

9/29/71
Jim M...
Gene S...

DR-1943

PNE-524
FINAL REPORT



Plowshare



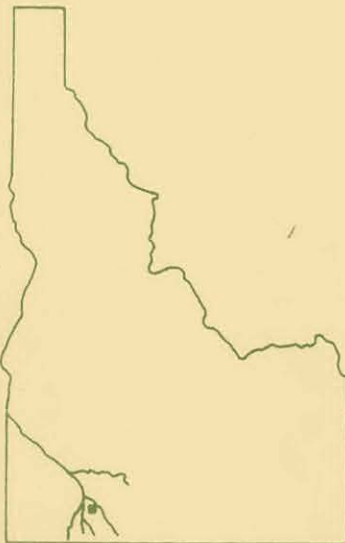
civil, industrial and scientific uses for nuclear explosives

UNITED STATES ~~ARMY CORPS OF ENGINEERS~~

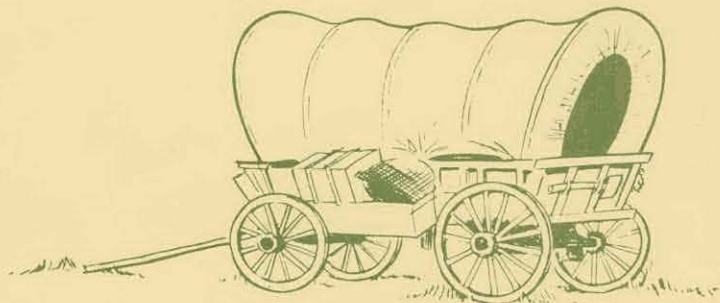
THIS DOCUMENT CONFIRMED AS
UNCLASSIFIED
DIVISION OF CLASSIFICATION
BY GH Kahn / amb
DATE 10/5/71

MASTER

BRUNEAU PLATEAU, IDAHO
30 September 1965



P R O J E C T S C H O O N E R



Final Report of Off-Site Surveillance for Project Schooner

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Environmental Protection Agency
Las Vegas, Nevada

ISSUED: SEPTEMBER 27, 1971

R1583

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

This report has been reproduced directly from the best available copy.

Available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22151.

Price: Paper Copy \$3.00
Microfiche \$0.95.

FINAL REPORT OF OFF-SITE SURVEILLANCE
FOR
PROJECT SCHOONER
December 8, 1968

by the
Environmental Surveillance Program
Western Environmental Research Laboratory*

ENVIRONMENTAL PROTECTION AGENCY

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Published June 1971

This surveillance performed under a Memorandum of
Understanding (No. SF 54 373)
for the
U.S. ATOMIC ENERGY COMMISSION

*At the time this work was performed the Laboratory was designated the Southwestern Radiological Health Laboratory and was a part of the Public Health Service, U. S. Department of Health, Education, and Welfare. In the latter part of 1970, SWRHL was transferred to the Environmental Protection Agency, and in May 1971 was renamed the Western Environmental Research Laboratory.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ABSTRACT

Project Schooner was a nuclear excavation experiment conducted at the Nevada Test Site on December 8, 1968, as part of the Plowshare Program. The results of the off-site radiological surveillance program performed for this event by the Southwestern Radiological Health Laboratory are presented in this report.

Aircraft observations soon after detonation indicated the top of the radioactive debris rose to approximately 19,000 feet above mean sea level. Aircraft and ground monitoring teams then documented cloud passage and deposition radioactivity levels in downwind areas to the north and northeast of the Nevada Test Site. The main cloud moved to the northeast across Utah and Colorado, while the base surge moved north into Idaho and then eastward across Montana and North Dakota.

The highest external gamma exposure rate observed off-site was 350 mR/hr at 1100 hours PST, several yards south of Nevada Highway 25, about 2.5 miles east of Queen City Summit (on an azimuth of 54 degrees and at a distance of 44 miles from ground zero). The highest external gamma exposure rate observed at a populated location was 8.5 mR/hr at the Diablo Maintenance Station (33°, 47 miles) on Highway 25.

The highest integrated external gamma exposure to an off-site resident wearing a personal dosimeter was 165 mR. This exposure, measured by a thermoluminescent dosimeter, was received by a sheepherder from Uhalde's Ranch near Adaven, Nevada (45°, 75 miles), from December 8 through 17, 1968, while he was working several miles east of the ranch.

The predominant radionuclide found in environmental samples was tungsten-187 (^{187}W). The highest integrated ^{187}W concentration observed in air at a populated location was 12,000 $\mu\text{Ci}\cdot\text{sec}/\text{m}^3$ at Stickelman's Farm (357°, 55 miles) near Clark Station on December 8, 1968. The highest ^{187}W

concentration in milk (9,100 pCi/l) was found in a December 9, 1968, sample from the Chavis Ranch (57^o, 127 miles), north of Pioche, Nevada. The highest ¹⁸⁷W concentration (21,000 pCi/l) in a water supply used for human consumption was found in a December 11, 1968, sample from the Simpson's Ranch (42^o, 75 miles) at Adaven, Nevada.

The highest ³H concentration in a water supply used for human consumption (2,800 pCi/l) was found in a December 11, 1968, sample from the Lotspeich Ranch (15^o, 266 miles) near Deeth, Nevada. Iodine-131 was found in its highest concentration in milk (100 pCi/l) in a December 11, 1968, sample from the Boyd Schena Ranch (56^o, 252 miles) near Abraham, Utah. The only other isotope of interest, ¹⁸¹W, has been found in low levels in natural vegetation which has grown since the occurrence of the Schooner deposition, and in the muscles of cattle grazing in the deposition areas.

Analyses of radiological data indicate that radioactive effluent arising from this event did not present any health hazard to the off-site population, based on presently accepted safety criteria established by the U. S. Atomic Energy Commission.

TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	i
LIST OF TABLES	v
LIST OF FIGURES	vi
I. INTRODUCTION	1
II. OPERATIONAL GUIDE	1
III. PROCEDURES	2
A. Field Operations	2
B. Radioassay Techniques	3
IV. RESULTS	3
A. Aerial Surveillance	3
B. Monitoring	5
C. Gamma Rate Recorders	10
D. Dosimetry	13
E. Vegetation Sampling	25
F. Air Sampling	27
G. Milk Sampling	34
H. Milk Cow Feed Sampling	37
I. Water and Snow Sampling	37
J. Wildlife and Animal Sampling	42
V. DISCUSSION	43
A. Fallout Pattern and Maximum Exposure Rates	43
B. Cloud Travel	45
C. H+1 Hour Exposure Rate Versus Distance	47
D. Exposure Rate as a Function of Time - Queen City Summit, Diablo Maintenance Station, and Stickelman's Farm	47
E. Comparison of Data Obtained from Survey Meters, Recorders, TLD's, and Film Badges	52

Table of Contents(continued)	Page
F. Percent Exposure as a Function of Time	53
G. Residual Activity Decay	53
H. Exposure as a Function of Distance	58
I. Exposure Pattern	58
J. Post-shot Exposure Levels at Queen City Summit	58
K. Gross Beta and ^{131}I Concentrations in Air	61
L. Gross Beta and ^{187}W Concentrations in Air	61
M. Gross Beta Activity in Air for Nevada	65
N. Dose Calculations	65
VI. SUMMARY	67
APPENDICES	70

LIST OF TABLES

TABLE		<u>Page</u>
1	Maximum TLD Exposures on Northern Arcs	15
2	Net TLD and Film Badge Exposures at Fixed Stations	22
3	Exposure to Off-Site Residents (TLD and Film Badge Results)	24
4	Gross Gamma Activity on Natural Vegetation	25
5	Follow-up Activity in Natural Vegetation	27
6	Highest Off-Site Air Sampling Results in Nevada - December	30
7	Highest Air Sampling Results outside Nevada - December	32
8	Radioiodine in Air Samples outside Nevada - December	33
9	Tritium in Atmospheric Moisture Samples	34
10	Domestic Water Sampling Results	40
11	Snow Sampling Results	42
12	Integrated Exposures	52

LIST OF FIGURES

FIGURE	<u>Page</u>
1 Maximum Observed Exposure Rates at D-day Ground Monitoring Locations	6
2 "Hot-spot" Team Roads Monitored	9
3 Maximum Observed Recorder Exposure Rates	11
4 Dosimetry Arc Locations	14
5 TLD Exposures - Arc 1	16
6 TLD Exposures - Arc 2	17
7 TLD Exposures - Arc 3	18
8 TLD Exposures - Arc 4	19
9 TLD Exposures - Arc 5	20
10 TLD and Film Badge Station Locations	21
11 Vegetation Sampling Locations	26
12 Air Sampling Locations	29
13 Milk Sampling Locations	35
14 Standby Milk Surveillance Stations	36
15 Milk Cow Feed Sampling Locations	38
16 Water Sampling Locations	39
17 Fallout Pattern and Maximum Observed "Hot-Line" Exposure Rates	44
18 Activity Transport Speed along "Hot-line"	46
19 Estimated H+1 Hour Exposure Rates	48
20 Exposure Rate vs. Time - Queen City Summit	49
21 Exposure Rate vs. Time - Diablo Maintenance Station	50
22 Exposure Rate vs. Time - Stickelman's Farm	51
23 Integrated Gross Gamma Exposure - Queen City Summit	54
24 Residual Activity Decay - Queen City Summit	55
25 Residual Activity Decay - Diablo Maintenance Station	56
26 Residual Activity Decay - Stickelman's Farm	57
27 Exposure vs. Distance	59

LIST OF FIGURES (cont)

FIGURE		<u>Page</u>
28	Exposure Pattern	60
29	Post-Schooner Exposure Levels - Queen City Summit	62
30	Gross Beta vs. ¹³¹ I Concentration in Air	63
31	Gross Beta vs. ¹⁸⁷ W Concentration in Air	64
32	Integrated Gross Beta Activity in Air for Nevada	66
33	Estimated Internal ¹⁸⁷ W Doses for Off-Site Areas	68

OFF-SITE SURVEILLANCE
SCHOONER EVENT

I. INTRODUCTION

Project Schooner was a nuclear experiment in a layered tuffaceous medium executed as a part of the Plowshare Program for the development of nuclear excavation. Schooner was detonated on December 8, 1968, at approximately 0800:00.149.6 (PST), 1600:00.149.6 (GMT), in Area 20, Nevada Test Site (NTS). The resultant yield was 31 ± 4 kt. The emplacement hole was U20u at geodetic coordinates:

Longitude: W $116^{\circ} 33' 57.1419''$
Latitude : N $37^{\circ} 20' 36.3187''$

The resultant average crater dimensions are:

(1) Crater Radius	129.8 meters(426 ft.)
(2) Crater Depth	63.4 meters(208 ft.)
(3) Crater Lip Height	13.4 meters(44 ft.)
(4) Lip Crest Radius	147.2 meters(483 ft.)
(5) Ejecta Boundary	539 meters(1768 ft.)
(6) Lip Volume, Apparent	2,099,000 cubic meters(2,745,330 cubic yards)
(7) Crater Volume, Apparent	1,745,000 cubic meters(2,282,870 cubic yards)

In accordance with a Memorandum of Understanding with the Atomic Energy Commission, the Southwestern Radiological Health Laboratory (SWRHL) conducted a program of radiological monitoring and environmental sampling to document levels of radioactivity released to the off-site areas from Project Schooner. This report summarizes the procedures used for the off-site surveillance operations and presents the data obtained from this surveillance.

II. OPERATIONAL GUIDE

The Southwestern Radiological Health Laboratory serves as the off-site radiological safety organization for the AEC in accordance with AEC-PHS Memorandum of Understanding, No. SF 54 373, as amended. SWRHL also represents the Bureau of Radiological Health and maintains close working relationships with the states concerned and other components of the Bureau.

All parties are kept advised of an operation while it is being conducted, and state and other Bureau surveillance networks are alerted when necessary to assist in documenting radioactive releases to off-site areas associated with AEC testing programs.

The Director of SWRHL, or his designee, serves as the Off-Site Radiological Safety Officer on the staff of the Test Manager, NVOO, AEC. The radiological safety guidelines established by the AEC which apply to the off-site area are set forth in Item II-A of Chapter 0524, "Standard Operating Procedures, Nevada Test Site Organization." The responsibilities of SWRHL include:

1. Documenting the radiological situation in off-site areas through comprehensive environmental sampling and radiation monitoring.
2. Assuring continuous protection of public health and safety by determining potential and past exposures, and implementing protective measures as directed by the Test Manager.
3. Conducting a public contact and information program in the off-site area to assure local residents that all reasonable safeguards are being employed to protect public health and property from radiation hazards.
4. Collecting information regarding incidents which may be attributed to radioactive releases to the off-site area.

III. PROCEDURES

A. Field Operations

The operational procedures for the SWRHL off-site surveillance activities are described in the Environmental Surveillance Operations Plan for Project Schooner, dated October 17, 1968. In general, aerial cloud tracking information was used to deploy ground monitors in the downwind trajectory area following the detonation. The monitors obtained survey meter readings for external radiation levels, placed portable air samplers and gamma rate recorders to supplement permanent sampling and recorder network stations, and collected milk, water, and other environmental samples to document residual contamination levels. Permanent thermoluminescent dosimeter (TLD) and film badge stations

were supplemented by temporary TLD stations placed at regular intervals along roads to document cloud passage and residual deposition exposures across the trajectory at varying distances from ground zero (GZ). TLD's and/or film badges were also issued to off-site residents in the cloud trajectory for documenting exposures to individuals.

"Hot-spot" monitoring teams utilizing 4- by 4-inch NaI(Tl) detectors coupled to portable scalers surveyed highways in the trajectory area following cloud passage in search of "hot-spot" deposition areas which may have resulted from rain-out, wash-out, or snow-out. The same teams were also used to delineate low level deposition boundaries at greater distances from GZ.

The SWRHL whole-body counting facility was used to measure internal body burdens of selected isotopes in personnel exposed to the release during the surveillance operation. The whole-body counting facility was also available for measuring internal body burdens in off-site residents at the request of the Test Manager.

B. Radioassay Technique

Descriptions of SWRHL analytical procedures are provided in Chapter 11 of NVO-28, AEC Nevada Operations Office.

IV. RESULTS

A. Aerial Surveillance

Both a main and a base surge cloud were formed by the Schooner effluent. After initial development, the main cloud split at approximately 13,000 feet above mean sea level (MSL). The upper portion of the main cloud moved rapidly in a narrow path to the east-northeast and the lower portion of the main cloud including the base surge spread over a larger area and traveled more slowly to the north and northeast.

The first cloud contact by a SWRHL aircraft was at 0847 hours (47 minutes after the detonation) at an altitude of 9,000 feet MSL, 20 miles from GZ. A maximum reading of 70 mR/hr was observed on an azimuth of 10 degrees from GZ.

A second SWRHL aircraft conducted a spiral descent through the upper portion of the main cloud at 0924 hours, 35 miles from GZ, on an azimuth of 70 degrees. The cloud top was at 17,000 feet MSL. A peak activity of 150 mR/hr was observed at 14,200 feet MSL. The major portion of the activity encountered was above 13,000 feet MSL, although low level activity apparently extended to ground level (5,500 feet MSL). The same aircraft also conducted a spiral descent through the lower portion of the main cloud, 35 miles from GZ, on an azimuth of 60 degrees. The cloud top at this point was 13,000 feet MSL, with a peak reading of 120 mR/hr observed at 12,000 feet MSL at 0928 hours. The major portion of the activity in this cloud was above 9,000 feet MSL, but activity also extended to ground level from this portion.

A longitudinal pass through the upper cloud on an azimuth of 65 degrees located the leading edge 75 miles from GZ at 1008 hours, with a peak activity of 90 mR/hr observed 3 miles from the leading edge. The visible portion of the cloud was about 1,000 feet thick at this point, with the top of the leading edge located at 17,000 feet MSL. The cloud top near the trailing edge (about 35 miles from GZ) was at 14,000 feet MSL, with readings in this area of the cloud averaging 40 mR/hr. Subsequent tracking in the Milford, Utah, area at 1330 hours indicated the cloud was still about 1,000 feet thick with a top at 17,000 feet MSL.

The base surge moved north and northeast from GZ and remained below 9,000 or 10,000 feet MSL through the day. Typical exposure rate readings observed in this portion of the cloud were:

TIME (hours)	ALTITUDE (feet MSL)	AZIMUTH (degrees)	DISTANCE (miles)	EXPOSURE RATE (mR/hr)
1003	8,000	55	55	1
1012	9,000	40	55	4.5
1351	7,000	345	32	0.3
1415	7,000	355	65	0.2-0.3
1510	8,000	30	125	0.4
1526	9,700	50	140	0.3-0.4

On December 9 a tracking aircraft equipped with gamma detection and air sampling equipment flew from about 40 miles southwest of Milford, Utah, to 13 miles north of Dillon, Montana, at 8,500 to 9,500 feet MSL between 1053 and 1445 hours PST. Activity from Schooner was located over the entire path flown with a maximum of 2000 pCi/m³ gross beta particulate activity on a sample collected over a 45-mile segment from Delta, Utah, to 30 miles southwest of Provo, Utah, between 1123 and 1133 hours at 9,500 feet MSL. The gamma detection system showed the peak activity to be in a 3-mile-wide portion about 37 miles southwest of Provo. The next highest concentration was 540 pCi/m³ found over a 30-mile segment from 17 miles south southeast of Dillon, Montana, to 13 miles north of Dillon from 1435 to 1445 hours at 9,500 feet MSL.

The return portion of the flight from Dillon to Pocatello, Idaho, was flown at 11,500 feet MSL between 1448 hours and 1542 hours. Positive indications were found over this leg with a maximum concentration of 340 pCi/m³ from 22 miles south to 52 miles south of Dillon. Tracking resumed at 1836 at Pocatello, flying to Twin Falls, Idaho, Great Salt Lake and Delta, Utah, ending at 2042 hours. Altitudes flown were 10,500 and 11,500 feet MSL. Low-level positive activity was detected from Pocatello to Twin Falls to the Idaho-Utah border near Moulton, Idaho, and possibly over the Great Salt Lake.

B. Monitoring

A summary of the ground monitoring results at various off-site locations is given in Appendix A, and the peak observed exposure rates on December 8 are shown in Figure 1. All readings are gross gamma exposure rates taken three feet above the ground and measured with a Geiger-Mueller (GM) survey meter, unless otherwise noted.

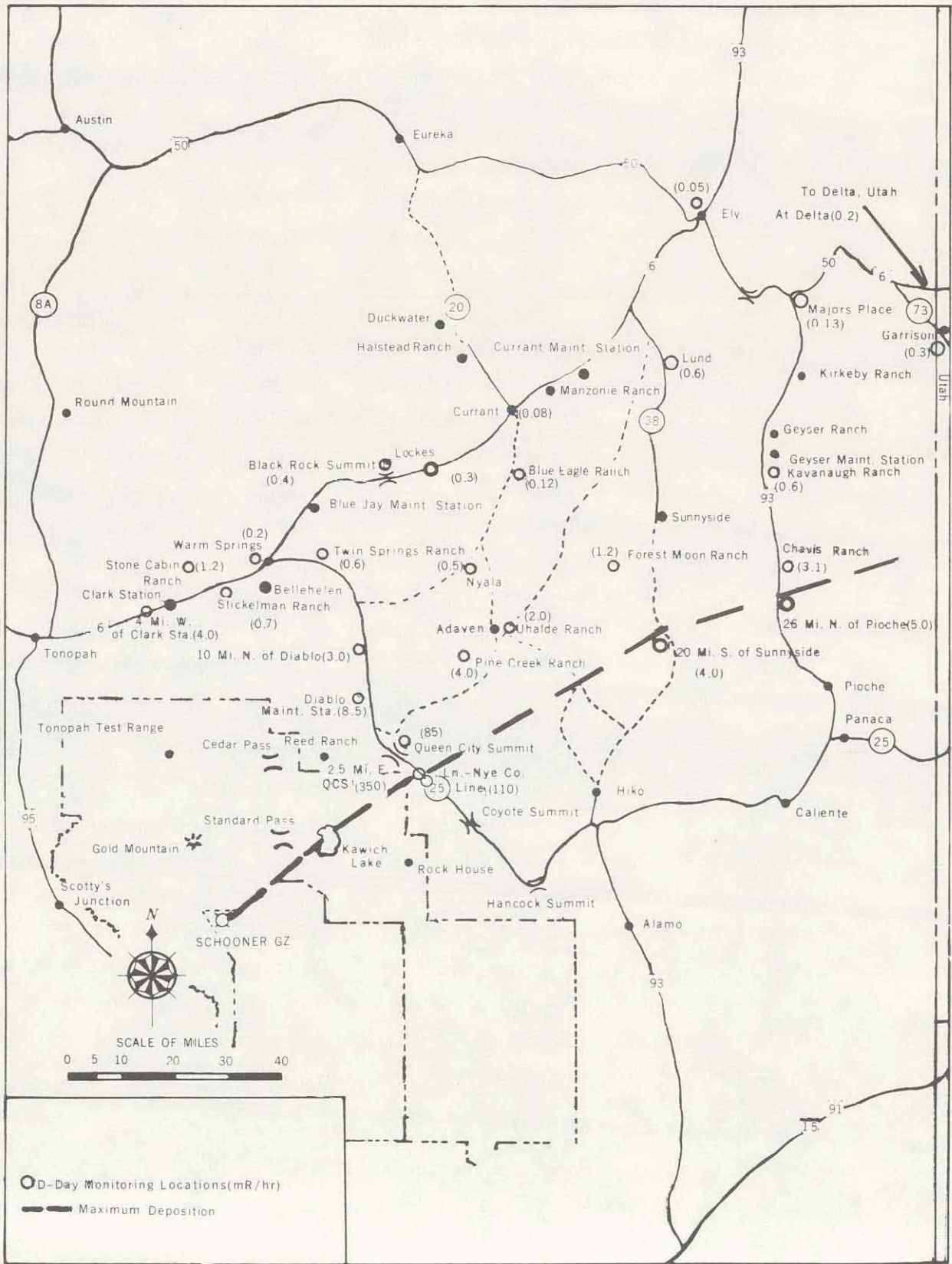


Figure 1. Maximum Observed Exposure Rates at D-Day Ground Monitoring Locations

Cumulative integrated exposures (determined by graphic integration) for populated locations only, based on survey meter readings, are also presented in Appendix A.

The gamma exposure rates associated with the main cloud, which moved northeast, were greater than those associated with the base surge which moved to the north and then spread northeast. The maximum exposure rate observed from the main cloud was 350 mR/hr at 1100 hours which was observed south of Highway 25 about 2.5 miles east of Queen City Summit. (This was the only measurement taken at this location during cloud passage and it was not substantiated by later observations.) At Queen City Summit, 3.4 miles west of the county line, the peak was 85 mR/hr at 1027 hours. The maximum exposure rate observed during passage of the base surge cloud was 4.0 mR/hr, approximately 4 miles west of Clark Station on Highway 6.

The maximum exposure rate at a populated location was 8.5 mR/hr, measured during cloud passage at the Diablo Maintenance Station, 47 miles from GZ. Peak exposure rates greater than 1 mR/hr at other populated locations, all in the path of the lower portion of the main cloud, were found at Pine Creek Ranch, 72 miles from GZ; Uhalde Ranch, 75 miles from GZ; Forest Moon Ranch, 104 miles from GZ; and Chavis Ranch, 127 miles from GZ.

The highest gamma exposure rate recorded on U. S. Highway 93 during cloud passage was 5.0 mR/hr at 1426 hours, 26 miles north of Pioche, 125 miles from GZ. The second highest was 3.1 mR/hr at 1539 hours at the Chavis Ranch, 1/4 mile east of Highway 93, 127 miles from GZ.

The highest readings observed in Utah during cloud passage were 0.3 mR/hr at 1800 hours in Garrison, 176 miles from GZ, and 0.2 mR/hr at 2023 hours in Delta, 256 miles from GZ.

Monitoring of the Schooner deposition on December 8 showed that the "hot-line" from the upper portion of the cloud crossed Highway 25

near the Lincoln-Nye County line; Nevada Highway 38 approximately 20 miles south of Sunnyside; and Highway 93, 26 miles north of Pioche (Figure 1).

Residual gamma activity at populated locations within 75 miles of GZ could be detected with GM survey meters for as long as nine days following the detonation (see Appendix A). Residual activity near the Lincoln-Nye County line and at Queen City Summit could be detected with survey meters into January.

"Hot-spot" teams with 4- by 4-inch NaI(Tl) crystal detector systems surveyed highways in Nevada, Utah, Colorado, Wyoming, Idaho, Montana, and North Dakota during the five days following the Schooner experiment to document residual activity patterns (Figure 2). On December 9, one of the teams observed the southern edge of deposition 14 miles north of Pioche, Nevada, on Highway 93. Levels increased to a peak of approximately 160 times background 26 miles north of Pioche. (Actual measurements were given in gross gamma counts per minute.) Vehicle contamination prevented the team from obtaining accurate quantitative measurements on deposition patterns on December 9 and 10 along U. S. Highway 50 west of Ely, Nevada; Highway 8A north of Austin; and U. S. Highway 40 between Wells and Reno, Nevada. On December 11 the western edge of the deposition pattern was observed approximately two miles east of Frenchman Station on Highway 50.

A second "hot-spot" team located the southern edge of deposition about 10 miles south of Kanosh, Utah, on U. S. Highway 91 on December 9. Levels increased to approximately 26 times background 31 miles north of Kanosh and returned to background 20 miles north of Salt Lake City. Levels of approximately twice background were detected from 26 miles west of Pocatello, Idaho, to Twin Falls, Idaho, along U. S. Highway 30. On December 10, levels ranged from background to twice background from Twin Falls to Coeur D'Alene, Idaho, via Boise. On succeeding days the team detected no activity which could definitely be attributed to Schooner as they traveled from Coeur D'Alene to Fargo, North Dakota, and thence to Las Vegas via

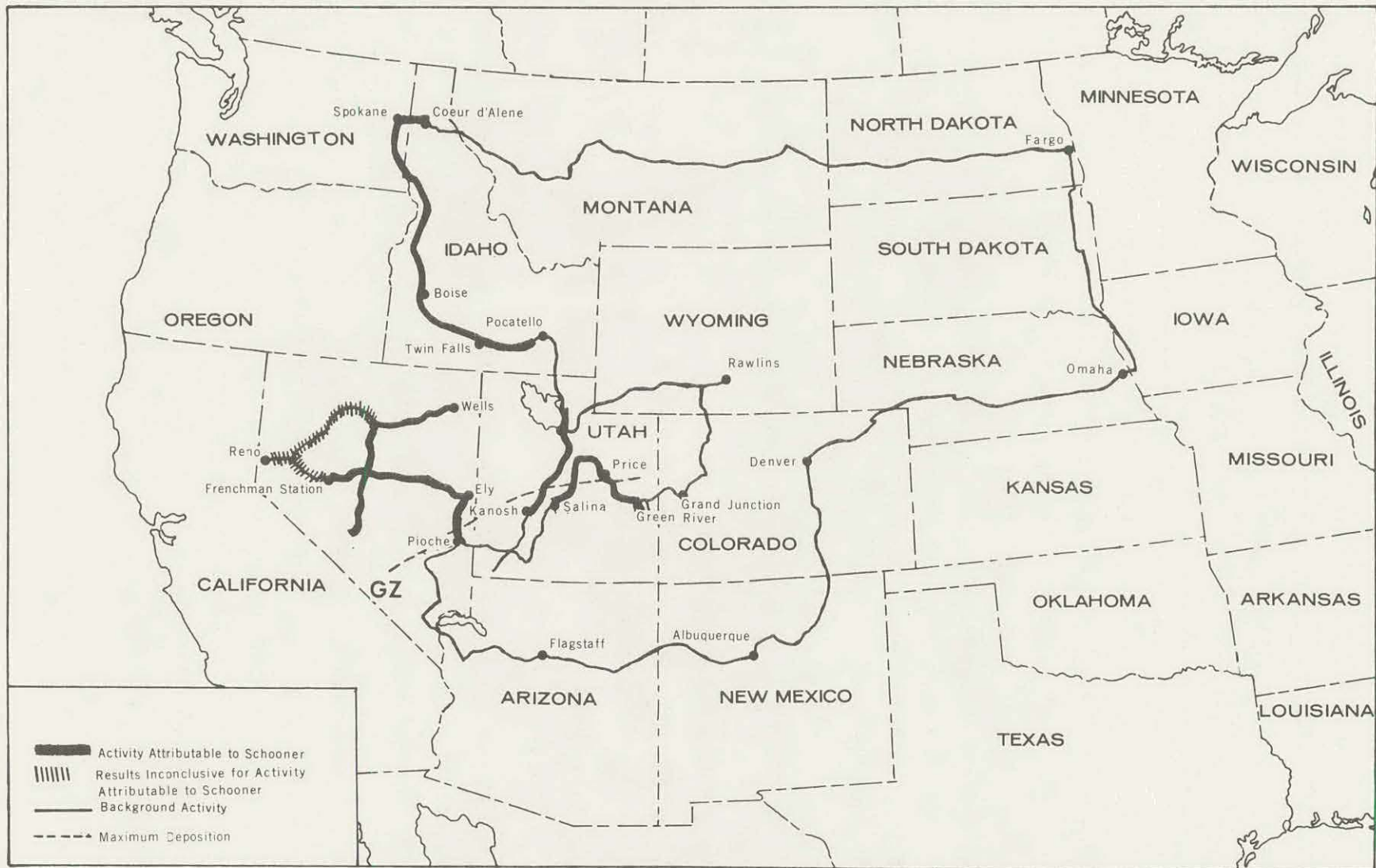


Figure 2. "Hot-Spot" Team Roads Monitored

Omaha, Denver, and Albuquerque. Background information from western Montana eastward and back to Las Vegas was not measured prior to the Schooner Event. However, the observed data for this area were within the usual background range observed on the detector system.

