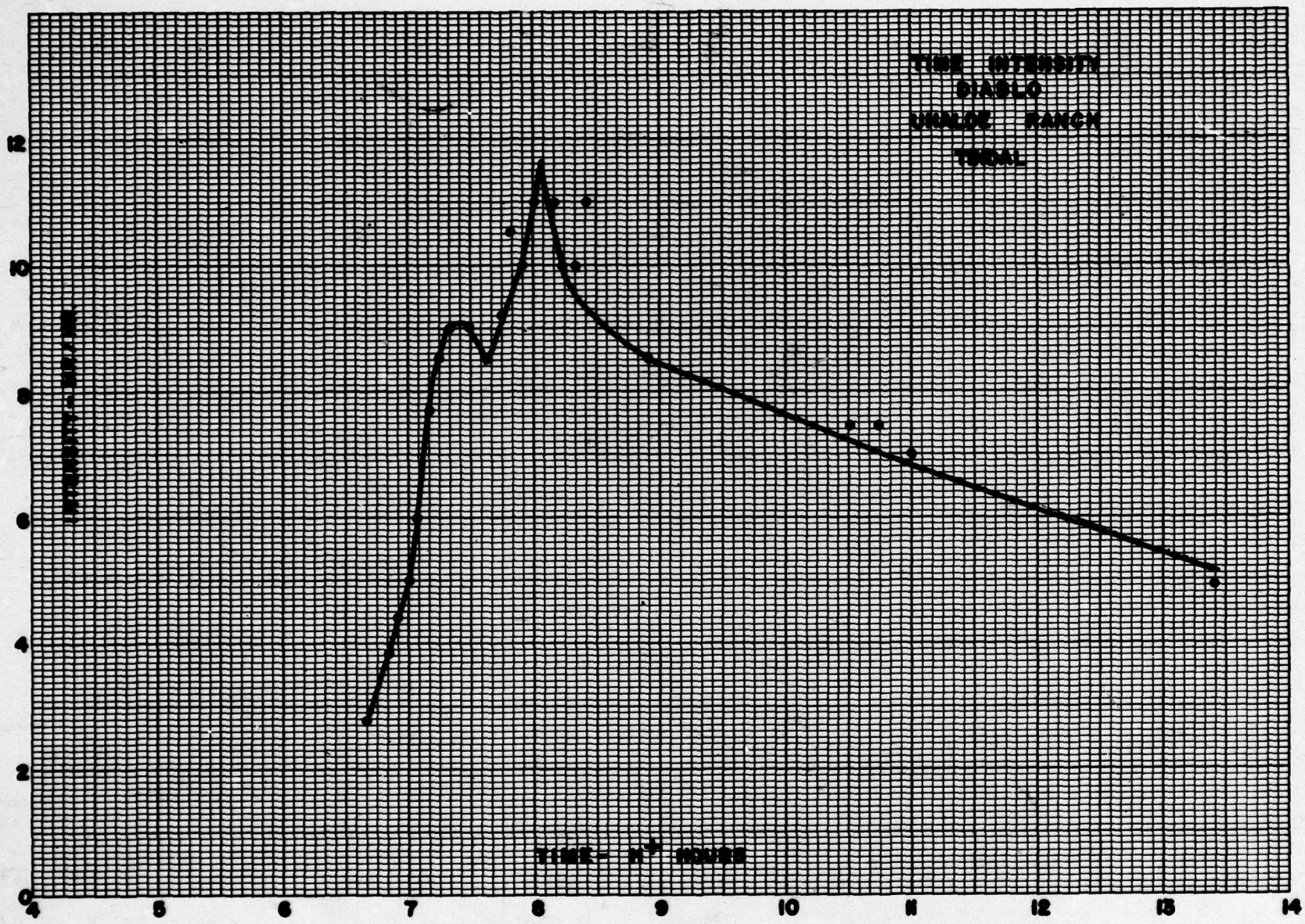

TIME INTENSITY
DIABLO
LIVERMORE RANCH
TYPICAL
0
2
4
6
8
10
12
4
5
6
7
8
9
10
11
12
13
14

Figure VI-3