On December 11, a third "hot-spot" team observed the southern edge of deposited activity 10 miles north of Salina, Utah, on U. S. Highway 89. Levels increased to a peak of five times background 1.6 miles north of Ephraim, Utah, and the "hot-line" was crossed again 25 miles southeast of Price, Utah, on U. S. Highways 6 and 50. Maximum levels were four times the usual background range of the detector system. The apparent edge of activity was in the vicinity of Green River, Utah. On succeeding days no activity attributable to Schooner was detected eastward through Grand Junction, Colorado, or north to Rawlins, Wyoming.

C. Gamma Rate Recorders

SWRHL maintains a network of continuously operated GM-type detector gamma rate recorders surrounding the Nevada Test Site. The release from Schooner was monitored by twelve of these stations, as shown in Figure 3. Appendix B summarizes the recorder data for the twelve stations.

The highest activity observed at a recorder station occurred at the Diablo Maintenance Station. The recorder indicated a gross gamma peak of 2.7 mR/hr occurring at about 1230 hours. A ground monitor at the same location recorded a peak of 8.5 mR/hr at 1215 hours. In general, the arrival times of activity agreed with arrival times observed by ground monitors equipped with portable survey instruments at or near these locations; however, peak exposure rates and the net integrated exposures were generally a factor of two to three times lower for recorder data than those measured with portable survey instruments (Table 12). Several factors could have contributed to

the difference in peak readings, the most apparent being the location of the detectors. For power purposes, the recorders are generally situated close to a structure, which may reduce the field affecting the detector, increase the amount of scatter, and affect the distribution of the deposit. Survey meter measurements by SWRHL monitors are generally made away from the influence of any objects or structures. Other factors include the effect of the different energy responses of both instruments for photons less than 100 keV, and the dissimilar temperature coefficients and reading accuracies of the instruments.

Ground monitors supplemented the permanent recorder network with 20 portable GM-type detector gamma-rate recorder systems placed at various downwind locations. These systems employ the same GM-type detector used by the monitors. Most of the portable recorders were left in the field about one day and each was equipped with one thermoluminescent dosimeter (TLD) to obtain additional exposure data. The locations of these recorders are shown in Figure 3 and a summary of the data is presented in Appendix C. The exposure periods reported are based on the period of recorder operation.

The highest activity observed on a portable system occurred at Queen City Summit, a non-populated location on Highway 25. The recorder indicated a gross gamma peak of 107 mR/hr occurring at 1025 hours on December 8. The integrated recorder exposure (determined by graphic integration) was 1356 mR, while a TLD assigned to the recorder had an exposure of 1340 mR. The period of exposure was from 0945 hours on December 8 to 1413 hours on December 9. A ground monitor with survey instruments at the same location recorded a peak of 85 mR/hr at 1027 hours. If consideration is given to the limits of reading accuracy of the instruments and the different locations of the detectors in the radiation field, then the peak observed exposure rates are in agreement. The integrated recorder exposures and the corresponding TLD exposures agree for exposures greater than 20 mR. Disagreement at the lower values is probably due to operational problems such as varying background exposure or exposure to contaminated areas or equipment during TLD retrieval from the field.

D. Dosimetry

Dosimetry coverage for Project Schooner included the placement of TLD's along highways to intercept the debris cloud. These intercepts were placed along Highways 6 and 25, ranging from 45 to 65 miles from GZ, and Highway 93, averaging 125 miles from GZ. These intercepts, approximating arcs, spanned the sector from north to northeast. An additional arc of TLD's was placed to the south, along Highway 95 from Mercury to north of Beatty, at an approximate distance of 45 miles.

Additional film badge and TLD stations were established to supplement the routine off-site dosimetry network and TLD's were issued to selected off-site residents for whom there existed a possibility of radiation exposure from the Schooner release.

Two TLD's were placed at each station on the northern intercepts so that one could be collected shortly after cloud passage and the other left to document residual activity. Figure 4 shows the locations of the northern intercepts with respect to GZ, including three special study intercepts on the Nellis Air Force Range. The bold line in the figure represents the "hot-line" or path of maximum exposure as delineated by the TLD's. The fine lines indicate the edges of the deposition area from both the TLD data and ground monitoring at the time of TLD collection. The intercepts did not extend far enough west to determine the western edge of the deposition pattern. No exposure above background was detected by the TLD's to the south of GZ along Highway 95.

Table 1 provides a summary of the results obtained from the northern intercepts. Retrieval times for the second TLD's were scheduled to allow about 99 percent of the total exposure at that station to have been accumulated by the TLD's. The highest exposure measured along an off-site TLD intercept, the stations of which were located at two-mile intervals along Highways 6 and 25, and five-mile intervals along Highway 93, was 4.76 R in 195 hours of exposure, 2.3 miles east of Queen City Summit on Highway 25. This was the closest TLD station to the area where the highest off-site gamma

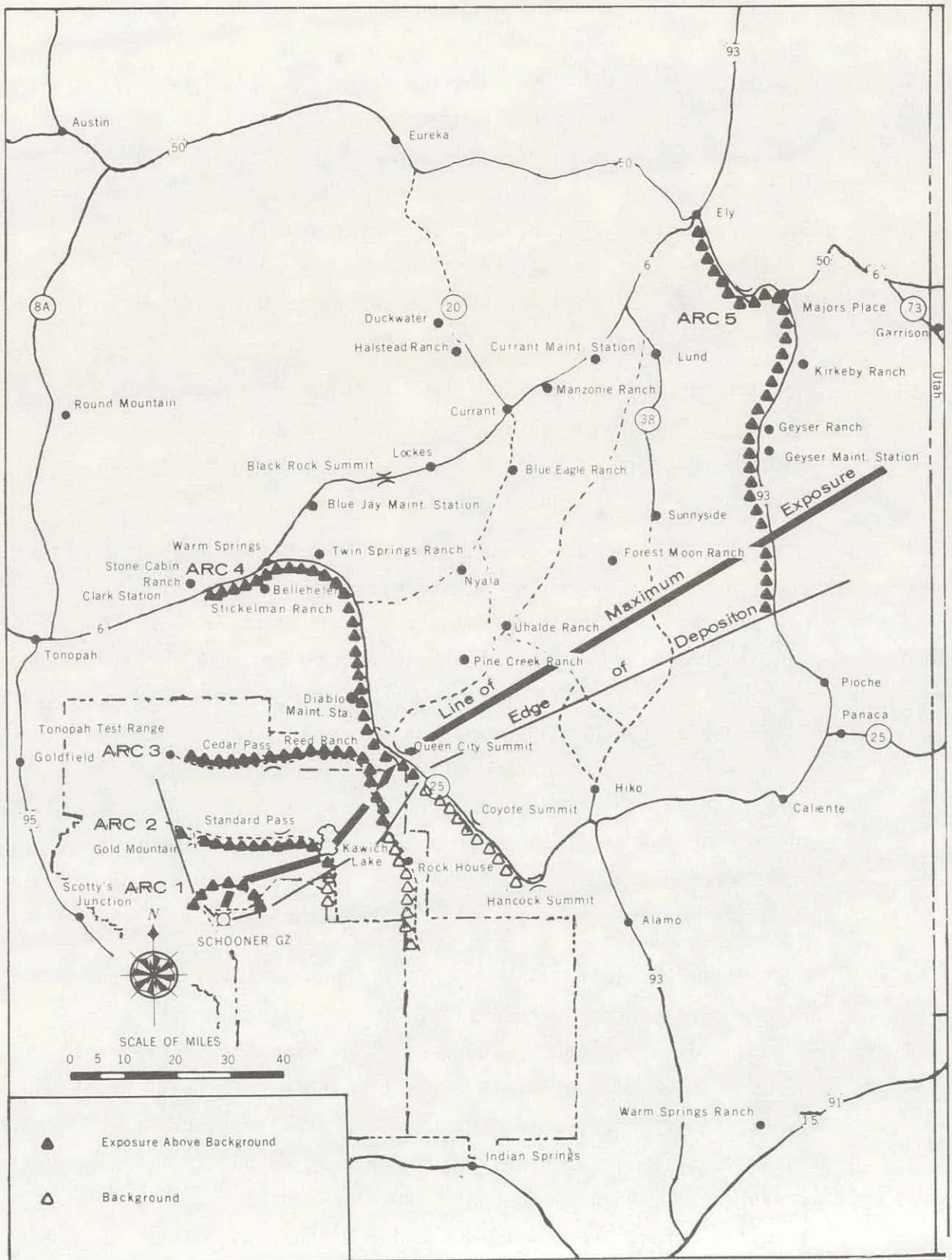


Figure 4. Dosimetry Arc Locations

exposure rate (350 mR/hr) was observed. The details of exposure profiles along each intercept, including the three intercepts on the Nellis Air Force Range used for the special study, are shown in Figures 5 through 9. In some cases, shown in Figure 8, the exposures to TLD's collected on December 8 were higher than those collected a week later. This indicates an exposure while the first TLD's were transported across contaminated areas during retrieval.

TABLE 1
Maximum TLD Exposures on Northern Arcs

PEAK EXPOSURE AT		FIRST TLD		SECOND TLD	
Azimuth (degrees)	Distance (miles)	Exposure Period (hours)	Exposure (R)	Exposure Period (hours)	Exposure (R)
54	44	9	1.40	195	4.76
58	122	18	0.046	119	0.075

The results from 23 permanent TLD and film badge stations are presented in Table 2 and the station locations are shown in Figure 10. The exposures cover approximately a 50-day period from early November to late December. The highest TLD exposure at any network station was 1.89 R at Queen City Summit. Approximately 0.3 miles east of this location, a TLD intercept station measured 3.16 R in 195 hours of exposure (Figure 8). The highest exposure measured with a TLD at a populated location was 149 mR at the Diablo Maintenance Station.

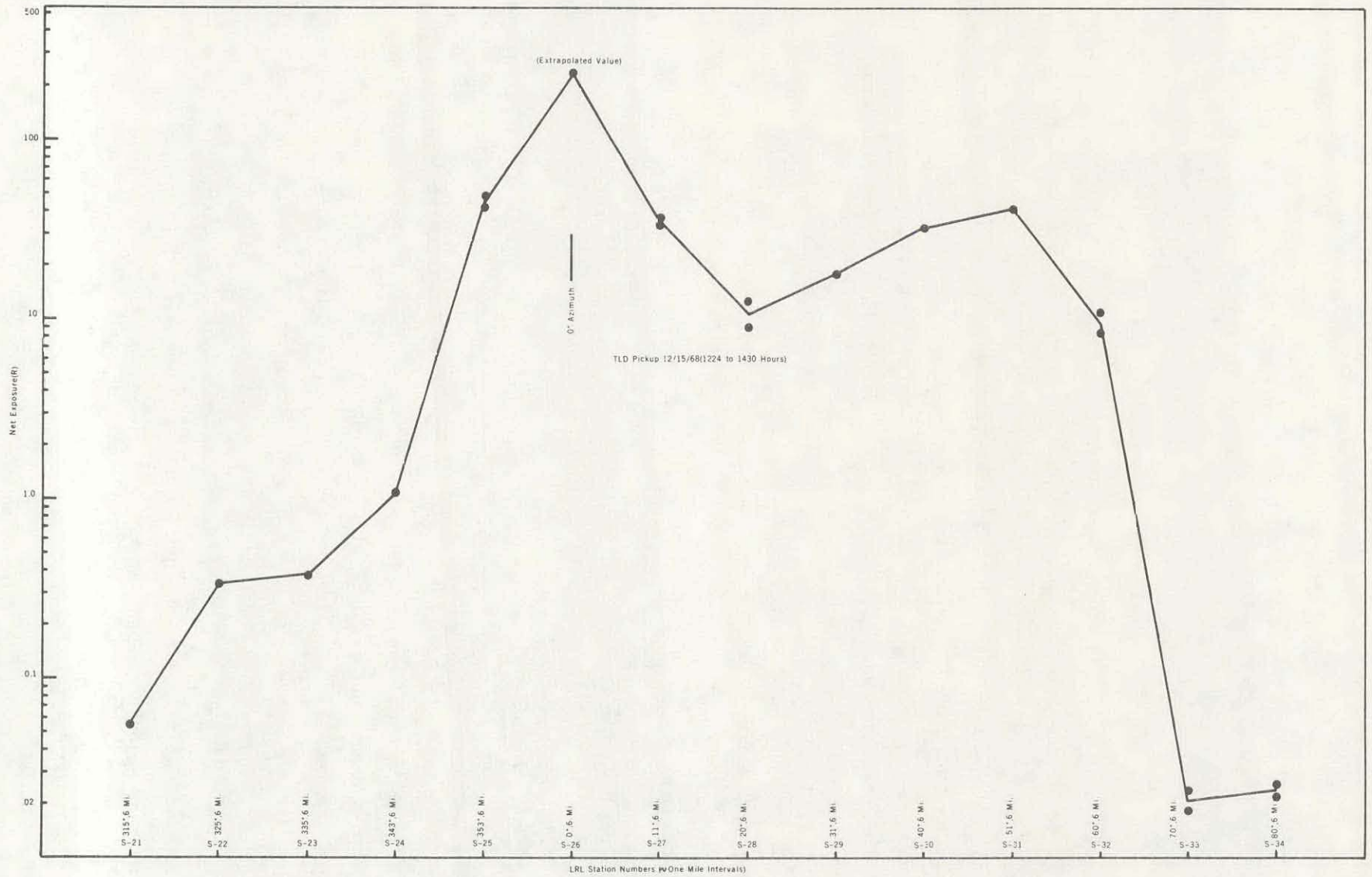


Figure 5. TLD Exposures —Arc 1



Figure 6. TLD Exposures - Arc 2

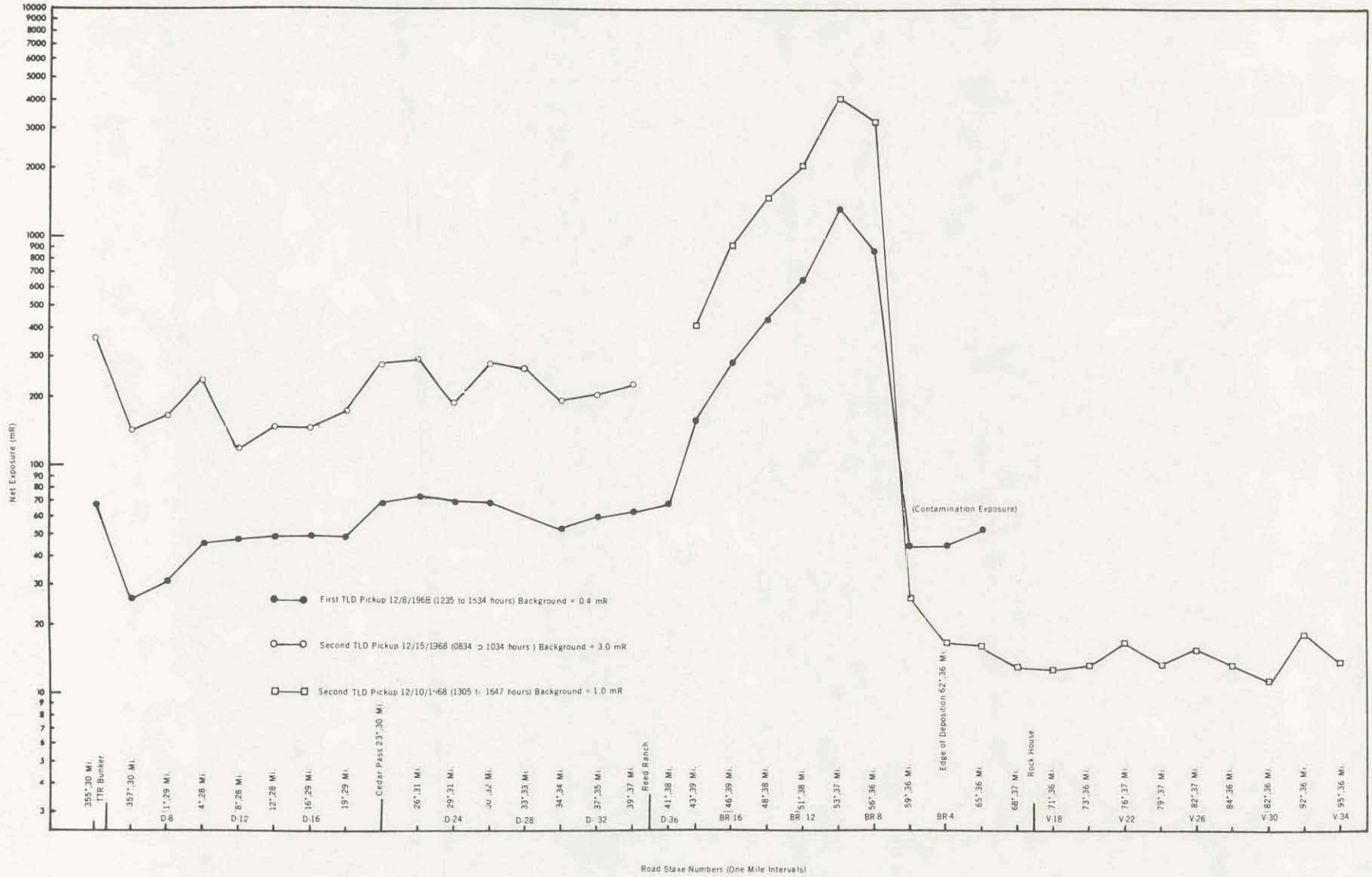


Figure 7. TLD Exposures - A-c 3

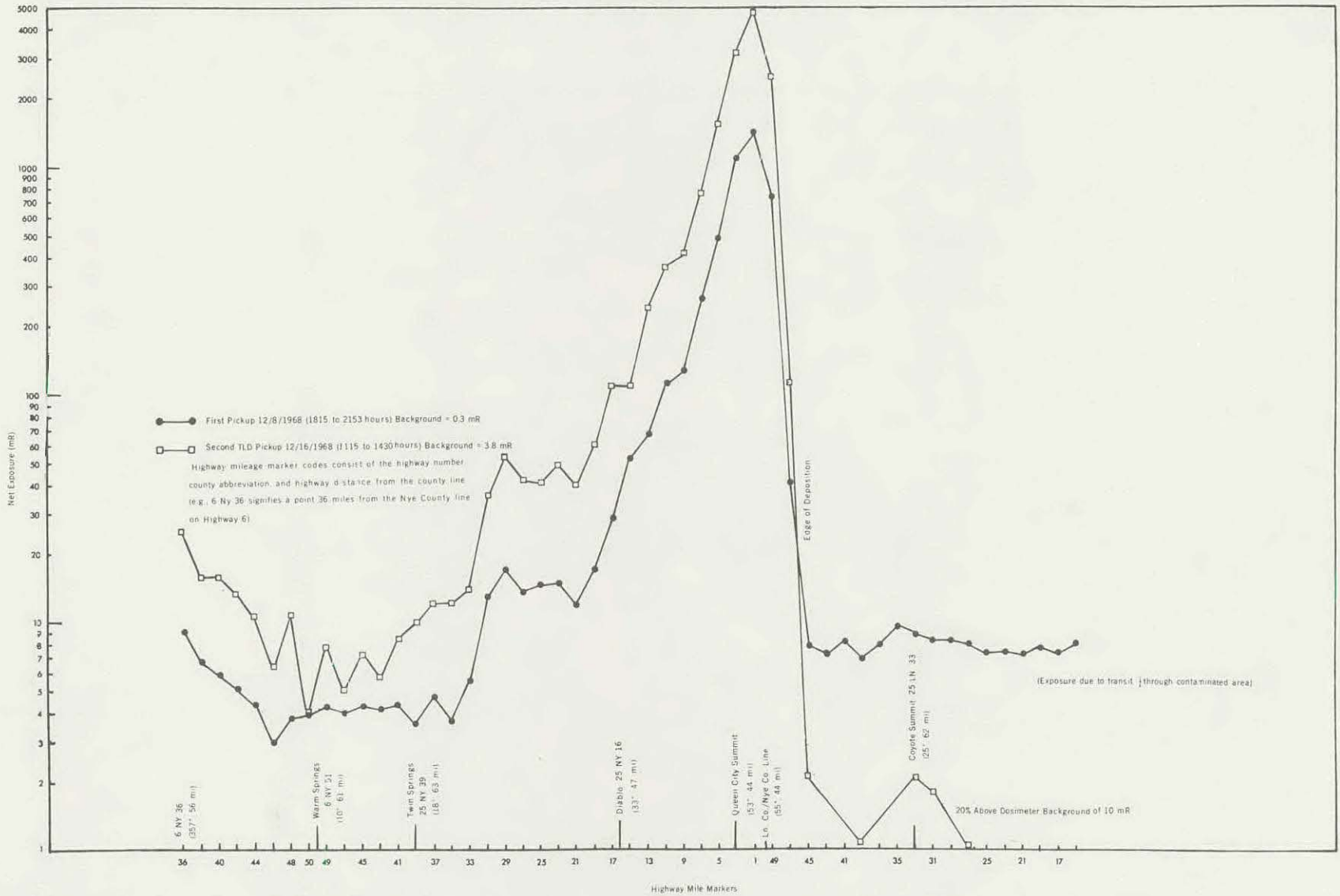


Figure 8 TLD Exposures - Arc 4

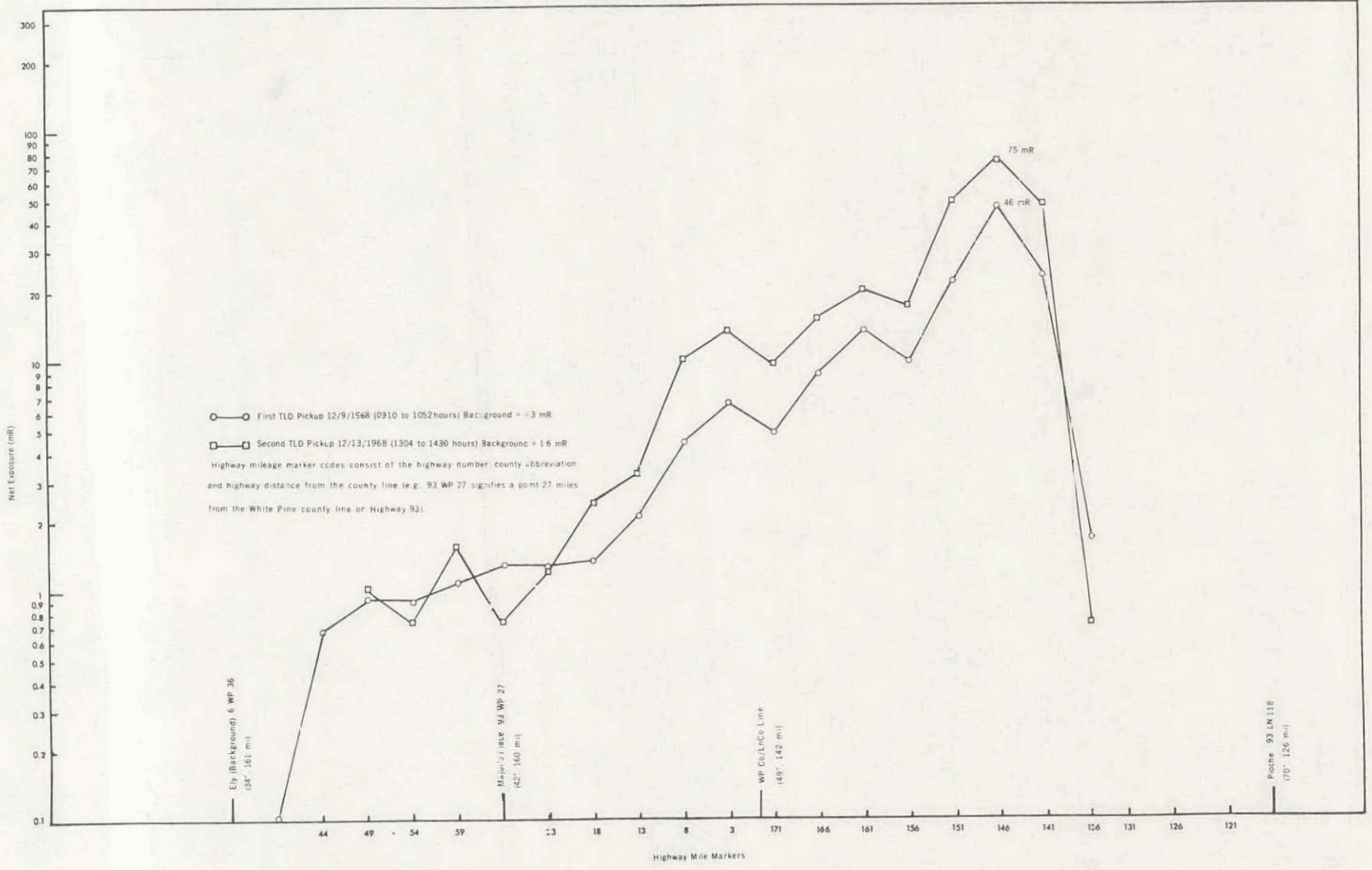


Figure 9. TLD Exposures - Arc 5

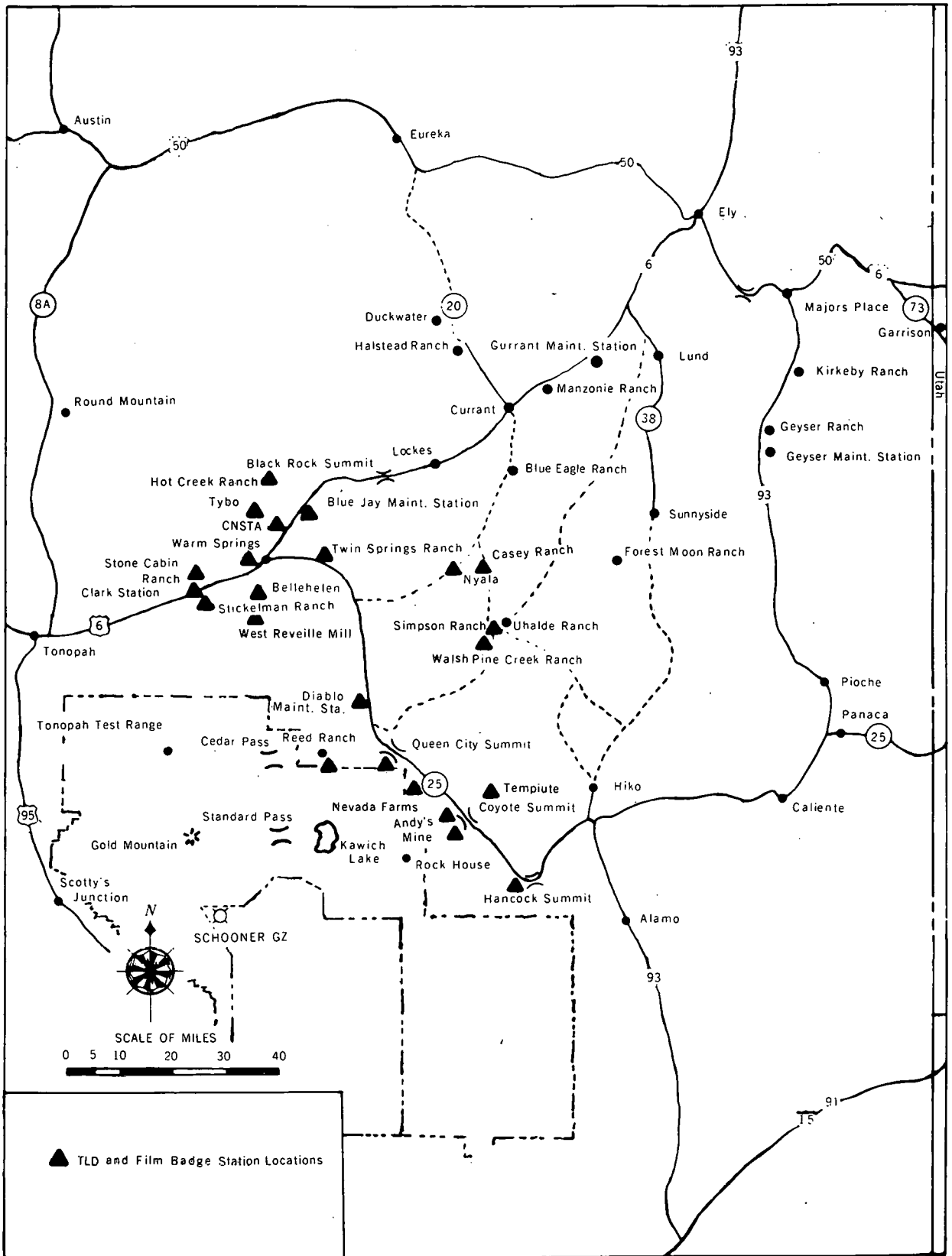


Figure 10. TLD and Film Badge Station Locations

TABLE 2

Net TLD and Film Badge Exposures at Fixed Stations

LOCATION (Azimuth, Distance)	EXPOSURE PERIOD (From - To)	EXPOSURE RECORDED (mR)	
		TLD	Film Badge
Andy's Mine 73°, 47 mi	11/6-12/26	0	<30
Bellehelen Mine 8°, 50 mi	11/7-12/27	7	30
Blue Jay Maintenance Station 15°, 76 mi	11/7-12/27	3	37
Casey's Ranch 39°, 82 mi	11/8-12/27	1	<30
Clark Station 352°, 57 mi	11/7-12/27	28	45
CNSTA 13°, 76 mi	11/7-12/27	0	<30
Coyote Summit (Highway 25) 72°, 51 mi	11/6-12/26	0	<30
Diablo Maintenance Station 33°, 47 mi	11/7-12/26	149	146
Hancock Summit (Highway 25) 85°, 64 mi	11/6-12/26	0	<30
Hot Creek Ranch 7°, 82 mi	11/7-12/27	0	<30
Nevada Farms 63°, 46 mi	11/6-12/26	0	<30
Nyala 34°, 76 mi	11/8-12/27	10	<30
Queen City Summit (Highway 25) 53°, 44 mi	11/6-12/26	1893	1979
Reed Ranch (Vacant) 38°, 37 mi	11/6-12/26	168	168
Simpson's Ranch 42°, 75 mi	11/8-12/27	29	43
Stickelman's Farm 357°, 55 mi	11/7-12/27	15	31
Stone Cabin Ranch 356°, 61 mi	11/7-12/27	25	39
Tempiute 68°, 55 mi	11/6-12/26	0	<30

TABLE 2 (continued)

LOCATION (Azimuth, Distance)	EXPOSURE PERIOD (From - To)	EXPOSURE RECORDED (mR)	
		TLD	Film Badge
Twin Springs Ranch 18°, 63 mi	11/7-12/27	4	45
Tybo 7°, 74 mi	11/7-12/27	0	<30
Walsh's Ranch (Pine Creek) 46°, 72 mi	11/8-12/27	63	76
Warm Springs 10°, 61 mi	11/7-12/27	0	58
West Reveille Mill 24°, 53 mi	11/6-12/27	6	30

TLD's were issued to seventeen off-site residents on the day of the event and were collected approximately one week later. The exposures are listed in Table 3. The highest exposure in this group, 165 mR, was received by a sheepherder from Uhalde Ranch near Adaven, Nevada. The sheepherder was tending several bands of sheep during the exposure period, and apparently spent some time in the vicinity of high deposition, east of the ranch in White River Valley. He received a higher exposure than those people who remained near the ranch. Exposures to two other Uhalde Ranch residents were 16 mR and 25 mR. A TLD station at the ranch indicated an exposure of 25 mR.

The next highest exposure, 57 mR, was to a resident at the Diablo Maintenance Station. The man's work included daily trips to the Queen City Summit area where higher levels of residual contamination existed. A second Diablo resident who remained at home during this period received an exposure of 35 mR.

TABLE 3

Exposure to Off-Site Residents
(TLD and Film Badge Results)

LOCATION (Azimuth, Distance)	RESIDENT IDENTIFICATION NO.	DOSIMETER	ISSUE DATE	COLLECTION DATE	EXPOSURE (mR)
Blue Eagle Ranch 32°, 97 mi	S-BE-1-CH	TLD	12/8	12/16	<1
	S-BE-2-MCH	TLD	12/8	12/16	2
	S-BE-3-LS	TLD	12/8	12/16	<1
Blue Jay Maintenance Station, 15°, 76 mi	S-BJ-1-JB	FB	11/6	12/27	<30
	S-BJ-2-EF	FB	11/6	12/27	<30
Currant Maintenance Station, 33°, 116 mi	S-C-1-PM	TLD	12/8	12/16	<1
	S-C-2-JP	TLD	12/8	12/16	<1
Diablo Maintenance Station, 33°, 47 mi	S-D-1-DC	TLD	12/8	12/16	57
	S-D-1-DC	FB	11/7	1/2	70
	S-D-2-BM	TLD	12/8	12/16	35
	S-D-3-CM	FB	11/7	1/2	35
Nyala 34°, 76 mi	S-N-1-MHS	FB	11/8	12/27	<30
	S-N-2-GS	FB	11/8	12/27	<30
	S-N-3-NS	FB	11/8	12/27	<30
Simpson's Ranch 42°, 75 mi	S-S-1-OS	FB	11/8	12/26	<30
	S-S-1-AS	FB	11/8	12/26	<30
Sunnyside 47°, 112 mi	S-SN-1-KA	TLD	12/8	12/15	9
	S-SN-2-LA	TLD	12/8	12/15	9
	S-SN-3-LL	TLD	12/8	12/15	11
	S-SN-4-ML	TLD	12/8	12/15	9
Twin Springs Ranch 18°, 63 mi	S-TS-1-HF	TLD	12/8	12/15	3
	S-TS-2-BM	TLD	12/8	12/15	7
	S-TS-3-JS	TLD	12/8	12/14	5
	S-TS-4 ^a	TLD	12/8	12/16	7.5
	S-TS-1-HF	FB	11/6	12/27	<30
Uhalde Ranch 45°, 75 mi	S-U-1-FA	TLD	12/8	12/16	25
	S-U-2-JN	TLD	12/8	12/17	165
	S-U-3-GU	TLD	12/8	12/16	16
	S-U-4 ^a	TLD	12/8	12/16	25

^aTLD located outside ranch house.

Film badges issued routinely to residents at Blue Jay Maintenance Station, Twin Springs Ranch, Nyala, and Simpson's Ranch at Adaven did not indicate exposures above their minimum sensitivity of 30 mR. Two residents at the Diablo Maintenance Station received exposures on their film badges of 70 mR and 35 mR for the period November 7 to January 2. The higher exposure is consistent with an exposure of 57 mR on a TLD worn by the same individual for the period December 8-16.

E. Vegetation Sampling

Natural vegetation samples, primarily sage and grease-wood brush, were collected at 10-mile intervals along various roads and highways across the trajectory. Vegetation samples collected in the downwind area indicated wide-spread contamination caused by high winds and broad-scale diffusion of the base surge cloud. The attempt at trajectory delineation by vegetation samples was unsuccessful.

Locations of sampling points are indicated in Figure 11 and the results are listed in Appendix D. All samples were analyzed for gross gamma activity and the highest counts in the off-site area were found along Highways 6, 25, 38, and 93. These counts ranged from 21,000 to 3,800,000 cpm/kg fresh weight, with the peak activity occurring near Queen City Summit on Highway 25 and in an area 20 miles north of Pioche on Highway 93. Table 4 summarizes the highest activities found along the various highways. Schooner related activity was not detected in vegetation samples taken in Colorado, Nebraska, and New Mexico.

TABLE 4
Gross Gamma Activity on Natural Vegetation

LOCATION	DATE OF COUNT	GROSS GAMMA (cpm/kg)
Highway 25 - 2 mi E of Queen City Summit	12/10	3,800,000
Highway 38 - 20 mi S of Sunnyside	12/10	1,800,000
Highway 6 - 30 mi E of Tonopah	12/9	2,400,000
Highway 6 - 40 mi NE of Warm Springs	12/10	640,000
Highway 93 - 20 mi N of Pioche	12/10	3,800,000
Highway 50 - 50 mi E of Austin	12/10	140,000
Highway 21 - 7 mi S of Garrison, Utah	12/13	63,000

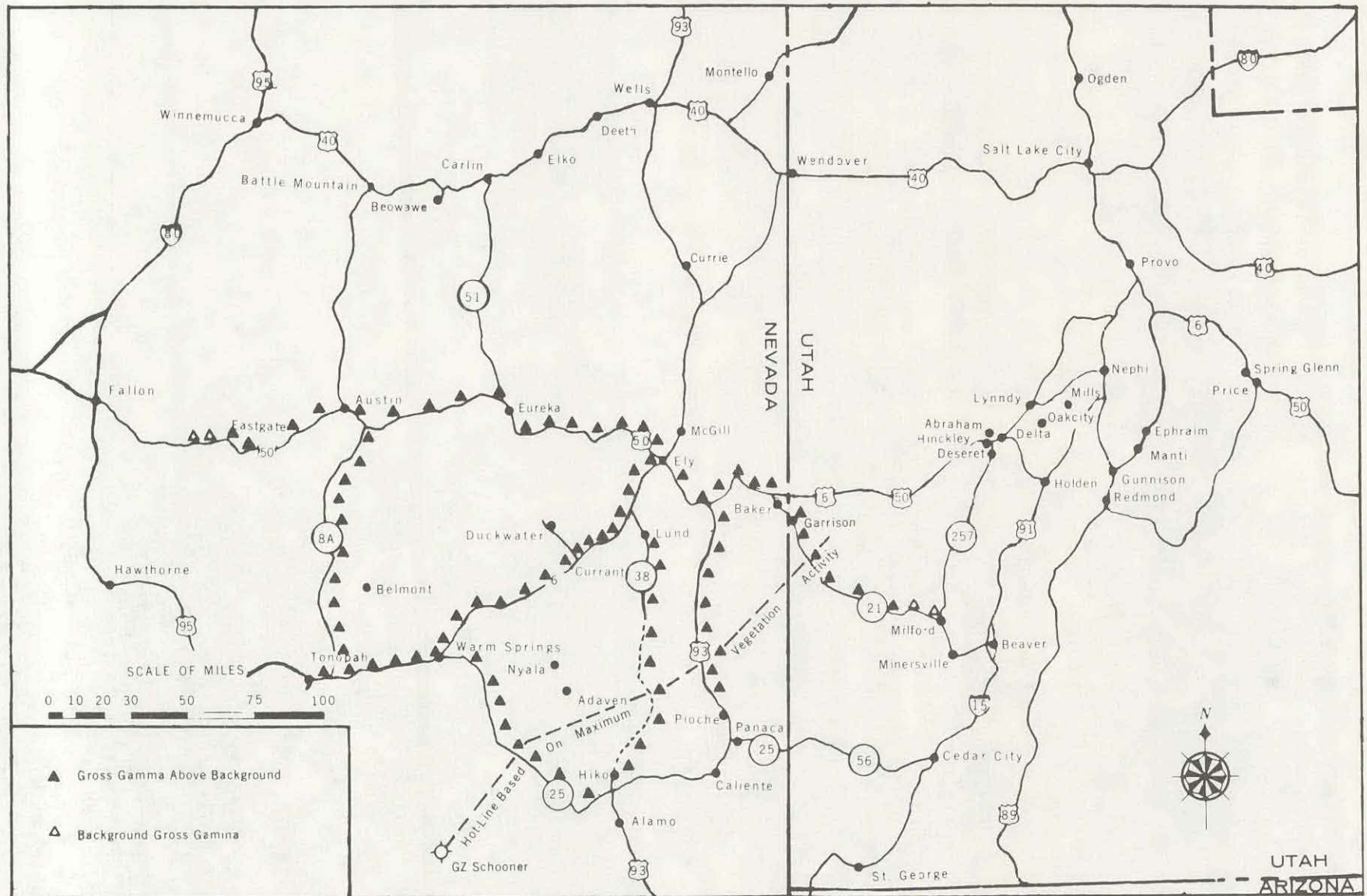


Figure 11. Vegetation Sampling Locations

Further sampling of natural vegetation was performed in June, August, October, and November 1969, in the Schooner deposition area. Unfortunately, sampling locations differed from those used in earlier collections and those used for the follow-up study. All samples were analyzed for ^{181}W and the highest counts were again found along Highway 25. Table 5 summarizes the highest ^{181}W activities found along the various highways.

TABLE 5
Follow-up Activity in Natural Vegetation

LOCATION	DATE OF COUNT	^{181}W (pCi/kg)
Highway 25 - 0.5 mi W of Queen City Summit	6/12/69	1,900,000
Highway 6 - 25 mi E of Tonopah	6/12/69	320,000
Highway 93 - 31 mi N of Pioche	10/09/69	68,000
Highway 21 - 15 mi SE of Garrison, Utah	11/10/69	2,200
Highway 257 - 15 mi S of Deseret, Utah	10/27/69	1,800
Highway 91 - 30 mi N of Kanosh, Utah	10/27/69	2,500

Tungsten-181 (300 pCi/kg) was found on December 22, 1969, in barley grown at Nevada Farms (62° , 45 miles), south of Highway 25, approximately 4 miles east of the "hot-line." This barley was planted in September 1968, and harvested in July 1969.

Radiochemical separations were made on some vegetation samples to determine the ratio of ^{181}W to ^{185}W . A ratio of 2.1:1 was measured on October 30, 1969.

F. Air Sampling

Ninety-one air sampling stations operated for SWRHL as an Air Surveillance Network (ASN) west of the Mississippi River collected Schooner radioactivity. In addition, nine

portable sampling units operated by SWRHL monitors in the off-site area also collected Schooner activity. Figure 12 shows the locations of air sampling stations in operation during the Schooner surveillance period. The stations collecting activity resulting from Schooner are designated in the figure. These included all stations in Nevada with the exception of the Reno station, all stations in the northern two-thirds of Utah and the western half of Oregon and Washington, and all stations (including standby stations) in Colorado, Wyoming, Idaho, Montana, South Dakota, and Nebraska. Several stations in California, Arizona, New Mexico, Texas, Louisiana, Missouri, and Iowa also observed Schooner radioactivity.

The results are tabulated in Appendix E. Activities reported are extrapolated to the end of the sampling period and rounded to two significant figures following calculation. Only those filters showing positive gamma results have been reported. The beta results are extrapolated to the end of the sampling period, based on the decay observed on a filter obtained from a PHS aircraft sampling the primary Schooner cloud. Gross beta decay characteristics of several ASN filters studies matched the gross beta decay characteristics of the aerial sample over the period for which the ASN filters were studied. The predominant radionuclide present on filters was ^{187}W .

Table 6 presents a summary of results from stations in Nevada collecting the highest amounts of activity on the day of the event. The results are sums of specific isotopes detected on a particulate filter and charcoal cartridge for each sampling period. Integrated concentrations ranged downward from 12,000 $\mu\text{Ci}\cdot\text{sec}/\text{m}^3$ of ^{187}W and 6.8 $\mu\text{Ci}\cdot\text{sec}/\text{m}^3$ of ^{131}I . Five of the more active samples were selected for recounting by gamma spectroscopy 13 months post-shot, in order to look for the longer-lived isotopes. The results are included in Table 6.

In states other than Nevada, the highest integrated ^{187}W concentrations measured were from both Garrison, Utah, and Mountain Home, Idaho. The ^{187}W value was 240 $\mu\text{Ci}\cdot\text{sec}/\text{m}^3$. Table 7 shows the highest ^{187}W concentrations at some locations in states other than Nevada. The results were obtained in the same manner as for Table 6.

TABLE 6

Highest Off-Site Air Sampling Results in Nevada - December

LOCATION (Azimuth, Distance)	SAMPLING PERIOD Date/Time From-To	ISOTOPIC ANALYSIS					
		¹⁸⁷ W	¹³¹ I	¹⁸¹ W	¹³⁷ Cs	¹⁰⁶ Ru	⁵⁴ Mn
		$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$
		$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$
Clark Station, Nevada ^a (Stickelman's Farm) 356°, 55 mi	8/0955-8/2145	280,000	28	15,000	2.3	4.4	1.0
		12,000	1.2	640	0.19	0.098	0.042
Queen City Summit ^a (Highway 25) 48°, 47 mi	8/0938-8/1713	340,000	250	15,000	0.6	6.8	2.9
		9,300	6.8	410	0.19	0.02	0.079
44 mi W of Hiko (Highway 25) 56°, 48 mi	8/0950-8/1050	1,100,000	No	NA	NA	NA	NA
		4,000	Charcoal Cartridge Run	--	--	--	--
Antelope Summit ^a (Highway 50) 22°, 157 mi	8/1030-9/0856	46,000	ND	2,800	0.2	2.5	0.3
		3,700	--	230	0.20	0.02	0.02
Warm Springs ^a 11°, 60 mi	8/0700-8/2130	44,000	8.2	1,900	0.2	1.3	0.2
		2,300	0.4	99	0.068	0.01	0.01
Tonopah 324°, 61 mi	8/1430-9/1145	26,000	ND	NA	NA	NA	NA
		2,000	--	--	--	--	--
10 mi N of Diablo (Highway 25) 30°, 56 mi	8/0945-8/2113	41,000	ND	NA	NA	NA	NA
		1,600	--	--	--	--	--

^a Sample recounted 13 months post-shot.

NA - No analysis performed for these isotopes.

ND - Not detected. Notation implies the characteristic photopeaks for that isotope were either not present or masked.

TABLE 6 (continued)

LOCATION (Azimuth, Distance)	SAMPLING PERIOD Date/Time From-To	ISOTOPIC ANALYSIS					
		^{187}W	^{131}I	^{181}W	^{137}Cs	^{106}Ru	^{54}Mn
		$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$	$\frac{\text{pCi}}{3}$
		$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$
		$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$	$\frac{\mu\text{Ci}\cdot\text{sec}}{3}$
		$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$	$\frac{\text{m}}{3}$
Kavanaugh Ranch 52°, 133 mi	8/1150-8/2130	36,000 1,200	ND --	NA --	NA --	NA --	NA --
Nyala 36°, 77 mi	8/0800-8/2125	27,000 1,200	ND --	NA --	NA --	NA --	NA --
Eureka ^a 12°, 153 mi	8/0700-9/0700	13,000 1,100	ND --	960 83	0.1 0.009	ND --	ND --
Blue Jay Maintenance Station, 15°, 75 mi	8/0900-9/0720	13,000 1,000	ND --	NA --	NA --	NA --	NA --
Duckwater (Halstead Ranch) 25°, 117 mi	8/1000-9/0800	12,000 980	ND --	NA --	NA --	NA --	NA --
Diablo Maintenance Station, 35°, 46 mi	8/0650-8/2110	17,000 860	12 0.6	NA --	NA --	NA --	NA --
Round Mountain 344°, 98 mi	8/1145-9/1140	10,000 860	ND --	NA --	NA --	NA --	NA --
Lund 39°, 135 mi	8/0743-8/2230	16,000 840	ND --	NA --	NA --	NA --	NA --
Lockes 26°, 97 mi	8/1530-8/2125	31,000 660	ND --	NA --	NA --	NA --	NA --

^a Sample recounted 13 months post-shot.

NA - No analysis performed for these isotopes.

ND - Not detected. Notation implies the characteristic photopeaks for that isotope were either not present or masked.

TABLE 7

Highest Air Sampling Results Outside Nevada - December

LOCATION (Azimuth, Distance)	¹⁸⁷ W		SAMPLING PERIOD (Date/Time) From-To
	(pCi/m ³)	(μCi·sec/m ³)	
Garrison, Utah 52°, 176 mi	2,800	240	8/0800- 9/0800
Mountain Home, Idaho 70°, 402 mi	2,400	240	9/1630-10/1930
Boise, Idaho 2°, 434 mi	970	84	9/0900-10/0900
Dugway, Utah 46°, 286 mi	1,000	79	8/2152- 9/1952
Twin Falls, Idaho 17°, 377 mi	940	81	9/0800-10/0800
Delta, Utah 57°, 256 mi	1,100	68	8/1305- 9/0725 ^a
Wendover, Utah 30°, 269 mi	660	57	9/0800-10/0800
Pocatello, Idaho 30°, 438 mi	350	33	9/1432-10/1620
Grand Junction, Colorado 75°, 451 mi	210	30	9/1700-11/0818
Provo, Utah 53°, 330 mi	310	27	9/0900-10/0900
Bozeman, Montana 26°, 641 mi	800	25	10/0755-10/1650
Salt Lake City, Utah 47°, 345 mi	270	23	9/0855-10/0830

^a Charcoal cartridge added 8/1805.

Radioiodine was detected in some air samples although a minimum of 1,000 pCi/m³ of ¹⁸⁷W would mask the presence of about 10 pCi/m³ of ¹³¹I. This 100:1 ratio (¹⁸⁷W/¹³¹I) seemed to hold for most filters. In states other than Nevada, the highest integrated concentration sampled was from Mountain Home, Idaho, where the ¹³¹I value was 0.6 μCi·sec/m³. Table 8 lists the highest integrated ¹³¹I concentrations at some stations outside Nevada.

TABLE 8
Radioiodine in Air Samples Outside Nevada - December

LOCATION (Azimuth, Distance)	¹³¹ I		SAMPLING PERIOD (Date/Time) From-To
	(pCi/m ³)	(μCi·sec/m ³)	
Mountain Home, Idaho 7°, 402 mi	6.1 0.8	0.60 0.06	9/1630-10/1930 10/1930-11/1730
Twin Falls, Idaho 17°, 377 mi	2.0	0.17	10/0800-11/0800
Delta, Utah 57°, 256 mi	2.1	0.12	8/1305- 9/0725 ^a
Wendover, Utah 30°, 269 mi	1.2	0.10	9/0800-10/0800
Grand Junction, Colorado 75°, 451 mi	0.9	0.10	9/1700-11/0818
Pueblo, Colorado 84°, 655 mi	1.0	0.09	10/1335-11/1405
Bozeman, Montana 26°, 641 mi	2.1	0.07	10/0755-10/1650
North Platte, Nebraska 73°, 883 mi	0.6	0.06	10/1130-11/1530
Casper, Wyoming 55°, 661 mi	0.6	0.05	9/1830-10/1830
Durango, Colorado 90°, 477 mi	0.5	0.04	15/1731-16/1730
St. George, Utah 96°, 166 mi	0.5	0.04	11/0545-12/0450

^aCharcoal cartridge added 8/1805.

Atmospheric moisture samples were collected by molecular sieve sampling systems at selected off-site locations. The results are shown in Table 9.

TABLE 9
Tritium in Atmospheric Moisture Samples

LOCATION (Azimuth, Distance)	DATE/TIME (On-Off)	VOLUME AIR (m ³)	WATER RECOVERED (ml)	TRITIUM CONCENTRATION (pCi/m ³ Air) (pCi/ml H ₂ O)	
Queen City Summit 53°, 44 mi	8/0953-8/1220	1.6	3.98	935	378
Diablo Maintenance Station, 33°, 47 mi	8/0940-8/1310	1.9	4.75	42.3	16.9
Kavanaugh Ranch 49°, 138 mi	8/1705-8/2005	1.4	2.44	42.5	24.4
Gunderson Road Turnoff, Highway 25 58°, 45 mi	8/1030-8/1115	≈0.3	1.43	≈35 ^a	≈7.3
Garrison, Utah 51°, 176 mi	8/1718-8/1810	≈0.4	2.17	≈27 ^a	≈5.0

^aData are reconstructed from total moisture recoveries.

G. Milk Sampling

SWRHL monitors collected milk samples from 45 locations in Nevada and Utah following the Schooner event. Milk samples were also obtained from 38 Standby Milk Surveillance Stations from the network covering the western U.S. The latter stations, located in Colorado, Idaho, Montana, Utah, and Wyoming, mailed daily samples to SWRHL for a seven-day period following the event. The sampling locations are shown in Figures 13 and 14 and the results of the analyses are listed in Appendix F.

Samples from 17 locations in Nevada and 12 locations in Utah contained ¹⁸⁷W. Iodine-131 was detected at only four of these locations in Nevada and at one in Utah. No Schooner-related activity was found in samples collected from any of the other states. No noticeable increase in ⁸⁹Sr, ⁹⁰Sr, or ¹³⁷Cs levels was observed in any of the collected samples.

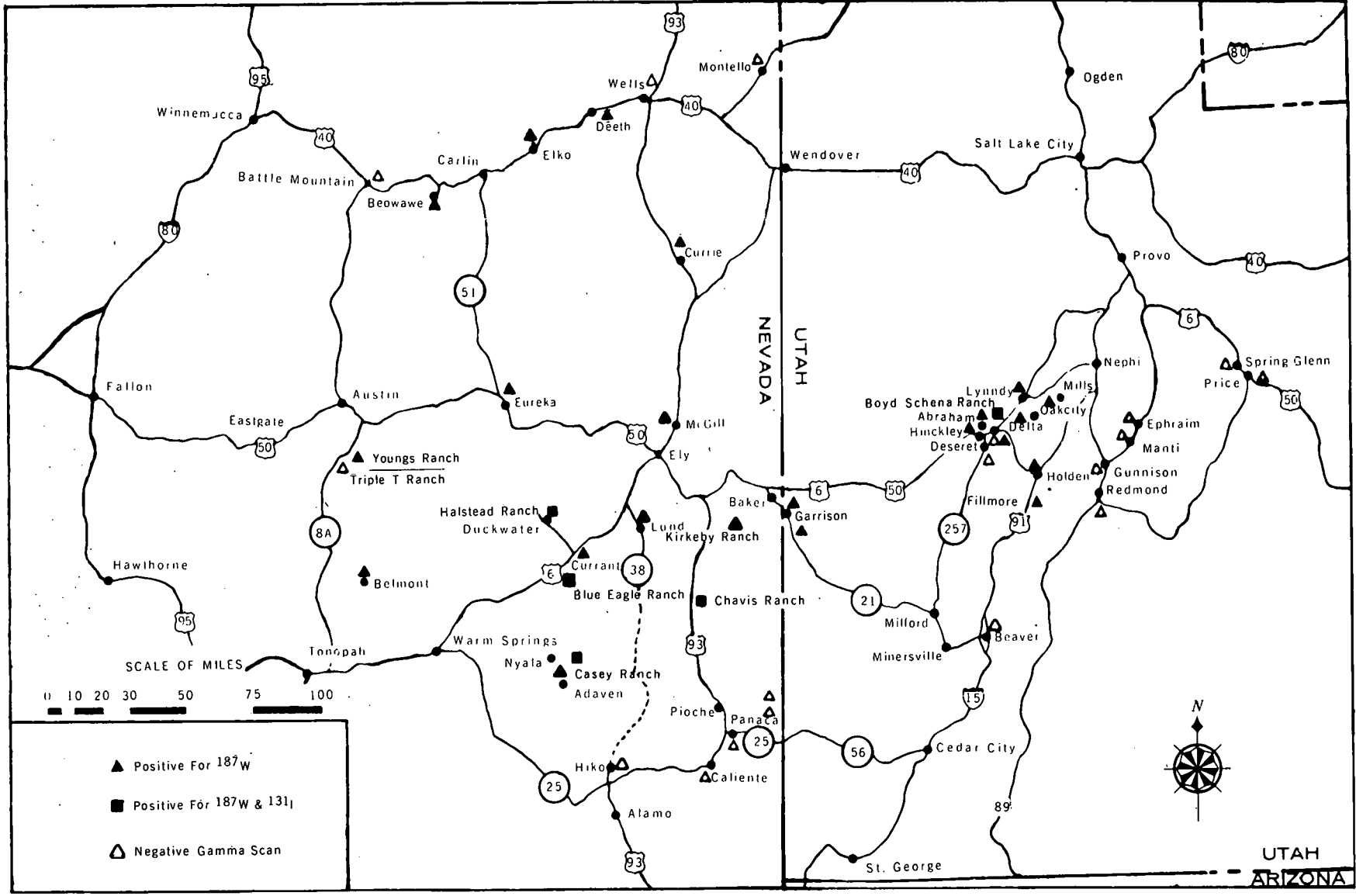


Figure 13. Milk Sampling Locations

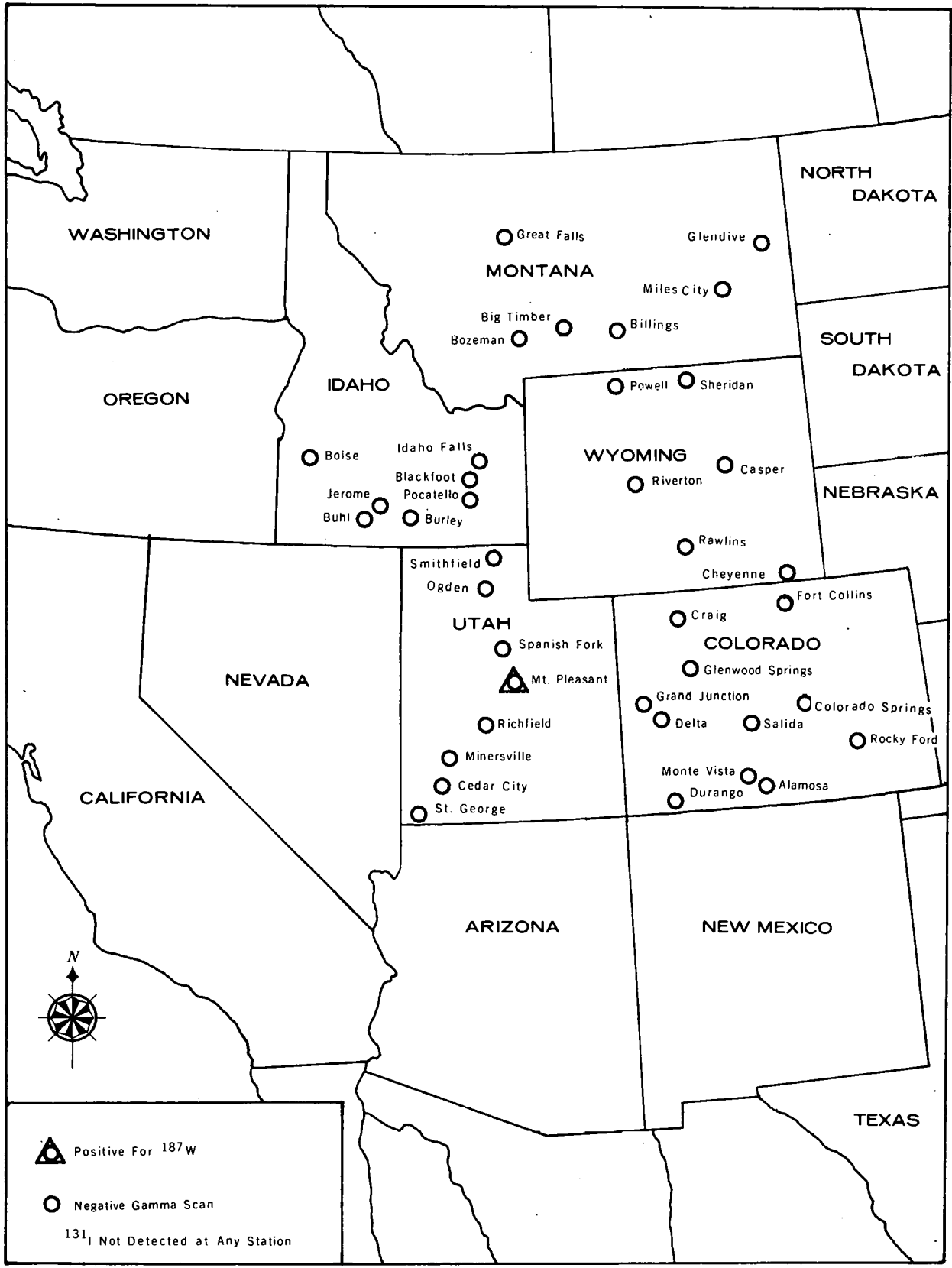


Figure 14. Standby Milk Surveillance Stations

The highest ^{187}W concentration in milk (9,100 pCi/l) was found in the December 9 sample from the Chavis Ranch north of Pioche, Nevada, and the highest ^{131}I concentration (100 pCi/l) was in a December 11 sample from the Boyd Schenà Ranch near Abraham, Utah.

Iodine-131 in milk occurred in such low concentrations that its presence probably remained undetected in many instances because of the masking effect of ^{187}W . In an experiment conducted at SWRHL, six milk samples collected in Nevada and Utah on December 10, 11, and 12 were passed through an anion exchange resin to separate the ^{187}W (resin) and ^{131}I (effluent). In only two instances from Nevada samples did trace amounts of ^{131}I appear (<30 pCi/l), indicating the presence of only low concentrations of ^{131}I in milk contaminated by Schooner debris.

H. Milk Cow Feed Sampling

Milk cow feed samples were collected from 44 milk sampling locations in Nevada and Utah, as shown in Figure 15 and listed in Appendix G. Feed samples from all locations except one contained ^{187}W . The presence of other radionuclides was masked by ^{187}W .

The highest feed concentration found was 8,200,000 pCi/kg ^{187}W at the Chavis Ranch north of Pioche, Nevada, where the highest milk concentration (9,100 pCi/l ^{187}W) was also found.

I. Water and Snow Sampling

Water samples were collected at 82 populated locations and open sources in Nevada and Utah. Figure 16 shows these sampling locations and identifies those stations which were positive for ^{187}W , the only gamma emitting isotope found in water. Tritium (^3H) analysis was performed on most domestic water supplies and on a few sources used for watering livestock.

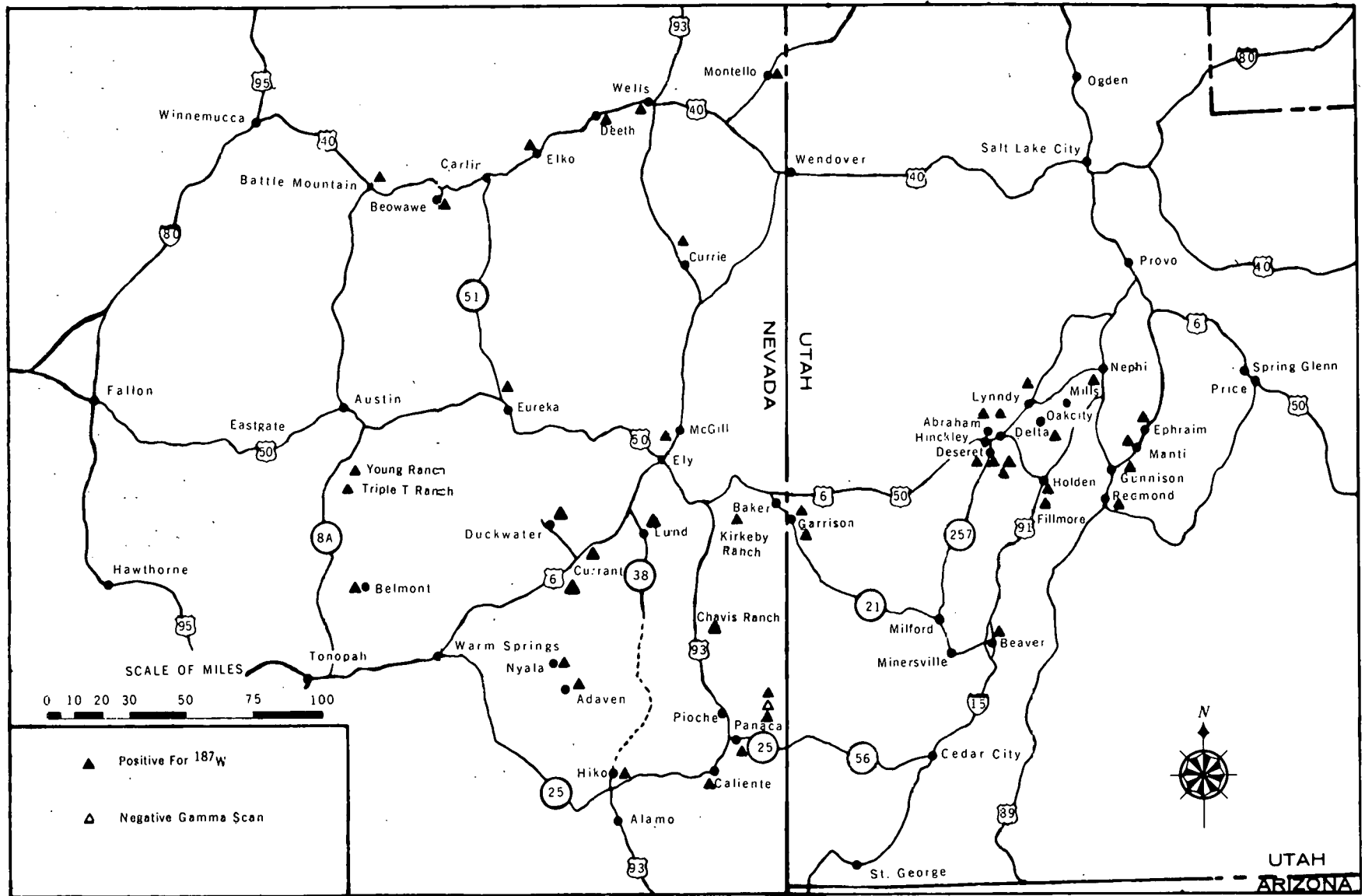


Figure 15. Milk Cow Feed Sampling Locations

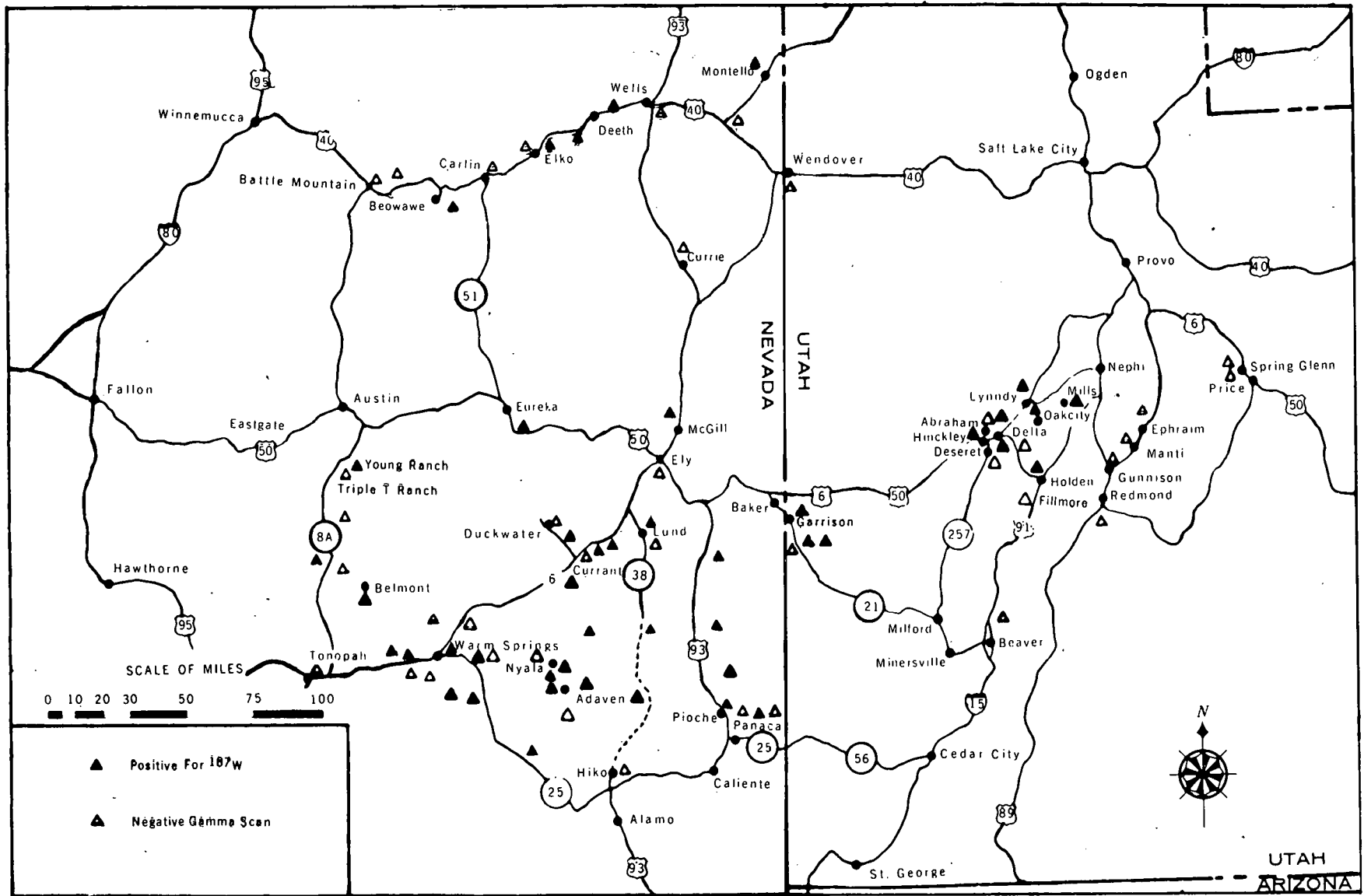


Figure 16 Water Sampling Locations

Tungsten-187, which has a half-life of 24 hours, was found in its highest concentration (770,000 pCi/l) in Fallini's Pond near Twin Springs, Nevada. This pond was also the site of the highest concentration of ^3H (16,000 pCi/l) that was found; this value represents less than 2 percent of the FRC concentration guides for the continued intake of ^3H . This pond is used for watering livestock. Further sampling at this location from July through October 1969, has produced ^3H concentrations ranging from 2,000 pCi/l to <400 pCi/l. The second highest concentration of ^{187}W (110,000 pCi/l) and of ^3H (3,500 pCi/l) was found in a pond at Clark Station, about 16 miles west of Warm Springs, Nevada. This pond is also used for watering livestock.

Tungsten-181 has been detected in water samples as recently as October 1969, at two open sources, Fallini's Pond and a pond at Reed Ranch (vacant) near the Diablo Maintenance Station. Appendix H presents the results from all water samples collected. Sixteen samples collected from domestic water supplies contained ^{187}W . Table 10 lists these stations and their ^{187}W and ^3H concentration. The appearance of low quantities of ^{187}W activity in water samples collected from closed water systems with less than minimum detectable quantities of ^{187}W on subsequent samples suggests that the samples could have been cross-contaminated.

TABLE 10
Domestic Water Sampling Results

SAMPLING LOCATION	^{187}W (pCi/l)	^3H (pCi/l)	DATE COLLECTED	TYPE OF SOURCE
Adaven, Nevada	21,000	480	12/11	Spring (open)
Simpson Ranch 42°, 75 mi.	2,800	No analysis	12/13	Spring (open)
Adaven, Nevada	10,000	550	12/10	Spring (closed)
Uhalde's Ranch 45°, 75 mi.				
Clark Station, Nevada	8,300	<400	12/11	Spring (open)
Stone Cabin Ranch 356°, 61 mi.				

TABLE 10 (continued)

SAMPLING LOCATION	^{187}W (pCi/l)	^3H (pCi/l)	DATE COLLECTED	TYPE OF SOURCE
Deeth, Nevada Lotspeich Ranch 15 ^o , 266 mi.	560	2,800	12/11	Pond (open)
Diablo Highway Maintenance Station, Nevada 33 ^o , 47 mi.	290	<400	12/10	Well (closed)
Duckwater, Nevada Halstead Ranch 24 ^o , 119 mi.	1,400	1,300	12/10	Well (closed)
Eureka, Nevada Morrison Ranch 11 ^o , 167 mi.	2,400	<400	12/10	Well (closed)
Nyala, Nevada Casey's Ranch 39 ^o , 82 mi.	320	<400	12/10	Well (closed)
Nyala, Nevada Sharp's Ranch 34 ^o , 76 mi.	320	<400	12/10	Well (closed)
Pioche, Nevada Court House 69 ^o , 121 mi.	360	<400	12/10	Well (closed)
Pioche, Nevada Williams & Sons 63 ^o , 129 mi.	1,200	<400	12/9	Spring (open)
Shoshone, Nevada Kirkeby Ranch 47 ^o , 160 mi.	420	<400	12/9	Well (closed)
Warm Springs, Nevada Service Station & Cafe 10 ^o , 61 mi.	1,200	2,000	12/10	Spring (open)
Ursine, Nevada Donohue Ranch 63 ^o , 145 mi.	2,100	<400	12/12	Stream (open)
Hinckley, Utah Walt Ekins Ranch 57 ^o , 252 mi.	150	<400	12/10	Well (closed)

Snow samples were collected from four locations. The ^{187}W and ^3H concentrations are given in Table 11.

TABLE 11
Snow Sampling Results

SAMPLING LOCATION (Azimuth, Distance)	^{187}W (pCi/l)	^3H (pCi/l)	DATE COLLECTED
Adaven, Nevada, 5.7 mi W of Pine Creek Ranch 46°, 68 mi.	23,000,000	5,200	12/9
Preston, Nevada, Black-Jack Inn, 34°, 139 mi.	63,000	10,000	12/11
Ely, Nevada, 34°, 160 mi.	12,000	5,900	12/11
Coeur D'Alene, Idaho 58 mi E on Idaho-Montana Line 4°, 701 mi.	<50	No Analysis	12/11

J. Wildlife and Animal Sampling

Two deer were collected in the Ely Ranger District of the Humboldt National Forest (i.e., surrounding the Mt. Wheeler and Lehman Cave area at Murphy's Wash), about 20 miles from the major "hot-line." The deer had ^{131}I thyroid concentrations of 130 pCi/gm and 170 pCi/gm at the time of death, December 19, 1968.

Small amounts of tungsten were found in edible tissue of cattle grazing in the Schooner deposition pattern. Complete results will be reported at a later date by the Animal Investigation Program of SWRHL.

V. DISCUSSION

A. Fallout Pattern and Maximum Exposure Rates

Monitoring with portable survey instruments, and residual deposition determined by vegetation samples, indicated that the fallout was dispersed over a very large area, as shown in Figure 17. Due to continuing redistribution of fallout material by high winds, the edges of the field were not precisely delineated. However, as the figure indicates, the western edge extended as far west as Tonopah, Nevada, and crossed Highway 50 between Frenchman and Eastgate, Nevada. Contamination of monitoring vehicles prevented delineation of the western edge beyond Highway 50. The eastern edge crossed Highway 25 near Hancock Summit, then crossed Highway 93 about 10 miles north of Pioche, Nevada, and finally extended into Utah, crossing Highway 21 northeast of Milford, Highway 91 south of Kanosh and Highway 89 just north of Salina, Utah.

Two major "hot-lines" were produced as a result of the meteorological conditions on December 8. Figure 17 shows the "hot-lines" and indicates the maximum observed gross gamma exposure rate levels in these areas. The "hot-line" associated with the base surge crossed Highway 6 approximately 4 miles west of Clark Station or 20 miles west of Warm Springs. Here the maximum exposure rate observed by a monitor during cloud passage was 4.0 mR/hr. The base surge was well dispersed and of very low activity as it crossed Highway 50. Its greatest residual activity on Highway 50 was observed about 25 miles east of Eureka, between Pancake and Antelope Summits. At 1410 hours on December 9 an exposure rate of .08 mR/hr was recorded at that location.

The "hot-line" associated with the main cloud was well defined by means of survey instruments and vegetation sampling. The "hot-line" crossed Highway 25 about 2.5 miles east of Queen City Summit, where a PHS field worker on a non-monitoring assignment recorded 350 mR/hr just south of the highway shortly after the peak activity is assumed

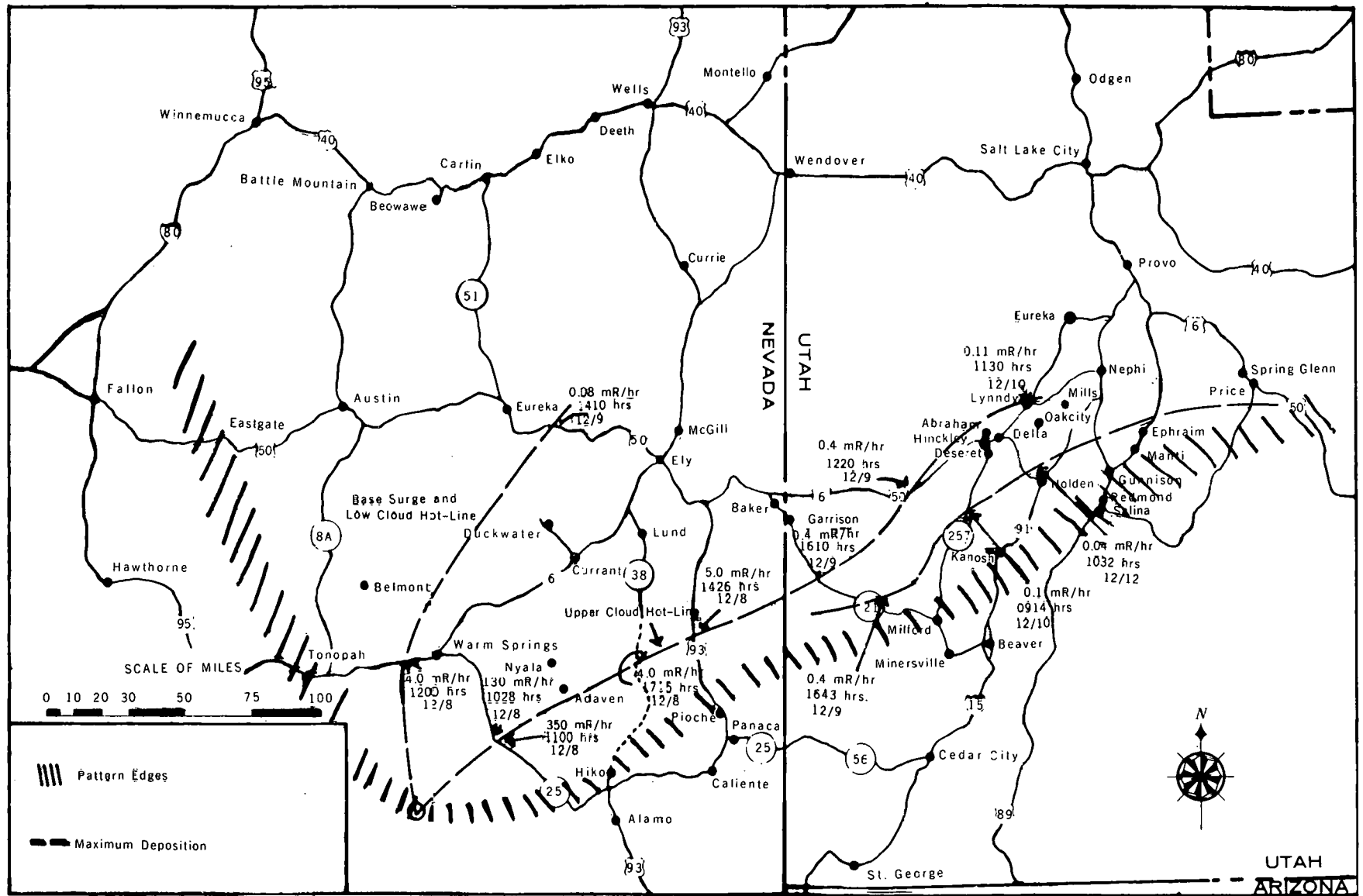


Figure 17. Fallout Pattern and Maximum Observed Hot-Line Exposure Rates

to have passed through. The highest exposure rate along Highway 93 occurred 26 miles north of Pioche, Nevada. A peak cloud passage exposure rate of 5.0 mR/hr was recorded at this location. Two areas of maximum residual ground activity were observed along Highway 21 southeast of Garrison. Exposure rates of 0.4 mR/hr were observed between 1600 and 1700 hours on December 9 at both 27 and 47 miles southeast of Garrison. However, vegetation samples collected along the highway seem to indicate that the greatest residual activity occurred 7 miles southeast of Garrison (Appendix D).

Maximum exposure rate readings observed beyond Highway 21 into central Utah are shown in Figure 17. Not included in this figure are exposure rate levels observed north of Ephraim on Highway 89 and southeast of Price on Highway 50. For this portion of the pattern mobile scanning teams equipped with 4- by 4-inch scintillation-detectors were utilized.

B. Cloud Travel

Aerial monitoring and tracking indicated that the upper portion of the main cloud of the Schooner debris (above 13,000 feet MSL) travelled to the east-northeast and the lower portion of the main cloud including the base surge, to the north and northeast. The upper portion of the main cloud moved to the east-northeast with an average speed of about 37 miles per hour, the lower portion of the main cloud moved to the northeast with an average speed of about 26 miles per hour, and the base surge moved to the north with an average speed of about 13 miles per hour.

The highest ground level readings in the trajectory area occurred as a result of passage of the lower portion of the main cloud. Its average transport speed to Garrison, Utah (175 miles), derived from Lawrence Radiation Laboratory telemetry station data and SWRHL monitoring results, was 19 miles per hour. Transport speeds along the "hot-line" are presented in Figure 18.

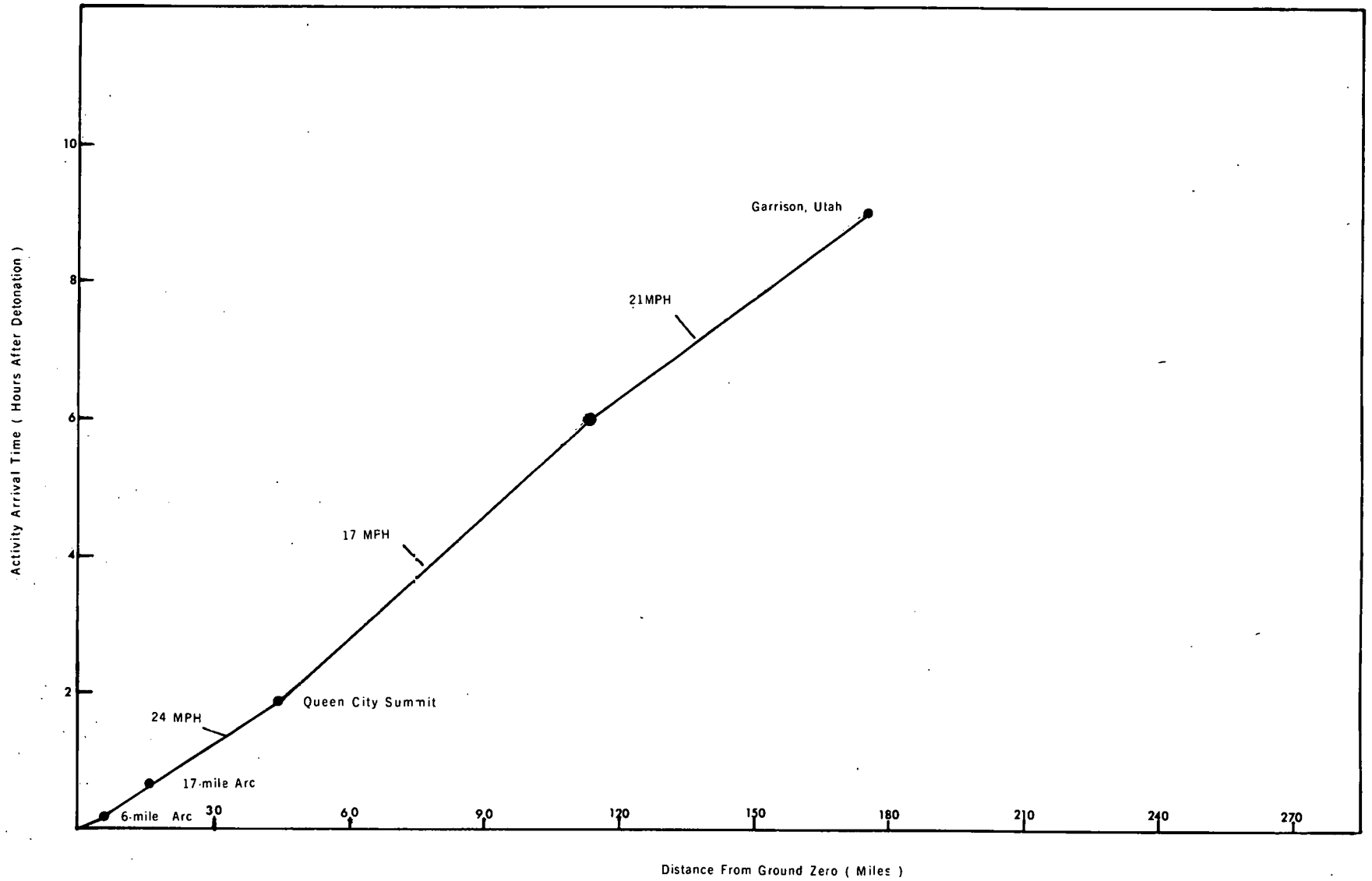


Figure 18. Activity Transport Speed Along Hot-Line

C. H+1 Hour Exposure Rate Versus Distance

Figure 19 is a plot of the estimated H+1 hour gross gamma exposure rate along the major "hot-line," as a function of distance from ground zero. The H+1 hour exposure rate is inversely proportional to the distance raised to the 2.45 power. The values used to construct the line were obtained by extrapolating the observed peak exposure rates, as measured by portable monitoring instruments, to H+1 hour. The decay factors were obtained from Schooner decay data collected by Lawrence Radiation Laboratory. The 350 mR/hr exposure rate measured at 1100 hours on December 8 was excluded in the straight line interpretation of the data points by the method of least squares. This was an observation made by a PHS field worker on a non-monitoring assignment and was obtained several yards south of Highway 25 about 2.5 miles east of Queen City Summit. Follow-up readings at that location were not made and therefore the observation cannot be substantiated in view of readings taken on the highway approximately two hours later. The reading at the later time was 120 mR/hr.

D. Exposure Rate as a Function of Time

Exposure rate profiles for three off-site locations, Queen City Summit, Diablo Maintenance Station, and Stickelman's Farm, are shown in Figures 20 through 22. Analysis of the curves indicates that at both Queen City Summit and the Diablo Maintenance Station, the time span between cloud arrival and peak activity was very short. Also of interest at both locations is the relatively slow rate of decay immediately following observance of the peak activity. The plot of exposure rates at Stickelman's Farm shows that sharp increases in activity occur throughout the exposure period. The abrupt increases are probably due to resuspension of activity closer to the crater or to the action of southerly winds which "lifted" the activity from the crater and transported it to the farm area. Stickelman's Farm is located approximately 55 miles north of the Schooner crater.

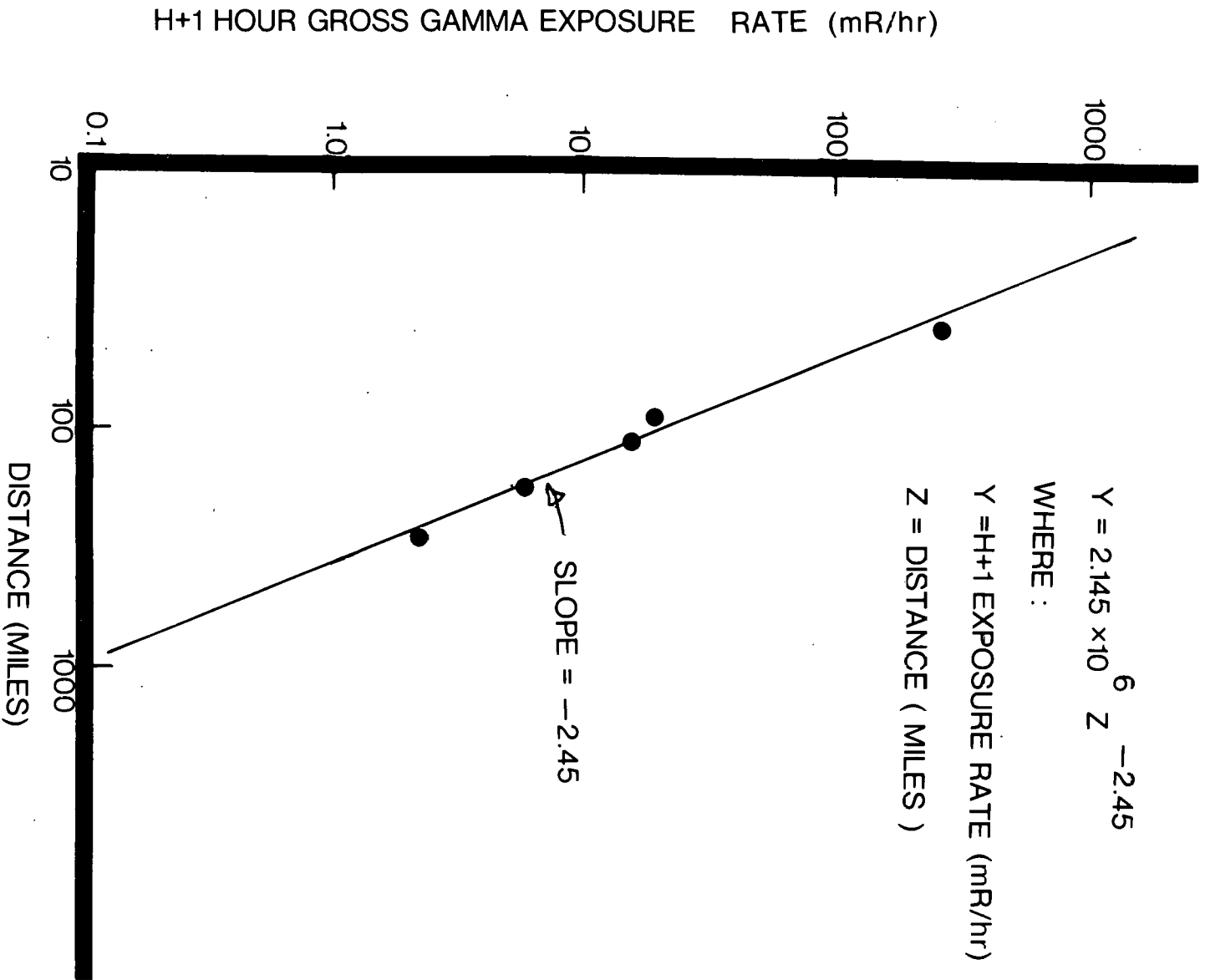


FIGURE 19 ESTIMATED H+1 HOUR EXPOSURE RATES

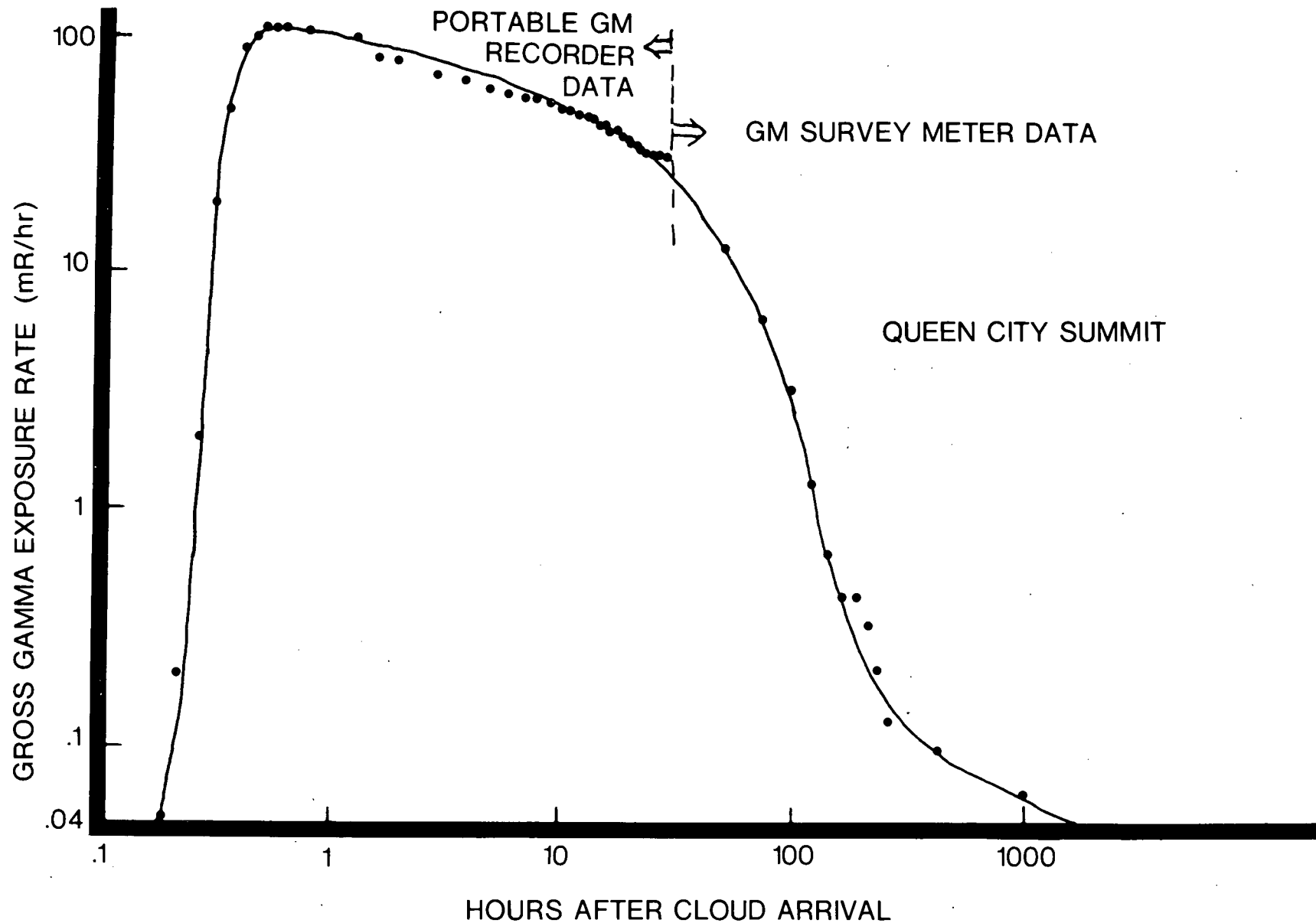


FIGURE 20. EXPOSURE RATE VS. TIME

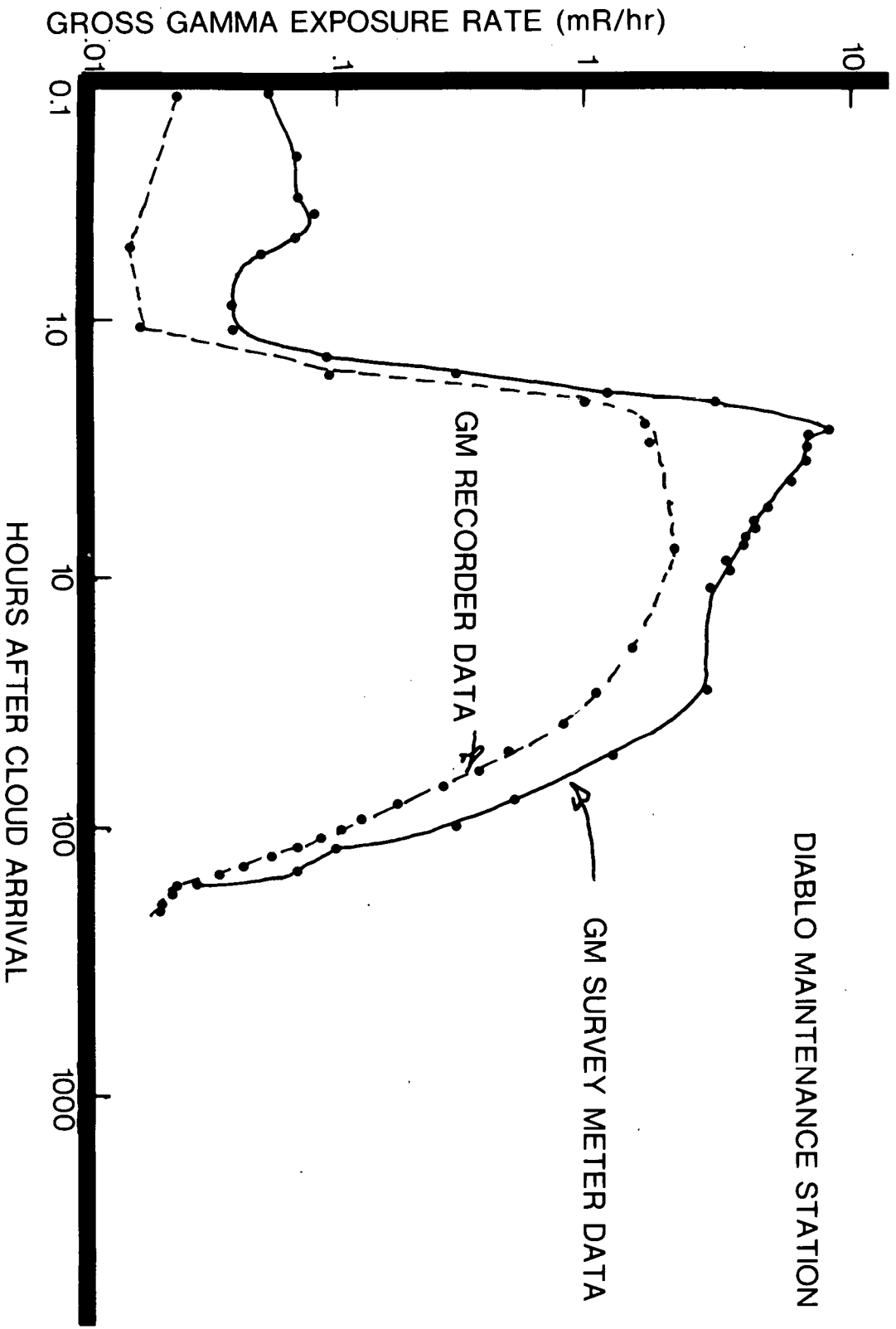


FIGURE 21. EXPOSURE RATE VS. TIME

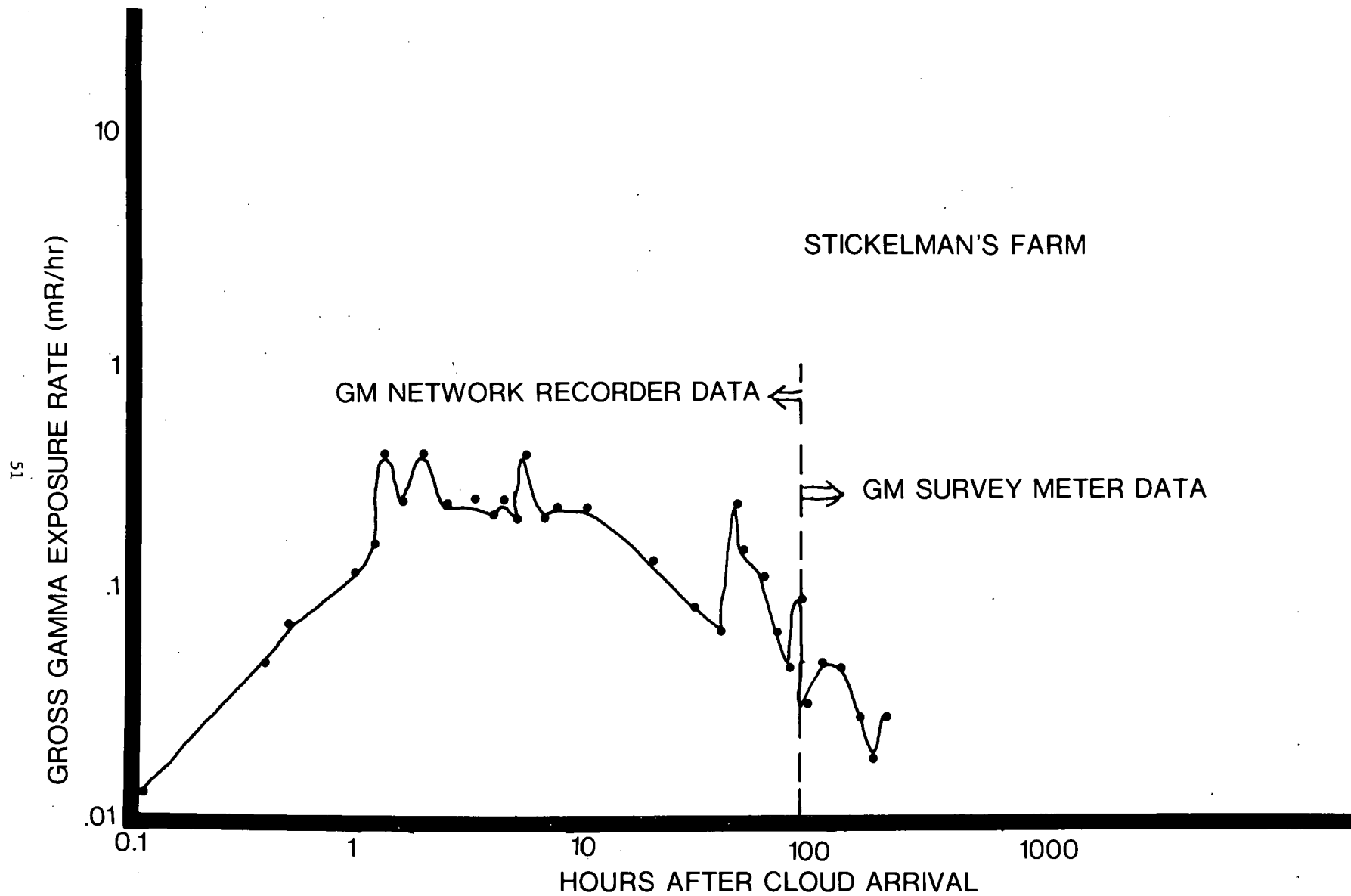


FIGURE 22. EXPOSURE RATE VS. TIME

Figure 21 shows the difference in detection characteristics between a continuously operated network Geiger-Mueller (GM) recorder and a GM survey meter both operating simultaneously in the same radiation field and both having been calibrated with the same radiation source (^{137}Cs). Readings from the survey meter were commonly found to be two or three times greater than those from the recorder during the Schooner operation. Reasons for this were given earlier.

E. Comparison of Data Obtained from Survey Meters, Recorders, TLD's and Film Badges

Table 12 lists the integrated exposures from some locations where several types of radioactivity-measuring devices were used. In general, the GM survey meter integrations are higher than the network GM recorder integrated exposures and the exposures to TLD's at the same locations. Film badges agree with the exposures to TLD's with the exception of those at Warm Springs and Twin Springs Ranch. The difference at Warm Springs is probably due to the fact that the high radon background in the area was subtracted from the TLD but not from the film badge. There is no explanation for the discrepancy between the film badge and TLD results at Twin Springs Ranch.

TABLE 12

Location ^a	Integrated Exposures (mR)			
	Survey Meter	Network Recorder	TLD	Film Badge
Diablo Maint. Station	188	75	149	146
Queen City Summit (through 12/20)	---	--	1893	1979
Twin Springs	11	4	4	45
Nyala	26	28	10	<30
Stone Cabin Ranch	34	--	25	39
Stickelman's Farm	28	11	15	31
Warm Springs	11	--	0	58
Pine Creek Ranch	---	--	63	76
Lund	20	8	--	--
Garrison, Utah	5	4	--	--

^aAll locations in Nevada unless otherwise noted.

F. Percent Exposure as a Function of Time

Figure 23 is a plot of exposure as a function of time at Queen City Summit. The 100 percent line (approximately 2250 mR net exposure, obtained from the graphic integration of the observed levels at Queen City Summit) represents 2000 hours of exposure, at which time exposure rate levels at Queen City Summit were three times background. Only a small fraction of one percent of the total exposure has not been received after 500 hours. About 99 percent of the exposure is accumulated during the first 168 hours and about 63 percent during the first 24 hours of exposure.

Results obtained from TLD station data appear to conflict with the above discussion. After 1200 hours of exposure a TLD at the same location (Queen City Summit) received 1893 mR. This is 84 percent of the total exposure (2250 mR) derived by graphic integration. According to Figure 23, 1200 hours of exposure should give 99 + percent of the total exposure.

G. Residual Activity Decay

Figures 24 through 26 show the residual activity decay at Queen City Summit, Diablo Maintenance Station, and Stickelman's Farm. The exposure rate values are net gamma measurements taken with GM survey instruments three feet above the ground. The straight line interpretation of the data points was obtained by the method of least squares. At Queen City Summit the residual activity decayed with a half-life of 0.86 days during approximately the first 7 days of exposure. At the end of 7 days the half-life began to increase until at 12 days it appeared to stabilize at a 32.7 day half-life. At the Diablo Maintenance Station, the residual activity decayed with a half-life of 0.84 days until background levels were reached. At Stickelman's Farm, where a network recorder showed the occurrence of redeposition of activity, the residual activity decay half-life was increased to 1.34 days. The above results indicate that ^{187}W (24-hour half-life) was the primary source of gamma exposure.

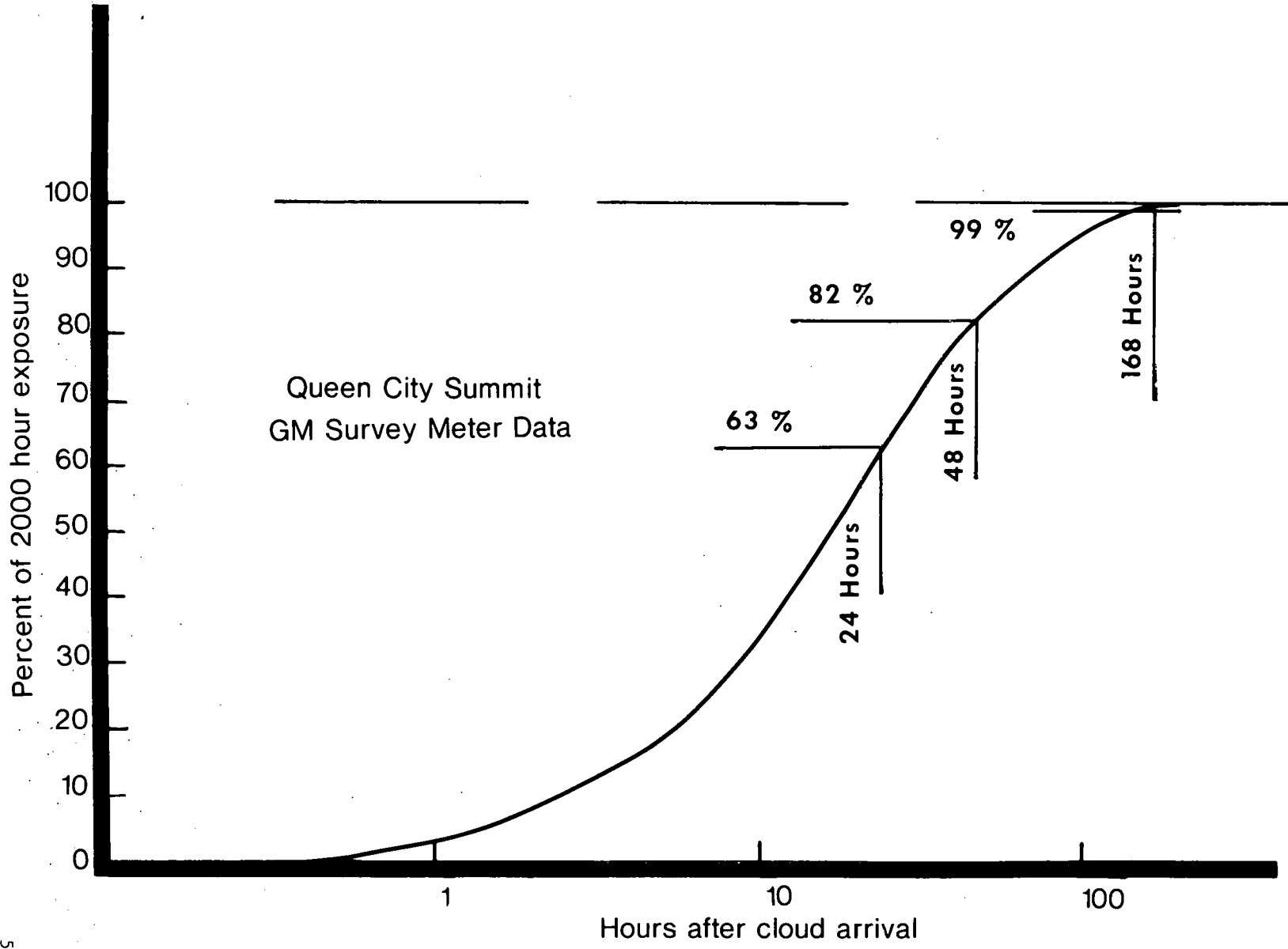


FIGURE 23 INTEGRATED GROSS GAMMA EXPOSURE

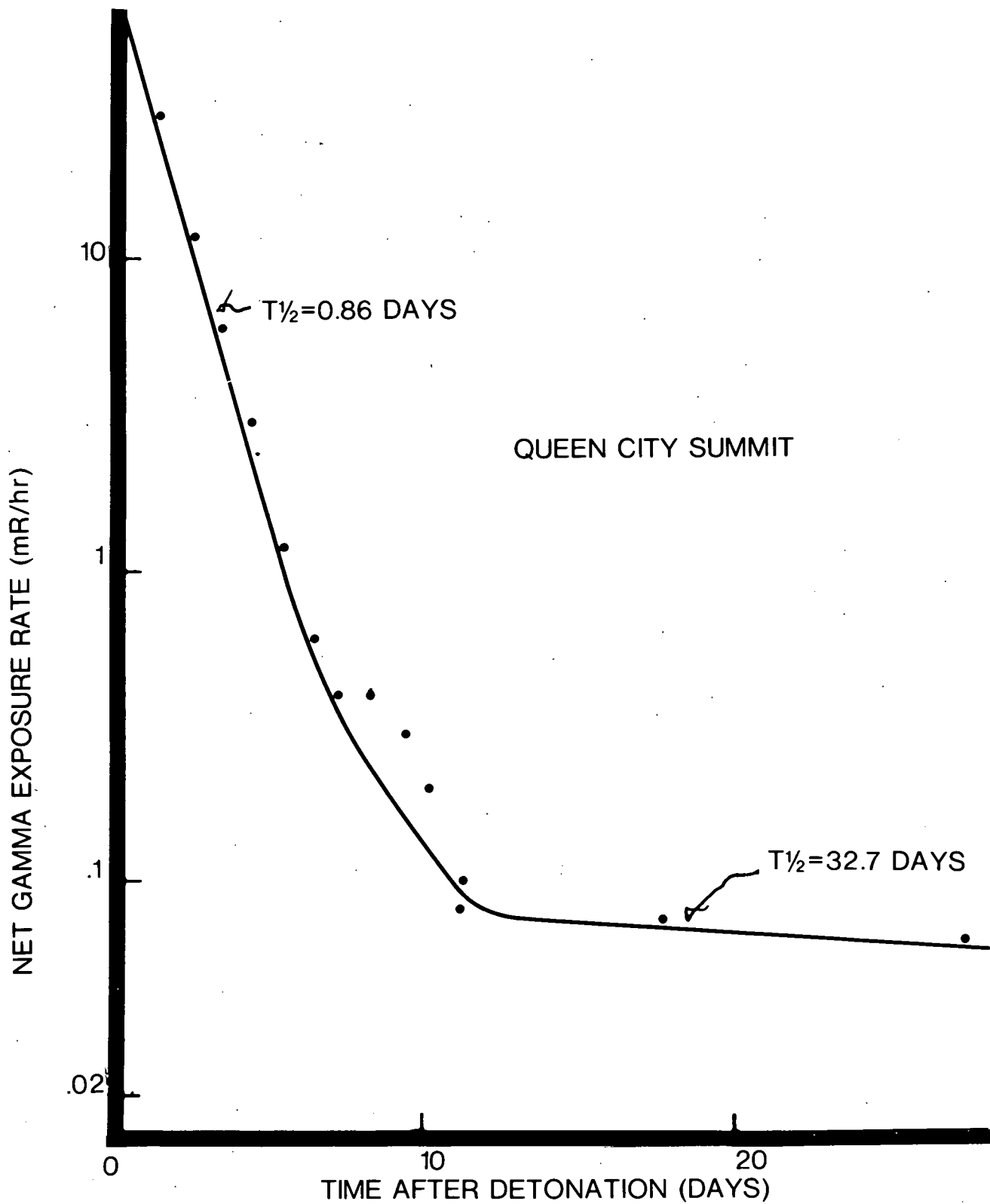


FIGURE 24. RESIDUAL ACTIVITY DECAY

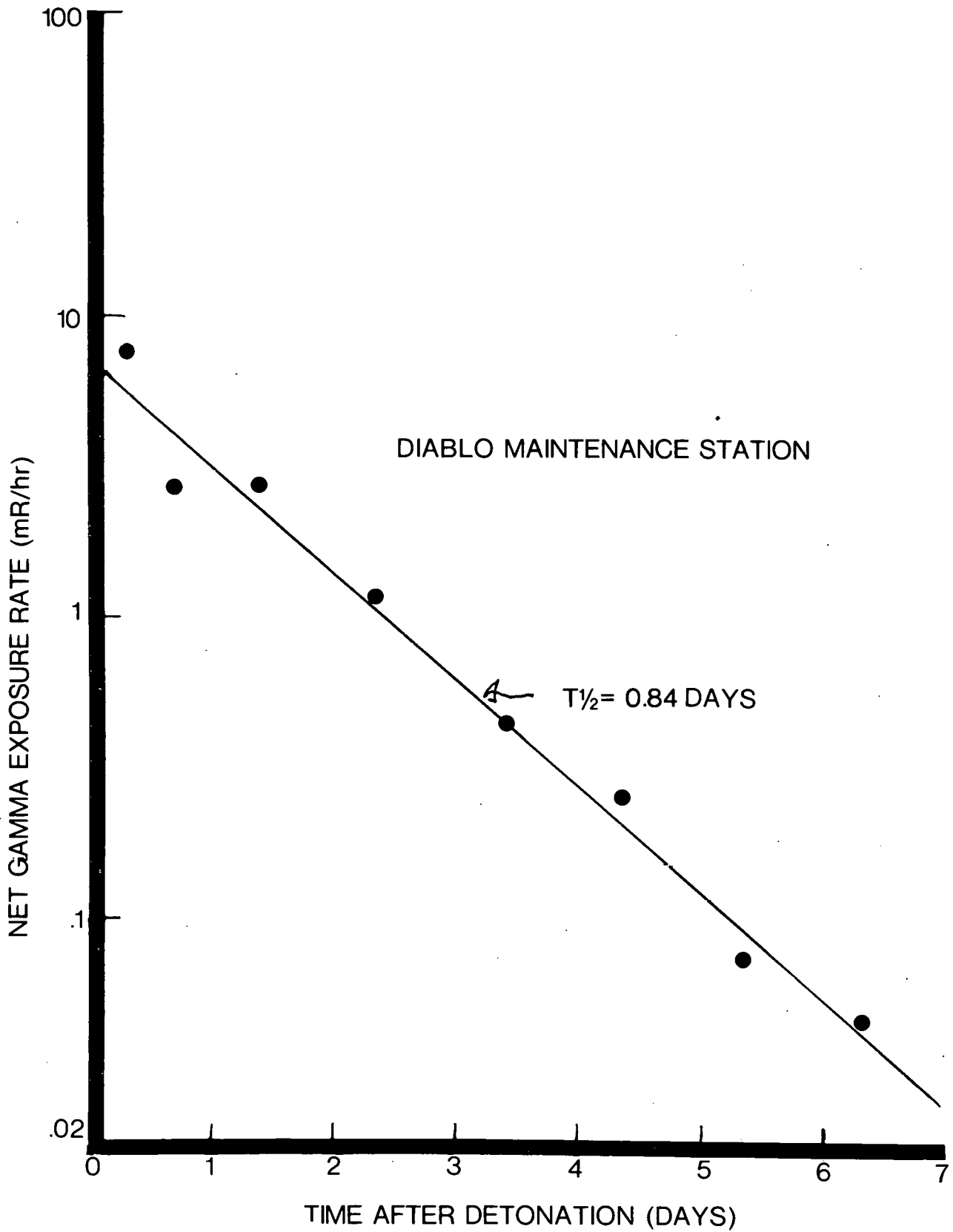


FIGURE 25. RESIDUAL ACTIVITY DECAY

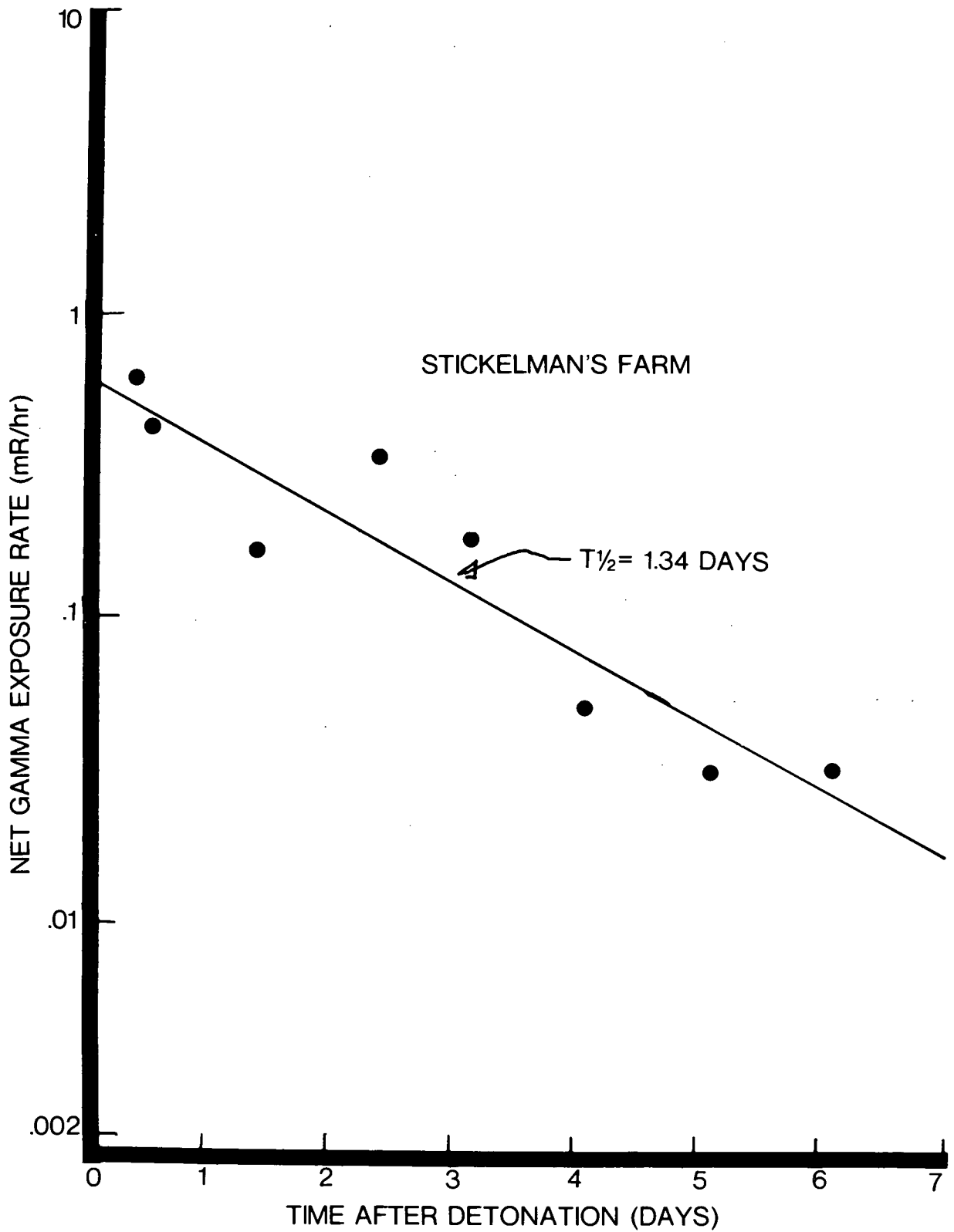


FIGURE 26. RESIDUAL ACTIVITY DECAY

H. Exposure as a Function of Distance

Figure 27 is a plot of TLD exposure as a function of distance along the major (lower portion of the main cloud) "hot-line." The total exposure is inversely proportional to the distance raised to the 2.55 power. Exposure times for the TLD's were of sufficient duration to allow a total exposure accumulation of about 99 percent, with the exception of the TLD collected from the 23-mile arc. This TLD was out for a shorter period and was exposed to only about 85 percent of the total exposure. Using the method of least squares, straight line interpretations of the observed data and the same data normalized to 500 hours were almost identical.

I. Exposure Pattern

Figure 28 shows the exposure pattern in the off-site area as defined by TLD data. The pattern represents outdoor external gamma exposures only. The exposure to people residing within these contours would vary because of their different living habits. It is reasonable to assume that there would be a reduction of one-quarter to one-half in the actual exposures received, if consideration is given to factors such as intermittent occupancy of buildings (homes, barns, etc.) and occasional travelling away from the area.

Approximately 40 people were living within the 10 to 30 mR exposure area during the Schooner operation, about 37 people in the 30 to 50 mR area, and 5 people in the 50 to 170 mR area. There were no residents living in areas where the exposure exceeded 170 mR.

J. Post-Shot Exposure Levels at Queen City Summit

An investigation was conducted to study the exposure rate at Queen City Summit following the Schooner Event. Data from the three TLD's exchanged monthly at this routine station were used in the study.

TLD data for approximately one year preceding the nine months following Schooner were compared. The average monthly background before Schooner was $14.64 \text{ mR} \pm 1.64 \text{ mR}$. The monthly exposures ranged

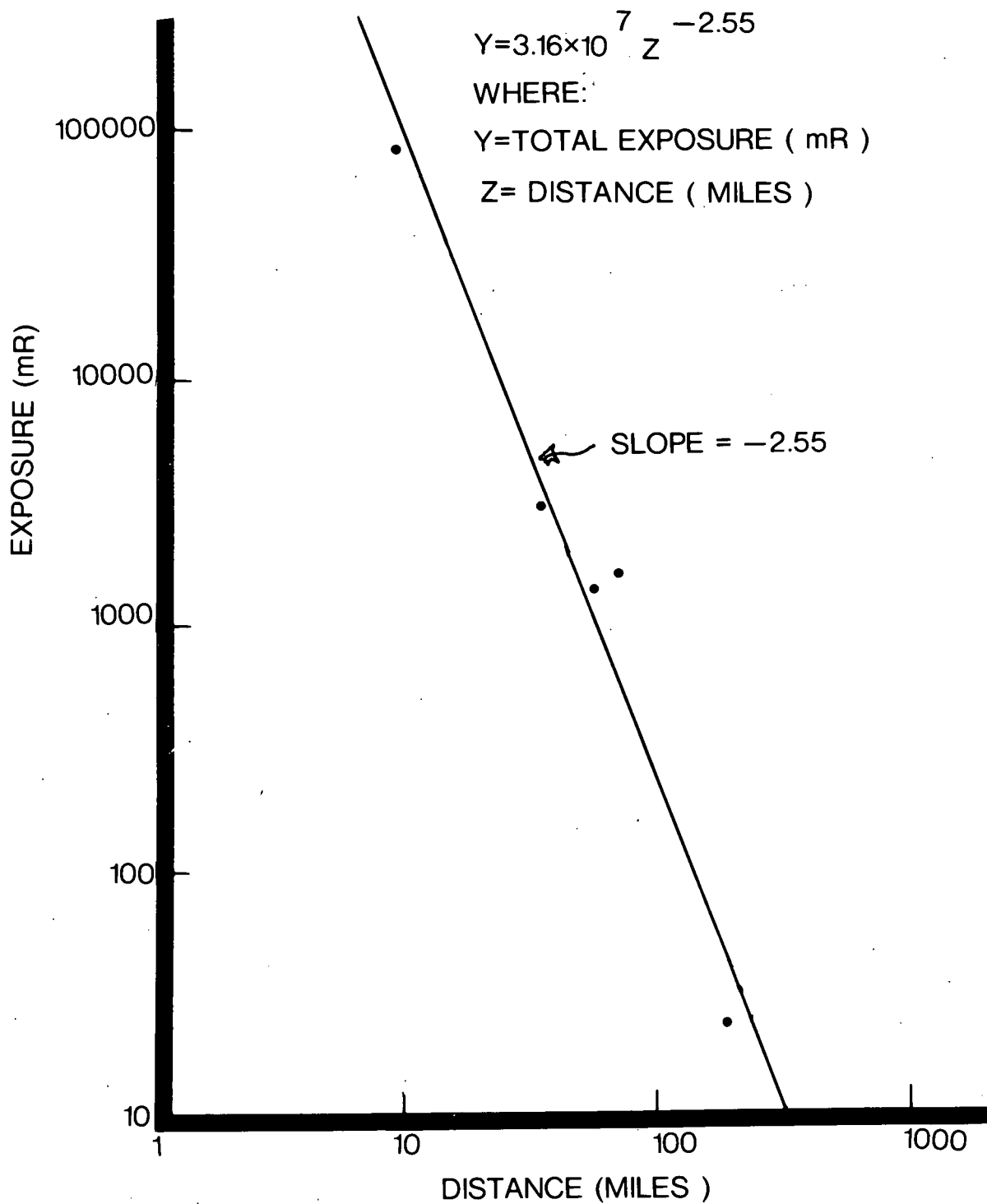


FIGURE 27 EXPOSURE VS. DISTANCE

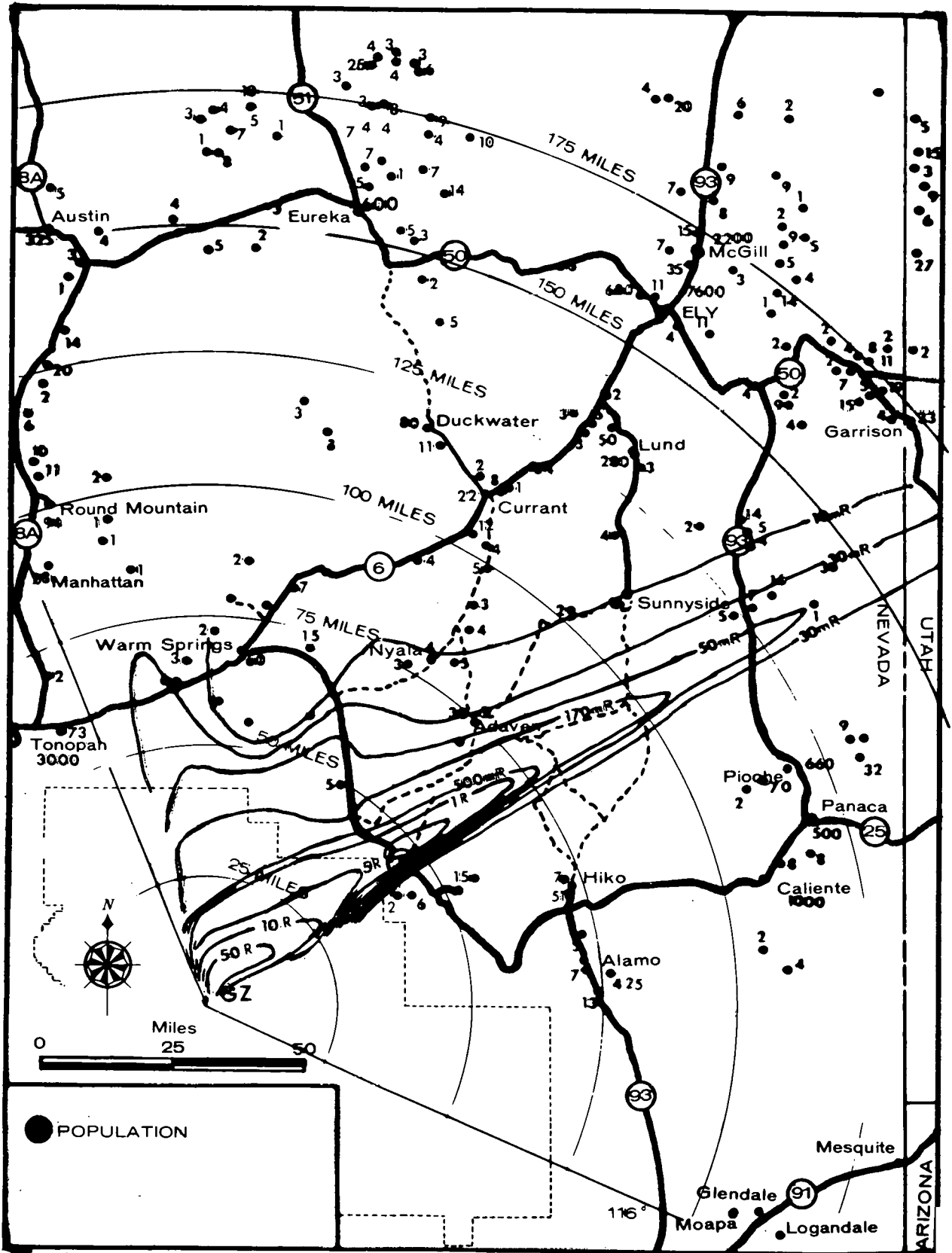


Figure 28. Exposure Pattern

from 41 mR the first month following Schooner to a value comparable to the pre-Schooner value after about seven months. (Figure 29).

A regression analysis was performed on the post-Schooner data. The three readings for each month showed more variability after Schooner than before, a situation which is common when measuring low level exposures. The data were fitted to an exponential model and the half-life was calculated to be 148 days \pm 16 percent. It is probably significant that the calculated half-life is comparable to the 145 day half-life of ^{181}W , the major long-lived contributor to the deposition exposure.

K. Gross Beta and ^{131}I Concentrations in Air

Gross beta and ^{131}I concentrations in air samples (filters only) were integrated over the individual collection periods and plotted with respect to each other (Figure 30). With the exception of the Queen City Summit, Clark Station (Stickelman's Farm), and Warm Springs data points, which are shown but not included in the interpretation, the straight line interpretation of the data points was obtained by the method of least squares. The integrated ^{131}I concentration is directly proportional to the integrated gross beta concentration raised to the 0.9 power. The distance of the stations from ground zero ranged from approximately 46 miles (Highway 25) to 883 miles (North Platte, Nebraska).

L. Gross Beta and ^{187}W Concentrations in Air

Gross beta and ^{187}W concentrations in air samples (filters only) were integrated over the individual collection periods and plotted with respect to each other (Figure 31). The straight line interpretation was obtained by the method of least squares. The integrated ^{187}W concentration is directly proportional to the integrated gross beta concentration raised to the 1.05 power. The distance of the stations from ground zero ranged from approximately 17 miles (Fleur de Lis Ranch) to 883 miles (North Platte, Nebraska).

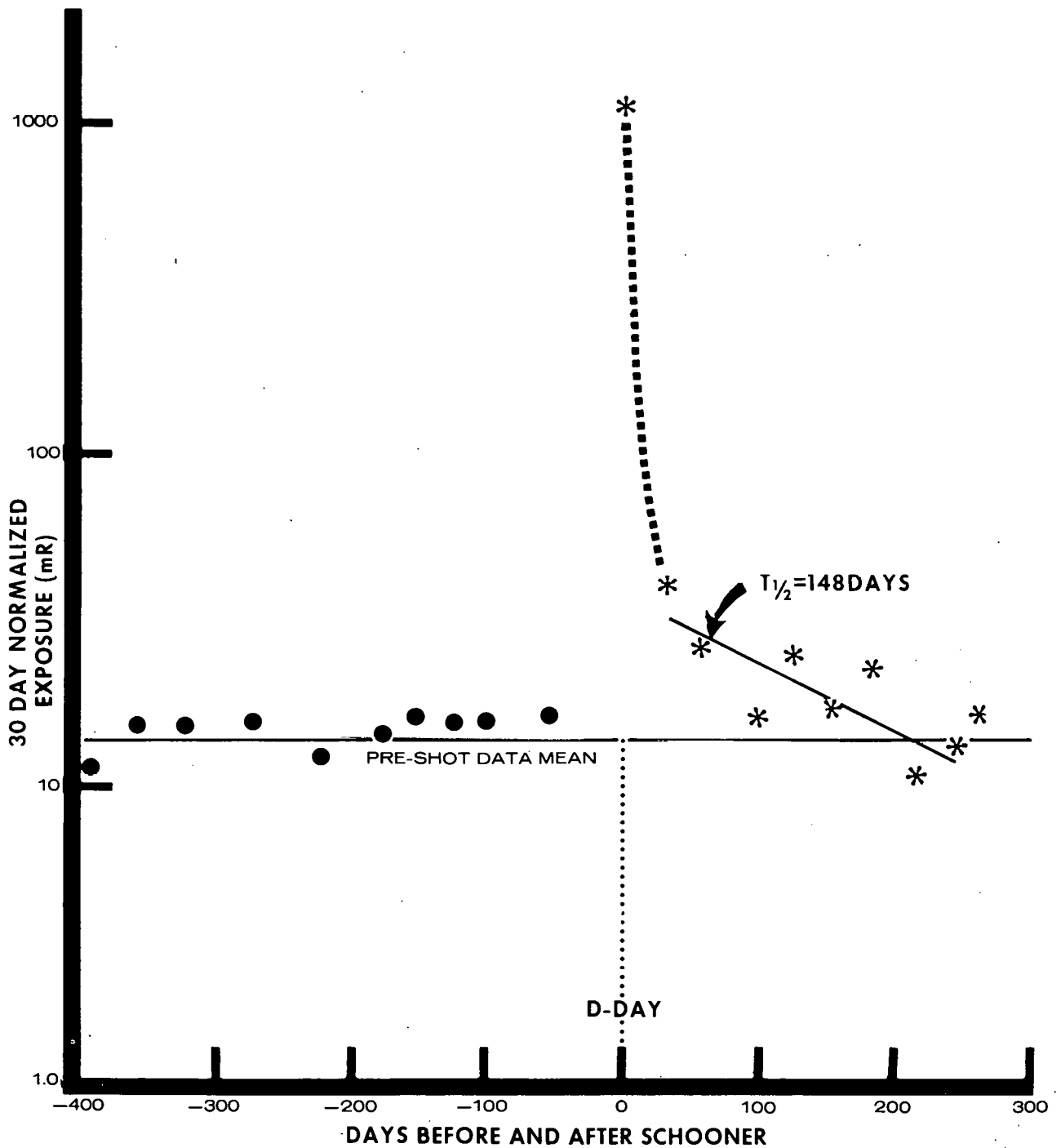
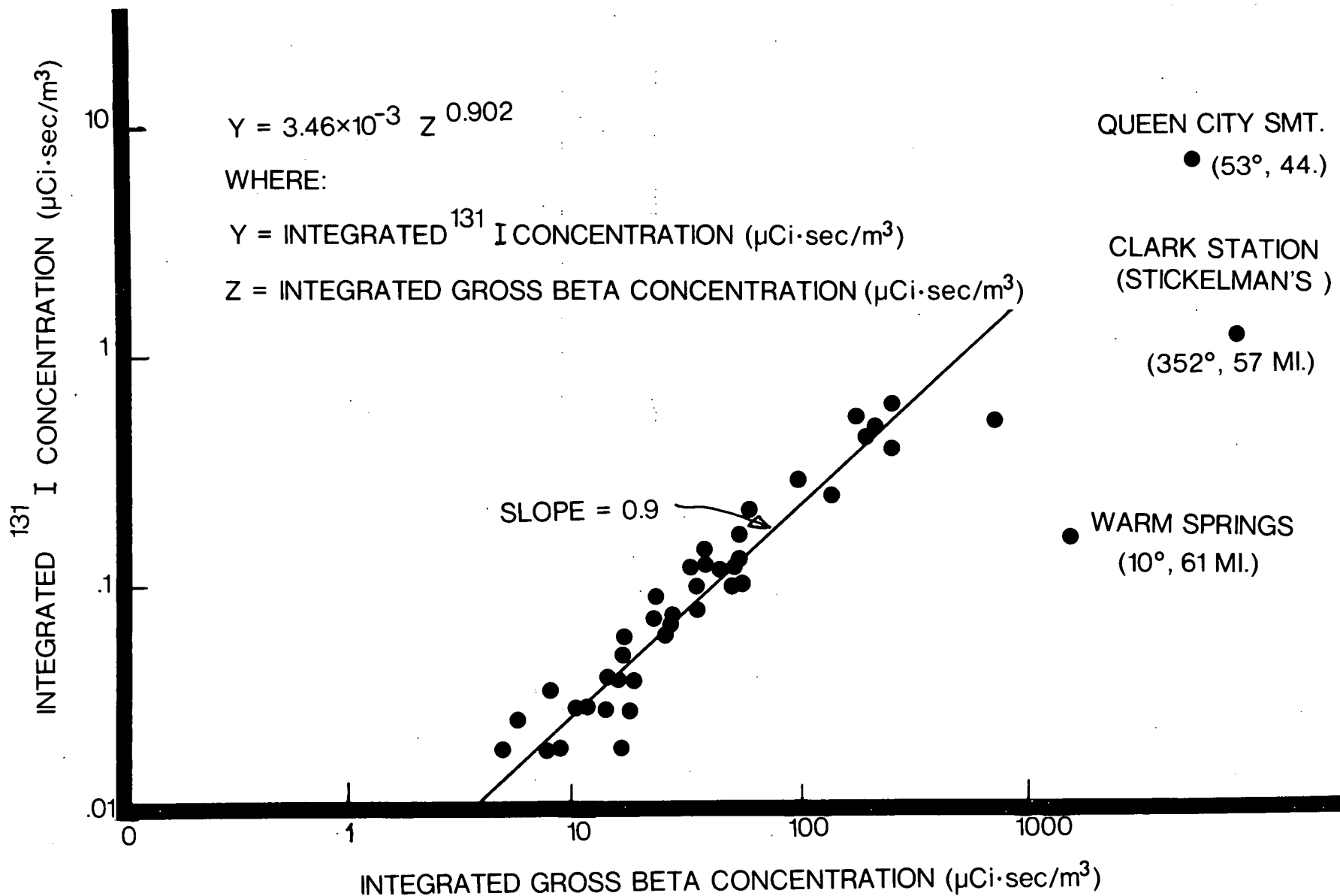


FIGURE 29 POST-SCHOONER EXPOSURE LEVELS



INTEGRATED GROSS BETA CONCENTRATION ($\mu\text{Ci}\cdot\text{sec}/\text{m}^3$)

FIGURE 30 GROSS BETA VS. ^{131}I CONCENTRATION IN AIR

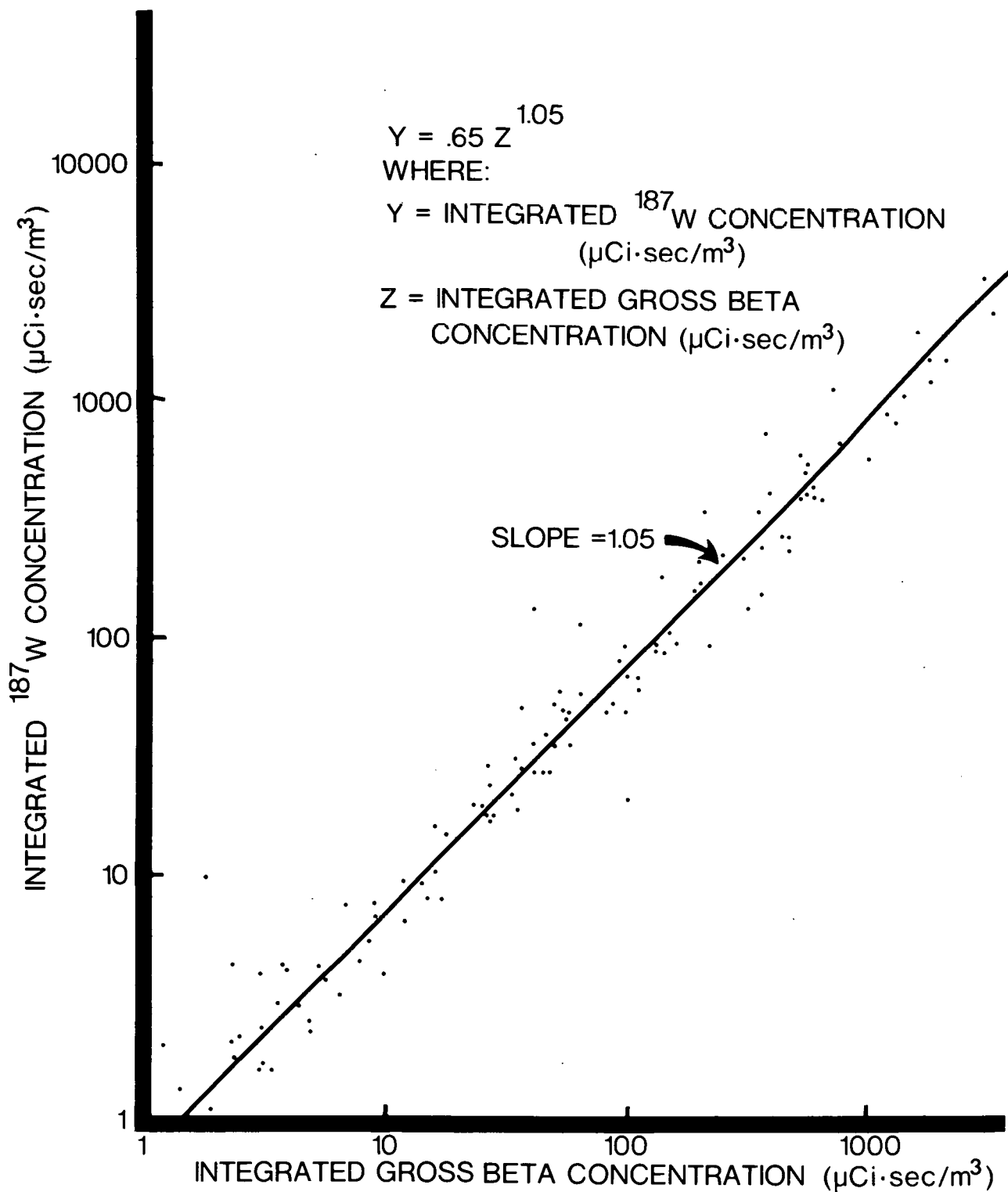


FIGURE 31 GROSS BETA VS. ^{187}W CONCENTRATION IN AIR

M. Gross Beta Activity in Air for Nevada

To construct Figure 32, gross beta concentrations in air were integrated over the period from 0800 hours on December 8 through 0800 hours on December 15. The isopleths are in units of microcurie-seconds per cubic meter. The pattern indicates that the main portions of airborne activity travelled north and north-east from the Nevada Test Site. Large-scale secondary redistribution accounts for the contamination to the south and southeast of the Nevada Test Site.

N. Dose Calculations

Physiological parameters from ICRP 2 were used to calculate a dose conversion factor for the ingestion of ^{187}W based on beta radiation only. The critical organ for the ingestion of ^{187}W is the lower gastrointestinal tract. The dose to the gastrointestinal tract is less than 40 mrad per $\mu\text{Ci } ^{187}\text{W}$ ingested. The actual calculations appear in Appendix I.

The highest concentration of ^{187}W in milk was observed at the Chavis Ranch. If a man drank one liter of milk per day at the concentrations observed at the Chavis Ranch, he would have consumed a total of 24,670 pCi ^{187}W . If the entire ingested amount passed through the lower gastrointestinal tract, this would correspond to a dose of approximately one mrad. Similarly, a dose of approximately two mrad can be estimated for a man drinking 1.5 liters per day of water which has a maximum concentration of 21,000 pCi ^{187}W , which was observed at Simpson's Ranch.

Based on assumptions in FRC Report No. 5, a peak concentration of 100 pCi/l ^{131}I in milk which was observed at the Boyd Schena Ranch, would correspond to a dose of about 16 mrad to an infant's thyroid.

Internal ^{187}W dose estimates (gastrointestinal tract) at general off-site locations were obtained by whole-body counting government personnel working in these off-site areas during the Schooner cloud passage. These data, along with the external gamma whole-body exposures received by the individuals counted, are also given.

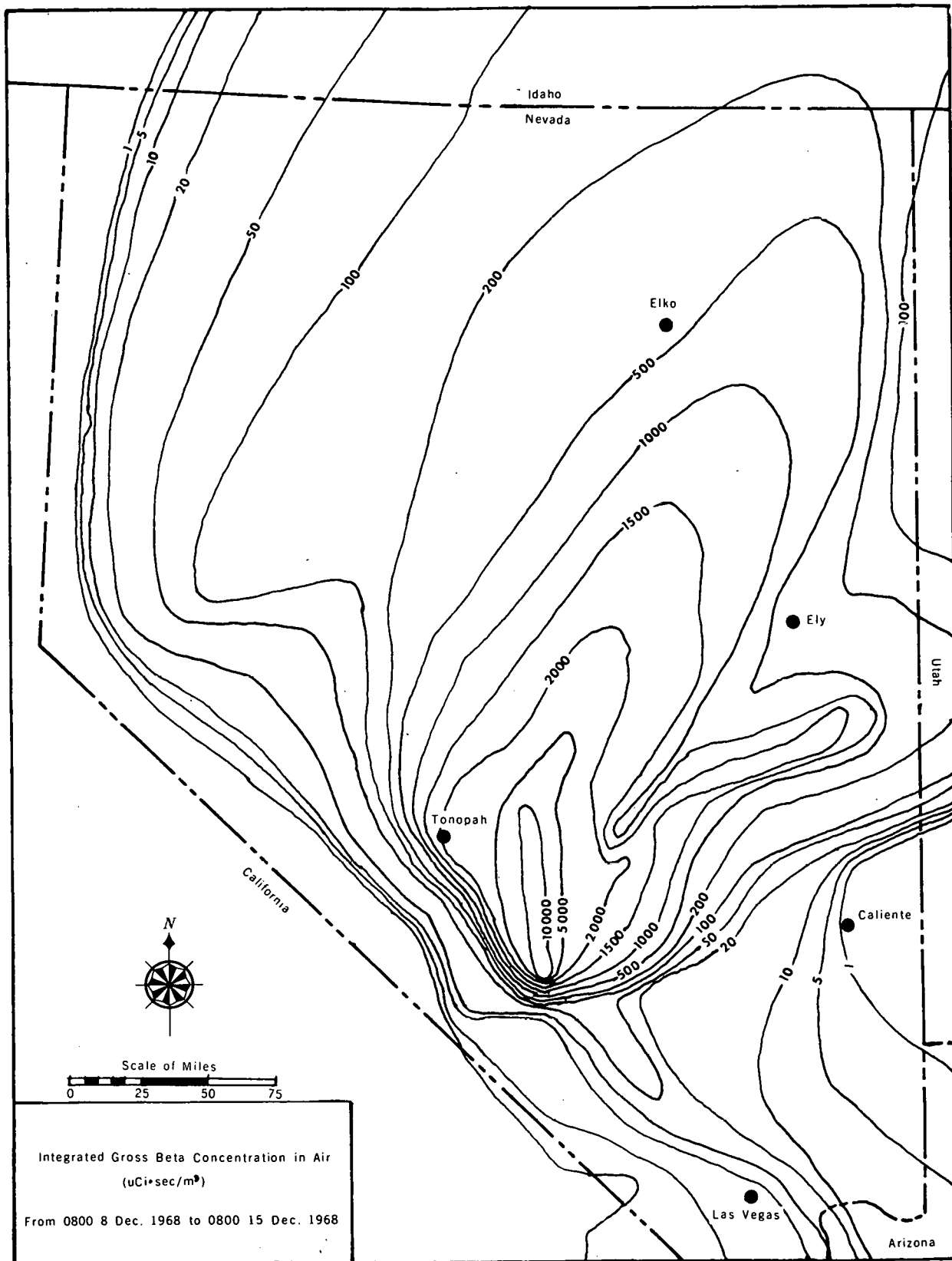


Figure 32. Integrated Gross Beta Activity in Air for Nevada

Generally the whole-body counts were made several days after the event, and for dosimetry purposes it is necessary to extrapolate the values back to the time of exposure. Extrapolations were based on counts taken on three individuals who were counted repeatedly during the week following the event. The average value of these counts serves as the base line for extrapolation. The basic dosimetry equation and model are shown in Appendix I. Values shown in Figure 33 are scaled from an individual who was 2.5 miles east of Queen City Summit on Highway 25 and whose dose is estimated to have been less than 1 rad (approximately 24 μCi at 1735 hours on December 8, 1968).

A gamma scan on December 8, 1968, of the individual working 2.5 miles east of Queen City Summit showed considerable ^{187}W activity in the gastrointestinal tract but not in the lungs. The lung mass is large (1000 grams) and the possible dose would be correspondingly small.

Tungsten-181 (^{181}W) was not identified in any spectrum obtained as a result of whole-body counting. However, assuming a ratio of 10:1 between ^{187}W and ^{181}W , simple scaling of the values given in ICRP 2 yields a possible increase in dose over the ^{187}W dose of 2 percent.

VI. SUMMARY

Results from SWRHL monitoring and environmental sampling for the Schooner event indicated a widespread deposition pattern. The main cloud moved to the northeast across Utah and Colorado, while the base surge spread to the north and moved across Idaho and Montana, and then moved eastward across North Dakota.

The highest gross gamma exposure rate observed off-site was 350 mR/hr at a location several yards south of Highway 25, about 2.5 miles east of Queen City Summit. The highest gross gamma exposure rate at a populated location was 8.5 mR/hr at the Diablo Maintenance Station.

The highest exposure recorded in the off-site area was 4.76 R, which represents the effects of cloud passage plus seven days of

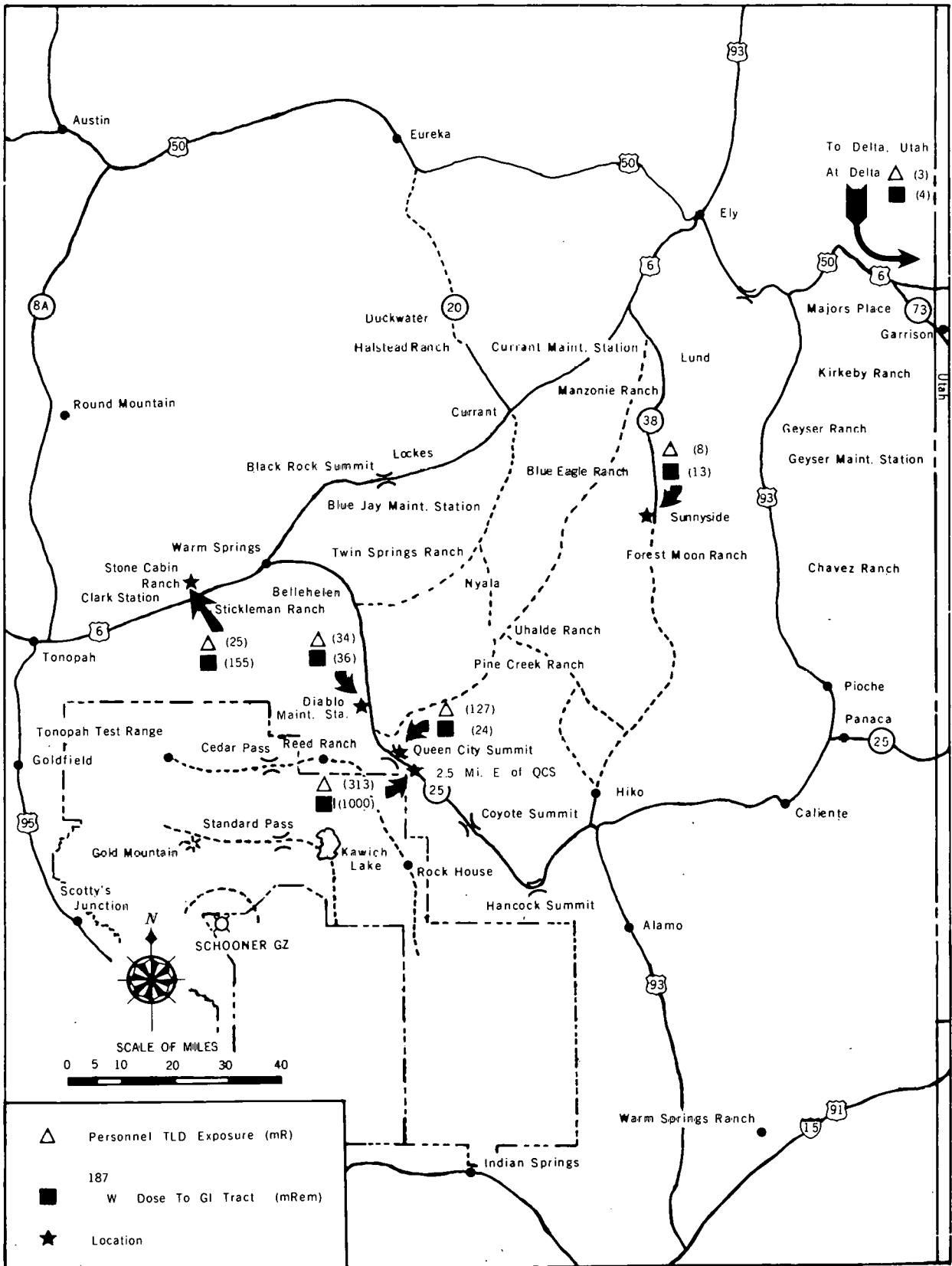


Figure 33. Estimated Internal ¹⁸⁷W Doses for Off-site Areas

residual activity. This exposure was recorded 2.3 miles east of Queen City Summit on Highway 25. The highest exposure to an off-site resident wearing a personal dosimeter was 165 mR, which was received between December 8 and December 17 by a shepherd working out of Uhalde's Ranch. A stationary TLD at the Diablo Maintenance Station recorded an exposure of 149 mR for the period from November 7 to December 26, while TLD's worn by residents at this location showed exposures of 57 and 35 mR between December 8 and December 16.

The predominant radionuclide found in environmental samples was tungsten-187. The highest integrated concentration observed in air was at Stickelman's Farm near Clark Station, 55 miles from ground zero. The air sample collected on the day of the event showed an integrated concentration of 12,000 $\mu\text{Ci}\cdot\text{sec}/\text{m}^3$ of ^{187}W .

The highest ^{187}W concentration observed in milk was 9,100 pCi/l at the Chavis Ranch near Pioche, Nevada. The estimated dose to the gastrointestinal tract of an adult drinking one liter of milk per day at the Chavis Ranch is approximately one mrad.

Iodine-131 was found in milk at four sampling locations in Nevada and one in Utah, with the highest value being 100 pCi/l from the Boyd Schena Ranch near Abraham, Utah. Milk samples collected from the Standby Milk Surveillance Network in Idaho, Montana, Wyoming, and Colorado did not contain activity attributable to the Schooner Event.

Low levels of ^{181}W have been found in natural vegetation which has grown since the occurrence of the Schooner deposition, and in the muscle of cattle grazing in the deposition areas.

Analyses of radiological data indicate that radioactive effluent arising from this event did not present any health hazard to the off-site population, based on presently accepted safety criteria established by the U. S. Atomic Energy Commission.

APPENDICES

	<u>Page</u>
APPENDIX A. Ground Monitoring Results	71
APPENDIX B. Gamma Exposure Rate Recorder Network Results	83
APPENDIX C. Portable Gamma Exposure Rate Recorder Results	84
APPENDIX D. Vegetation Sampling Results	86
APPENDIX E. Air Sampling Results	94
APPENDIX F. Milk Sampling Results	134
APPENDIX G. Milk Cow Feed Sampling Results	157
APPENDIX H. Water Sampling Results	165
APPENDIX I. Calculation of Radiation Dose Equivalent to the Gastrointestinal Tract from the Ingestion and Inhalation of ¹⁸⁷ W.	178

APPENDIX A. Ground Monitoring Results

(All readings are gross gamma values, taken at three feet above ground level.)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
NEVADA							
Adaven (Simpson's Ranch) (42°, 75 mi)		NDC		12/8/68		NDC	
				12/9/68	1500	1.0	
				12/10/68	1458	0.4	
				12/11/68	1420	0.3	
				12/12/68	1410	0.09	
			12/13/68	1500	BKG		
Adaven (Uhalde Ranch) (45°, 75 mi)	a	2.0 ^b	1235	12/8/68	1900	2.0	12
				12/9/68	1508	0.6	37
				12/10/68	1520	0.4	49
				12/11/68	1430	0.3	56
				12/12/68	1415	0.07	60
				12/13/68	1530	0.05	61
				12/14/68	1420	0.05	61
				12/15/68	1200	0.04	62
			12/16/68	1340	0.04	62	

^a Monitor arrived at location after cloud arrival.

^b Highest level observed by monitor at this location. The observation may have been after passage of peak cloud activity.

^c Accumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
Blue Eagle Ranch (32°, 97 mi)	1800	0.12	2110	12/8/68	2118	0.09	< 1
				12/9/68	1835	0.06	1
				12/10/68		NDC	--
				12/11/68	1345	0.05	3
				12/12/68	1400	BKG	3
Blue Jay Maint. Sta. (15°, 76 mi)				12/8/68		NDC	
				12/9/68	1335	0.1	
				12/10/68	1424	0.09	
				12/11/68	1225	0.07	
				12/12/68	1130	0.05	
Casey's Ranch (39°, 82 mi)				12/13/68	1220	BKG	
				12/8/68		NDC	
				12/9/68	1433	0.2	
				12/10/68	1414	0.2	
				12/11/68	1245	0.1	
Chavis Ranch (57°, 127 mi)				12/12/68	1330	0.05	
				12/13/68	1420	BKG	
	a	3.1	1539	12/8/68	2010	2.0	12
				12/9/68	1845	1.0	46
				12/10/68	1435	0.4	59
				12/11/68	1400	0.2	65
				12/12/68	1230	0.08	68
			12/13/68	1125	0.07	69	
			12/14/68	1000	BKG	70	

^aMonitor arrived at location after cloud arrival.

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
Clark Station (5 mi. Ranch) (352°, 57 mi)		NDC		12/8/68		NDC	
				12/9/68	1149	0.3	
				12/10/68	1145	0.4	
				12/11/68	1151	0.2	
				12/12/68	1547	0.05	
				12/13/68	1130	0.05	
				12/14/68	1100	0.04	
Currant (33°, 116 mi)	1515	0.08	2010	12/8/68	2130	0.08	< 1
				12/9/68	1540	0.05	1
				12/10/68	1420	0.03	2
				12/11/68	1305	0.05	2
				12/12/68	1200	BKG	2
Currant Maint. Sta. (32°, 119 mi)		NDC		12/8/68		NDC	
				12/9/68	1355	0.04	
				12/10/68	1235	0.03	
				12/11/68	1600	0.04	
Diablo Maint. Sta. (33°, 47 mi)	1100 ^d	8.5	1215	12/8/68	2100	3.0	50
				12/9/68	1304	3.0	98
				12/10/68	1227	1.3	151
				12/11/68	1340	0.5	174
				12/12/68	1200	0.3	182

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

^dMonitor detected "shine" from the upper cloud, which passed to the east of his location, at 0950 hours.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
Diablo Maint. Sta. (cont'd)				12/13/68	1230	0.1	186
				12/14/68	1205	0.07	187
				12/15/68	1105	BKG	188
Ely (34°, 160 mi)	1735	0.05	2105	12/8/68	2140	0.04	< 1
				12/9/68	1255	BKG	< 1
Forest Moon Ranch (47°, 104 mi)	1325	1.2	1605	12/8/68	2125	0.9	
Geyser Maint. Sta. (48°, 137 mi)		NDC		12/8/68		NDC	
				12/10/68	1335	0.09	
				12/11/68	1300	0.06	
				12/12/68		NDC	
				12/13/68	1055	0.04	
Geyser Ranch (48°, 141 mi)		NDC		12/8-9/68		NDC	
				12/10/68	1315	0.07	
				12/11/68	1200	0.05	
				12/12/68	1145	0.04	
Halstead Ranch (24°, 117 mi)		NDC		12/8/68		NDC	
				12/9/68	1625	0.07	
				12/10/68	1515	0.05	
				12/11/68	1530	0.04	
			12/12/68	1510	BKG		

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c (mR)
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME (mR/hr)		
Kirkeby Ranch (47°, 160 mi)		NDC		12/8/68		NDC	
				12/9/68	1950	0.4	
				12/10/68	1235	0.08	
				12/11/68	1150	0.05	
			12/12/68	1045	BKG		
Kavanaugh Ranch (49°, 138 mi)	1500	0.6	1718	12/8/68	2130	0.5	
Lockes Ranch (27°, 94 mi)	1445	0.3	1650	12/8/68	2130	0.3	2
				12/9/68	1430	0.3	7
				12/10/68	1328	0.1	11
Lund (39°, 135 mi)	1630	0.6	1915	12/8/68	2200	0.6	2
				12/9/68	1450	0.4	11
				12/10/68	1200	0.2	17
				12/11/68	1230	0.07	19
				12/12/68	0100	BKG	20
Major's Place (42°, 157 mi)	1700	0.13	1958	12/8/68	2137	0.09	< 1
				12/9/68	0925	BKG	< 1
Manzonie Ranch (32°, 116 mi)		NDC		12/8/68		NDC	
				12/9/68	1455	0.06	
				12/10/68	1345	0.04	
				12/11/68	1300	BKG	

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
Nyala (Sharp's Ranch) (34°, 76 mi)	1312	0.5	1650	12/8/68	2116	0.5	2
				12/9/68	1300	0.5	10
				12/10/68	1330	0.3	19
				12/11/68	1023	0.2	24
				12/12/68	1257	0.05	26
Pine Creek Ranch (46°, 72 mi)	a	4.0	1205	12/8/68		NDC	
				12/9/68	1654	1.8	
				12/10/68	1545	0.7	
				12/11/68	1503	0.5	
				12/12/68	1445	0.2	
				12/13/68	1615	0.06	
				12/14/68	1530	0.08	
Stickelman's Farm (357°, 55 mi)	a	0.7 ^b	1252	12/8/68	1540	0.5	2
				12/9/68	1315	0.2	10
				12/10/68	1210	0.4	16
				12/11/68	1130	0.2	23
				12/12/68	1050	0.07	25
				12/13/68	1135	0.05	26
				12/14/68	1132	0.05	27
			12/15/68		NDC		
			12/16/68	1245	BKG	28	

^aMonitor arrived at location after cloud arrival.

^bHighest level observed by monitor at this location. The observation may have been after passage of peak cloud activity.

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME (mR/hr)		(mR)
Stone Cabin Ranch (356°, 61 mi)	a	1.2 ^b	1300	12/8/68	2100	0.6	7
				12/9/68	1245	0.4	15
				12/10/68		NDC	--
				12/11/68	1100	0.1	28
				12/12/68		NDC	--
				12/13/68	1700	0.1	33
				12/14/68	1100	0.04	33
				12/15/68	0955	BKG	34
Sunnyside (47°, 112 mi)			NDC	12/8/68	1840	1.0	
				12/9/68	1700	0.4	
				12/10/68	1300	0.2	
				12/11/68	1345	0.09	
				12/12/68	1250	0.06	
				12/13-14/68		NDC	
				12/15/68	1400	0.04	
Twin Springs (Fallini's Ranch) (18°, 63 mi)	1130	0.6	1500	12/8/68	2125	0.2	2
				12/9/68	1229	0.2	5
				12/10/68	1345	0.1	7
				12/11/68	1300	0.08	9
				12/12/68	1501	0.05	10
				12/13/68	1250	BKG	11

^a Monitor arrived at location after cloud arrival.

^b Highest level observed by monitor at this location. The observation may have been after passage of peak cloud activity.

^c Accumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
Warm Springs (10°, 61 mi)	1415	0.2	1700	12/8/68	2030	0.2	< 1
				12/9/68	1215	0.1	2
				12/10/68	1300	0.2	5
				12/11/68	1300	0.1	9
				12/12/68	1515	0.06	10
				12/13/68	1145	0.04	11
				12/14/68	1120	BKG	11
25 mi E. Eureka (Highway 50) (20°, 152 mi)		NDC		12/8/68		NDC	
				12/9/68	1410	0.08	
Black Rock Summit (Highway 6) (23°, 88 mi)	1405	0.4	1700	12/8/68	2000	0.4	
				12/9/68	1420	0.1	
				12/10/68	1348	0.09	
20 mi. S. Sunnyside (Highway 38) (58°, 102 mi)		NDC		12/8/68	1715	4.0	
				12/9/68	1753	1.2	
				12/10/68	1452	0.7	
				12/11/68		NDC	
				12/12/68	1405	0.4	
26 mi No. Pioche (Highway 93) (59°, 125 mi)	a	5.0	1426	12/8/68	1435	4.0	
				12/9/68	1700	1.5	
				12/10/68	1515	0.6	
				12/11/68	1430	0.3	
				12/12/68	1300	0.2	
				12/13/68	1132	0.1	
				12/14-18/68		NDC	
			12/19/68	1132	0.1		

^aMonitor arrived at location after cloud arrival.^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr) ^b	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
20 mi. W. Warm Springs (Highway 6) (351°, 55 mi)	a	4.0 ^b	1200			NDC	
22 mi. W. Warm Springs (Highway 6) (349°, 55 mi)	a	4.0 ^b	1130			NDC	
10 mi. N. Diablo (Highway 25) (32°, 52 mi)	1115	3.0	1220	12/8/68	2100	1.6	
Queen City Summit (QCS) (Highway 25) (53°, 44 mi)	0955	85	1027	12/8/68	1700	60	
				12/9/68	1410	30	
				12/10/68	1528	12	
				12/11/68	1425	6.0	
				12/12/68	1421	3.0	
				12/13/68	1307	1.2	
				12/14/68	1250	0.6	
				12/15/68	1150	0.4	
				12/16/68	1310	0.4	
				12/17/68	1320	0.3	
				12/18/68	1235	0.2	
			12/19/68	0949	0.1		
			12/20-25/68		NDC		
			12/26/68	1516	0.09		
			1/21/69	0905	0.06		

^aMonitor arrived at location after cloud arrival.

^bHighest level observed by monitor at this location. The observation may have been after passage of peak cloud activity.

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

NDC = No data collected.

APPENDIX A. (continued)

NEVADA (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
2.4 mi. E. Queen City Summit (Highway 25) (54°, 44 mi)	a	130	1028	12/8/68	1253	120	
				12/9/68	1454	45	
2.5 mi. E. Queen City Summit (several yards S. Hwy 25) (54°, 44 mi)		NDC		12/8/68	1100	350	
Lincoln-Nye County Line (3.4 mi. E. QCS-Hwy 25) (55°, 44 mi)		NDC		12/8/68	1210	110	
			12/9/68	1500	40		
			12/10/68	1517	17		
			12/11/68	1435	10		
			12/12/68	1415	5.0		
			12/13/68	1313	3.0		
			12/14/68	1255	1.2		
			12/15/68	1156	0.8		
			12/16/68	1320	0.7		
			12/17/68	1330	0.4		
	12/18/68	1240	0.3				
	12/19/68	0956	0.4				
		12/20-25/68		NDC			
		12/26/68	1505	0.09			
		1/21/69	0913	0.06			

^aMonitor arrived at location after cloud arrival.

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

NDC=No data collected.

APPENDIX A. (continued)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATA			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME OF PEAK	DATE	TIME	(mR/hr)	(mR)
UTAH							
Delta (57°, 256 mi)	1830	0.2	2023	12/8/68	2148	0.2	< 1
				12/9/68	1257	0.1	3
				12/10/68	1305	0.04	5
				12/11/68	0630	BKG	5
Garrison (51°, 176 mi)	1650	0.3	1800	12/8/68	2130	0.2	< 1
				12/9/68	1515	0.1	3
				12/10/68	1300	0.06	5
				12/11/68	1130	BKG	5
Milford (70°, 206 mi)		NDC		12/8/68		NDC	
				12/9/68	1748	0.05	
				12/10/68	0942	BKG	
27 mi. S.E. Garrison (Highway 21) (61°, 174 mi)		NDC		12/8/68		NDC	
				12/9/68	1610	0.4	
				12/10/68	1117	0.4	
				12/11/68	1322	0.08	
				12/12/68	1310	0.06	
				12/13/68	1230	0.04	

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX A. (concluded)

UTAH (cont'd)

LOCATION (Azimuth, Distance)	CLOUD PASSAGE DATE			RESIDUAL EXPOSURE RATE AND DATA			ACCUMULATED EXPOSURE ^c
	ARRIVAL TIME	PEAK (mR/hr)	TIME of PEAK	DATE	TIME	(mR/hr)	(mR)
47 mi. S.E. Garrison (Hwy 21) (64°, 189 mi)		NDC		12/8/68		NDC	
				12/9/68	1643	0.4	
				12/10/68	1025	0.3	
				12/11/68	1353	0.08	
				12/12/68	1358	0.05	
			12/13/68	1310	BKG		
30 mi. W. Delta (Highway 6 and 50) (55°, 224 mi)		NDC		12/8/68		NDC	
				12/9/68	1220	0.4	
55 mi. N. Milford (Highway 257) (58°, 242 mi)		NDC		12/8-9/68		NDC	
				12/10/68	0914	0.1	
10 mi. N. Holden (Highway 91) (60°, 272 mi)		NDC		12/8-11/68		NDC	
				12/12/68	1032	0.04	
Lynndyl (55°, 272 mi)		NDC		12/8-9/68		NDC	
				12/10/68	1130	0.11	
				12/11/68		NDC	
				12/12/68	0830	0.04	

^cAccumulated exposures listed only for populated locations with sufficient exposure-rate information to calculate daily exposures.

BKG = Background. (.03 mR/hr)

NDC = No data collected.

APPENDIX B. Gamma Exposure Rate Recorder Network Results

LOCATION ^a (Azimuth, Distance)	EXPOSURE PERIOD (From - To)		CLOUD PASSAGE DATA			INTEGRATED EXPOSURE (mR)
			CLOUD ARRIVAL (12/8/68)	PEAK CLOUD EXPOSURE RATE (mR/hr)	TIME OF PEAK (12/8/68)	
Currant Maint. Sta. (32°, 119 mi)	1440 12/8/68	1200 12/14/68	1440	0.05	2200	0.1
Diablo Maint. Sta. (33°, 47 mi)	1100 12/8/68	2400 12/22/68	1100	2.7	1230	75
Duckwater (24°, 117 mi)	1530 12/8/68	2400 12/14/68	1530	0.08	0500	3
Ely (34°, 160 mi)	1830 12/8/68	2400 12/12/68	1830	0.02	2130	0.02
Garrison, Utah (51°, 176 mi)	1630 12/8/68	2400 12/17/68	1630	0.1	1800	4
Lund (39°, 135 mi)	1615 12/8/68	1200 12/14/68	1615	0.3	1930	8
Nyala (34°, 76 mi)	1300 12/8/68	2400 12/18/68	1300	0.8	2000	28
Round Mnt. (342°, 100 mi)	1630 12/8/68	1200 12/15/68	1630	0.03	1940	0.2
Stickelman's Farm (357°, 55 mi)	1120 12/8/68	2400 12/14/68	1120	0.4	1240	11
Sunnyside (47°, 112 mi)	1400 12/8/68	1200 12/18/68	1400	0.8	1630	23
Tonopah (322°, 63 mi)	1630 12/8/68	2400 12/13/68	1630	0.1	1850	2
Twin Springs Fallini's Ranch (18°, 63 mi)	1230 12/8/68	2400 12/15/68	1230	0.1	1445	4

^a All location are in Nevada unless otherwise indicated.

APPENDIX C. Portable Gamma Exposure Rate Recorder Results

LOCATION ^a (Azimuth, Distance)	RECORDER EXPOSURE PERIOD (From - To)		CLOUD PASSAGE DATA			RECORDER INTEGRATED EXPOSURE (mR)	TLD ^b EXPOSURE (mR)
	CLOUD ARRIVAL (12/8/68)	PEAK CLOUD EXPOSURE RATE (mR/hr)	TIME OF PEAK				
POPULATED LOCATIONS							
Bellehelen Mine (8°, 50 mi)	1010 12/8/68	1720 12/8/68	1152	0.07	1620 12/8/68	0.2	6
Blue Eagle Ranch (32°, 97 mi)	0950 12/8/68	1805 12/9/68	1750	0.2	0625 12/9/68	3	5
Chavis Ranch (57°, 127 mi)	1835 12/8/68	1400 12/9/68	c	1.8 ^d	1835 12/8/68	31	30
Garrison Airport, Utah (51°, 176 mi)	1715 12/8/68	2137 12/8/68	1710	0.15	1830 12/8/68	0.6	6
Gibson Farm (35°, 77 mi)	1025 12/8/68	1245 12/9/68	1345	0.65	1720 12/8/68	13	27
Kavanaugh Ranch (49°, 138 mi)	1135 12/8/68	1735 12/12/68	1515	0.7	1710 12/8/68	13	12
Koynes Mill (62°, 50 mi)	0930 12/8/68	1550 12/9/68	e	0.03	- -	0	8
Locke's Ranch (27°, 94 mi)	1030 12/8/68	1430 12/9/68	1405	0.30	1700 12/8/68	6	8
Major's Place (42°, 157 mi)	1814 12/8/68	0800 12/9/68	1914	0.1	2130 12/8/68	1	8
Pine Creek Ranch (46°, 72 mi)	1155 12/8/68	1655 12/9/68	c	5.0	1225 12/8/68	83	82

^a All locations are in Nevada unless otherwise indicated.

^b One TLD accompanied each recorder - net TLD exposures may include some contribution from in transit exposure through contaminated areas.

^c Recorder started after cloud arrival.

^d Highest level detected by recorder at this location. Recorder started after passage of peak cloud activity.

^e No Schooner related activity detected at this location.

APPENDIX C. (continued)

LOCATION ^a (Azimuth, Distance)	RECORDER EXPOSURE PERIOD (From - To)		CLOUD PASSAGE DATA			RECORDER INTEGRATED EXPOSURE (mR)	TLD ^b EXPOSURE (mR)
	CLOUD ARRIVAL (12/8/68)	PEAK CLOUD EXPOSURE RATE (mR/hr)	TIME OF PEAK				
<u>POPULATED LOCATIONS (Con't)</u>							
Stone Cabin Ranch (356°, 61 mi)	1900 12/8/68	1242 12/9/68	c	0.6 ^d	1910 12/8/68	5	13
Uhalde Ranch (45°, 75 mi)	1100 12/8/68	1510 12/9/68	1120	1.3	1505 12/8/68	23	35
Warm Springs (10°, 61 mi)	0950 12/8/68	1220 12/9/68	1410	0.16	2000 12/8/68	3	6
<u>NON-POPULATED LOCATIONS</u>							
10 mi.E. Queen City Smt.(Hwy 25) (63°, 49 mi)	0950 12/8/68	1620 12/9/68	c	0.1 ^d	1008 12/8/68	1	10
Hwy 25 at Gunderson Rd. (58°, 45 mi)	0930 12/8/68	1535 12/9/68	0945	0.18	1000 12/8/68	2	10
Queen City Summit (Hwy 25) (53°, 44 mi)	0945 12/8/68	1413 12/9/68	0950	107	1025 12/8/68	1356	1340
10 mi.N. Diablo Maint. Sta.(Hwy 25) (32°, 52 mi)	1018 12/8/68	1252 12/9/68	NDC	1.8	1310 12/8/68	34	66
Black Rock Summit (Hwy 6) (23°, 88 mi)	1000 12/8/68	1515 12/8/68	1350	NDC	NDC	—	—
Antelope Summit (Hwy 50) (23°, 150 mi)	1055 12/8/68	0900 12/9/68	1805	0.16	2100 12/8/68	1	4
0.8 mi. W. Eureka (Hwy 50) (10°, 152 mi)	1325 12/8/68	0830 12/9/68	2050	0.06	2205	0.8	3

^a All locations are in Nevada unless otherwise indicated.

^b One TLD accompanied each recorder - net TLD exposures may include some contribution from in transit exposure through contaminated areas.

^c Recorder started after cloud arrival.

^d Highest level detected by recorder at this location. Recorder started after passage of peak cloud activity.

NDC - No data collected.

APPENDIX D Vegetation Sampling Results

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
COLORADO			
Denver, Colorado	1220	1555	
8 mi. S Jct. US 6 and I-25	12/14/68	12/16/68	5,700
Pueblo, Colorado	1350	1605	
1 mi. S Jct. Colo. 96 and I-25	12/14/68	12/16/68	2,400
Walsenburg, Colorado	1510	1545	
4.6 mi. N Jct. US 160 and I-25	12/14/68	12/16/68	2,700
NEBRASKA			
Omaha, Nebraska		1555	
	12/13/68	12/16/68	4,500
NEVADA			
<u>Highway 6 - Tonopah to Warm Springs</u>			
Tonopah, Nevada	1130	2055	
10 mi. E Jct. 6/95 on Hwy. 6	12/8/68	12/9/68	180,000
Tonopah, Nevada	1200	2120	
20 mi. E Jct. 6/95 on Hwy. 6	12/8/68	12/9/68	240,000
Tonopah, Nevada	1230	2055	
30 mi. E Jct. 6/95 on Hwy. 6	12/8/68	12/9/68	2,400,000
Tonopah, Nevada	1250	1700	
40 mi. E Jct. 6/95 on Hwy. 6	12/8/68	12/10/68	250,000
Tonopah, Nevada	1215	1800	
50 mi. E Jct. 6/95 on Hwy. 6	12/8/68	12/10/68	95,000
<u>Highway 6 - Warm Springs to Ely</u>			
Warm Springs, Nevada	1255	1630	
Service Station	12/9/68	12/10/68	110,000
Warm Springs, Nevada	1315	1455	
10 mi. NE on Hwy. 6	12/9/68	12/10/68	76,000
Warm Springs, Nevada	1345	1455	
20 mi. NE on Hwy. 6	12/9/68	12/10/68	210,000

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA RAT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 6 - Warm Springs to Ely</u>			
Warm Springs, Nevada 30 mi. NE on Hwy. 6	1400 12/9/68	1545 12/10/68	140,000
Warm Springs, Nevada 40 mi. NE on Hwy. 6	1415 12/9/68	1605 12/10/68	640,000
Warm Springs, Nevada 50 mi. NE on Hwy. 6	1440 12/9/68	1534 12/10/68	350,000
Warm Springs, Nevada 60 mi. NE on Hwy. 6	1505 12/9/68	1511 12/10/68	180,000
Warm Springs, Nevada 64 mi. NE on Hwy. 6 (Currant, Nevada)	1520 12/9/68	1526 12/10/68	410,000
Warm Springs, Nevada 70 mi. NE on Hwy. 6	1600 12/9/68	1617 12/10/68	170,000
Warm Springs, Nevada 80 mi. NE on Hwy. 6	1625 12/9/68	1607 12/10/68	85,000
Warm Springs, Nevada 90 mi. NE on Hwy. 6	1640 12/9/68	1605 12/10/68	390,000
Warm Springs, Nevada 100 mi. NE on Hwy. 6	1655 12/9/68	1545 12/10/68	570,000
Warm Springs, Nevada 110 mi. NE on Hwy. 6	1715 12/9/68	1628 12/10/68	76,000
Warm Springs, Nevada 120 mi. NE on Hwy. 6	1730 12/9/68	1630 12/10/68	170,000
<u>Highway 50/93- Jct. Hwy. 6/93 to Jct. 6/73</u>			
Shoshone, Nevada Jct. 6/93	1247 12/9/68	1355 12/13/68	63,000
Shoshone, Nevada 10 mi. E Jct. 6/93, Hwy. 6	1302 12/9/68	1425 12/13/68	7,500
Shoshone, Nevada 20 mi. E Jct. 6/93, Hwy. 6	1322 12/9/68	1510 12/13/68	7,000
Shoshone, Nevada Jct. Highway 6/73	1340 12/9/68	1201 12/13/68	7,100

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 73</u>			
Baker, Nevada 5 mi. SE on Hwy. 73	1359 12/9/68	1201 12/13/68	13,000
<u>Highway 8A - Jct. Hwy. 8A/6 Northward</u>			
Tonopah, Nevada Jct. 8A/6	1115 12/9/68	1110 12/11/68	80,000
Tonopah, Nevada 10 mi. N Jct. 8A/6 on 8A	1145 12/9/68	1110 12/11/68	110,000
Tonopah, Nevada 20 mi. N Jct. 8A/6 on 8A	1200 12/9/68	1111 12/11/68	71,000
Tonopah, Nevada 30 mi. N Jct. 8A/6 on 8A	1220 12/9/68	1111 12/11/68	60,000
Tonopah, Nevada 40 mi. N Jct. 8A/6 on 8A	1235 12/9/68	1036 12/11/68	39,000
Tonopah, Nevada 50 mi. N Jct. 8A/6 on 8A	1255 12/9/68	1035 12/11/68	32,000
Tonopah, Nevada 60 mi. N Jct. 8A/6 on 8A	1335 12/9/68	1052 12/11/68	17,000
Tonopah, Nevada 70 mi. N Jct. 8A/6 on 8A	1350 12/9/68	1036 12/11/68	12,000
Tonopah, Nevada 80 mi. N Jct. 8A/6 on 8A	1410 12/9/68	1052 12/11/68	14,000
Tonopah, Nevada 90 mi. N Jct. 8A/6 on 8A	1430 12/9/68	1035 12/11/68	12,000
Tonopah, Nevada 100 mi. N Jct. 8A/6 on 8A	1500 12/9/68	1132 12/11/68	63,000
<u>Highway 25 - Warm Springs to Hancock Summit</u>			
Warm Springs, Nevada 10 mi. SE Jct. 6/25 on Hwy. 25	1350 12/8/68	1840 12/10/68	180,000
Warm Springs, Nevada 20 mi. SE Jct. 6/25 on Hwy. 25	1420 12/8/68	1717 12/10/68	450,000

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 25 - Warm Springs to Hancock Summit</u>			
Warm Springs, Nevada	1430	1654	
30 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	300,000
Warm Springs, Nevada	1500	1732	
40 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	2,800,000
Warm Springs, Nevada	1525	1732	
50 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	3,800,000
Warm Springs, Nevada	1600	1717	
60 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	190,000
Warm Springs, Nevada	1618	1840	
70 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	100,000
Warm Springs, Nevada	1635	1830	
80 mi. SE Jct. 6/25 on Hwy. 25	12/8/68	12/10/68	60,000
<u>Highway 38 - Lund to Hiko</u>			
Lund, Nevada	1525	1815	
1 mi. S on Hwy. 38	12/9/68	12/10/68	970,000
Lund, Nevada	1550	1710	
11 mi. S on Hwy. 38	12/9/68	12/10/68	430,000
Lund, Nevada	1610	1654	
21 mi. S on Hwy. 38	12/9/68	12/10/68	460,000
Lund, Nevada	1630	1800	
31 mi. S on Hwy. 38	12/9/68	12/10/68	190,000
Lund, Nevada	1723	1700	
41 mi. S on Hwy. 38	12/9/68	12/10/68	680,000
Lund, Nevada	1753	1710	
51 mi. S on Hwy. 38	12/9/68	12/10/68	1,800,000
Lund, Nevada	1820	1830	
61 mi. S on Hwy. 38	12/9/68	12/10/68	61,000
Lund, Nevada	1904	1815	
71 mi. S on Hwy. 38	12/9/68	12/10/68	30,000
Lund, Nevada	1930	1900	
81 mi. S on Hwy. 38	12/9/68	12/10/68	21,000

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 50 - Ely to Eureka</u>			
Ely, Nevada	1250	1526	
City Limits W Hwy. 50	12/9/68	12/10/68	110,000
Ely, Nevada	1305	1617	
10 mi. W on Hwy. 50	12/9/68	12/10/68	150,000
Ely, Nevada	1330	1607	
20 mi. W on Hwy. 50	12/9/68	12/10/68	73,000
Ely, Nevada	1340	1521	
30 mi. W on Hwy. 50	12/9/68	12/10/68	87,000
Ely, Nevada	1400	1521	
40 mi. W on Hwy. 50	12/9/68	12/10/68	39,000
Ely, Nevada	1410	1628	
50 mi. W on Hwy. 50	12/9/68	12/10/68	170,000
Ely, Nevada	1425	1534	
60 mi. W on Hwy. 50	12/9/68	12/10/68	270,000
Ely, Nevada	1445	1545	
70 mi. W on Hwy 50	12/9/68	12/10/68	32,000
<u>Highway 50 - Austin to Eureka</u>			
Austin, Nevada	1500	0140	
5 mi. E on Hwy. 50	12/9/68	12/10/68	73,000
Austin, Nevada	1530	0150	
20 mi. E on Hwy. 50	12/9/68	12/10/68	110,000
Austin, Nevada	1550	1440	
35 mi. E on Hwy. 50	12/9/68	12/10/68	33,000
Austin, Nevada	1615	0150	
50 mi. E on Hwy. 50	12/9/68	12/10/68	140,000
Austin, Nevada	1430	0150	
55 mi. E on Hwy. 50	12/9/68	12/10/68	12,000
<u>Highway 50 - Eastgate to Austin</u>			
Eastgate, Nevada	1230	0155	
	12/9/68	12/10/68	150,000

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 50 - Eastgate to Austin</u>			
Eastgate, Nevada	1330	0135	
10 mi. E on Hwy. 50	12/9/68	12/10/68	26,000
Eastgate, Nevada	1400	0140	
25 mi. E on Hwy. 50	12/9/68	12/10/68	9,400
Eastgate, Nevada	1410	0135	
40 mi. E on Hwy. 50	12/9/68	12/10/68	18,000
<u>Highway 50 - Eastgate Westward</u>			
Eastgate, Nevada	1430	1615	
	12/13/68	12/16/68	1,900
Eastgate, Nevada	1445	1600	
5 mi. W on Hwy. 50	12/13/68	12/16/68	440
Eastgate, Nevada	1500	1600	
15 mi. W on Hwy. 50	12/13/68	12/16/68	3,100
<u>Highway 93 - Ely to Pioche</u>			
Ely, Nevada	1300	1415	
Hwy. Marker 6	12/9/68	12/10/68	100,000
Ely, Nevada	1315	1430	
10 mi. S on Hwy. 93	12/9/68	12/10/68	430,000
Ely, Nevada	1335	1435	
20 mi. S on Hwy. 93	12/9/68	12/10/68	450,000
Ely, Nevada	1400	1411	
30 mi. S on Hwy. 93	12/9/68	12/10/68	320,000
Ely, Nevada	1440	1415	
40 mi. S on Hwy. 93	12/9/68	12/10/68	510,000
Ely, Nevada	1510	1430	
50 mi. S on Hwy. 93	12/9/68	12/10/68	420,000
Ely, Nevada	1536	1435	
60 mi. S on Hwy. 93	12/9/68	12/10/68	500,000

APPENDIX D (continued)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
NEVADA (cont'd)			
<u>Highway 93 - Ely to Pioche</u>			
Ely, Nevada 70 mi. S on Hwy. 93	1555 12/9/68	1424 12/10/68	620,000
Ely, Nevada 80 mi. S on Hwy. 93	1615 12/9/68	1424 12/10/68	3,800,000
Ely, Nevada 90 mi. S on Hwy. 93	1615 12/9/68	1411 12/10/68	350,000
Ely, Nevada 100 mi. S on Hwy. 93	1710 12/9/68	1440 12/10/68	27,000
NEW MEXICO			
Albuquerque, New Mexico 1 mi. W Jct. US 66 and I-25	2005 12/14/68	1540 12/16/68	4,500
Albuquerque, New Mexico 4 mi. N Jct. I-25 and US 66	1955 12/14/68	1540 12/16/68	1,500
Raton, New Mexico 17.2 mi. S N.M.-Colo. border on I-25	1610 12/14/68	1605 12/16/68	3,500
Santa Fe, New Mexico 18.9 mi. E on US 85	1835 12/14/68	1545 12/16/68	760
Wagon Mound, New Mexico 16.7 mi. W on I-25	1730 12/14/68	1615 12/16/68	3,600
UTAH			
Garrison, Utah	1515 12/9/68	1445 12/13/68	33,000
Garrison, Utah 7 mi. SE on Hwy. 21	1527 12/9/68	1445 12/13/68	63,000
Garrison, Utah 17 mi. SE on Hwy. 21	1540 12/9/68	1435 12/13/68	22,000

APPENDIX D (concluded)

NEAREST TOWN AND LOCATION	TIME- DATE COLLECTED	TIME- DATE COUNTED	GROSS GAMMA AT COUNT TIME (cpm/kg)
UTAH (cont'd)			
Garrison, Utah 27 mi. SE on Hwy. 21	1557 12/9/68	1410 12/13/68	17,000
Garrison, Utah 37 mi. SE on Hwy. 21	1627 12/9/68	1335 12/13/68	11,000
Garrison, Utah 47 mi. SE on Hwy 21	1643 12/9/68	1425 12/13/68	13,000
Carrison, Utah 57 mi. SE on Hwy. 21	1708 12/9/68	1345 12/13/68	3,500
Garrison, Utah 67 mi. SE on Hwy 21	1731 12/9/68	1345 12/13/68	1,600
Milford, Utah	1748 12/9/68	1147 12/13/68	940
Provo, Utah 30 mi. S on Hwy. 91	1530 12/13/68	1618 12/16/68	4,400

APPENDIX E. AIR SAMPLING RESULTS

(Activity Extrapolated to end of Collection Period)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		¹³¹ I	¹⁸⁷ W	¹³¹ I	Other
			On	Off				(pCi/m ³)	(μCi·sec/m ³)				
Kingman, Arizona 137°	204 mi	12-10	1930	24.0	PF	18/1450	58	5.0	Present	ND	ND		
		11	1930		CC				No CC run				
		11	1930	24.0	PF	23/1225	100	8.7	Present	ND	ND		
		12	1930		CC				No CC run				
		12	1930	24.0	PF	24/1052	2.6	0.23	Present	ND	ND		
		13	1930		CC			No CC run					
Phoenix, Arizona 137°	370 mi	12-11	1600	24.0	PF	23/1213	66	5.7	Present	ND	0.3	0.026	
		12	1600		CC				No CC run				
		12	1600	24.0	PF	23/1308	10	0.87	Present	ND	ND		
		13	1600		CC				No CC run				
		2-06	1600	24.0	PF	2-13/0920	1.4	0.12	Present	ND	ND		
		07	1600		CC			No CC run					
Seligman, Arizona 124°	249 mi	12-11	0700	24.0	PF	17/1924	57	4.9	Present	27/2.3	0.2	0.02	
		12	0700		CC				No CC run				
		12	0700	24.0	PF	24/1023	3.0	0.26	Present	ND	ND		
		13	0700		CC				No CC run				
Winslow, Arizona 116°	364 mi	12-11	1200	24.0	PF	23/1213	47	4.1	Present	ND	ND		
		12	1155		CC				No CC run				
		12	1200	24.0	PF	24/1040	2.8	0.24	Present	ND	ND		
		13	1155		CC			No CC run					
Baker, California 170°	138 mi	1-08	1400	24.0	PF	1-17/1518	1.1	0.098	Present	ND	ND		
		09	1400		CC				No CC run				

PF - Particulate filter

CC - Charcoal cartridge

NI - Not identified at time of count

ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		181 _W	187 _W	131 _I		Other
			On Off	On Off				(pCi/m ³)	(μCi·sec/m ³)			(pCi/m ³)	(μCi·sec/m ³)	
	Barstow, California 189°	171 mi	1-09 10	0700 0700	24.0	PF CC	1-14/1548	1.5	0.13	Present No CC run	ND	ND		
	Bishop, California 271°	101 mi				PF CC		No positive samples collected						
	Death Valley Jct., Calif. 173°	73 mi	1-18 19	0700 0800	25.0	PF CC	30/0910	3.1	0.28	Present ND	ND ND	ND ND		
			20 21	0700 0700	24.0	PF CC	1-24/0835	1.6	0.14	ND Present	ND ND	ND ND		
			21 22	0700 0700	24.0	PF CC	24/0835	1.6	0.14	Present ND	ND ND	ND ND		
			2-18 19	0700 0700	24.0	PF CC	2-24/0925	0.7	0.06		ND Present	ND ND		
	Furnace Creek, Calif. 197°	61 mi	2-18 19	0705 0705	24.0	PF CC	2-26/0915	3.0	0.26	Present No CC run	ND	ND		
	Indio, California 176°	252 mi	12-12 13	0830 0830	24.0	PF CC	23/1255	5.2	0.45	Present No CC run	ND	ND		
			1-08 09	0815 0815	24.0	PF CC	1-14/1530	1.6	0.13	Present No CC run	ND	ND		
			09 10	0815 0815	24.0	PF CC	14/1510	2.1	0.18	Present No CC run	ND	ND		
			2-16 17	0800 0815	24.0	PF CC	2-20/0945	0.9	0.08	Present No CC run				

 PF - Particulate filter
 CC - Charcoal cartridge
 NI - Not identified at time of count
 ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(µCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(µCi·sec/m ³)
	Lone Pine, California 238°	98 mi				PF CC		No positive samples collected					
	Needles, California 148°	206 mi	12-11 12	1556 0839	16.6	PF CC	23/1200	260	16	ND No CC run	LT(0.5)	0.4	0.02
			12 13	0840 1517	30.6	PF CC	23/1255	3.4	0.37	Present No CC run	ND	ND	
			17 18	0646 1042	27.8	PF CC	27/0935	1.4	0.14	Present No CC run	ND	ND	
			20 22	0711 1005	50.9	PF CC	1-02/1405	0.6	0.1	Present No CC run	ND	ND	
∞	Ridgecrest, Calif. 207°	133 mi	1-10 11	1235 1253	24.0	PF CC	1-17/1529	0.8	0.07	Present No CC run	ND	ND	
	Shoshone, Calif. 170°	97 mi	12-11 12	1132 0935	22.1	PF CC	19/0935	9.7	0.78	Present No CC run	ND	ND	
			1-10 11	0932 1000	24.5	PF CC	1-14/1448	1.6	0.14	Present No CC run	ND	ND	
			11 12	1002 1025	24.5	PF CC	1-20/0850	1.0	0.089	Present No CC run	ND	ND	
			14 15	1052 1020	23.5	PF CC	1-20/0941	2.9	0.24	Present No CC run	ND	ND	
	Denver, Colorado 075°	648 mi	12-09 10	2030 0830	12.0	PF CC	13/1626 12/1751	210	9.0	NI ND	160/6.9 ND	ND ND	
			10 11	0830 0830	24.0	PF CC	18/1245 13/2050	140	12	Present Present	120/10 10/0.86	0.4 ND	0.03

PF - Particulate filter
 CC - Charcoal cartridge
 NI - Not identified at time of count
 ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
			On Off	On Off				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Denver ^o 075	Colo. (continued)	648 mi	12-11	0830	24.1	PF	19/1010	8.1	0.71	Present	ND	ND	
			12	0835		CC	17/1325			Present	24/2.1	ND	
			18	0830	PF	27/1105	8.0	0.69	Present	ND	ND		
			19	0830	CC	23/1433	ND	ND	ND				
Durango, Colorado 090 ^o	477 mi	12-09	1731	24.0	PF	13/1652	92	7.9	NI	61/5.3	ND		
		10	1730		CC	13/2142			ND		ND	ND	
		10	1731	PF	19/1430	9.8	0.85	Present	ND	ND			
		11	1730	CC	13/2200	ND	ND	ND					
		15	1731	PF		LT(0.2)							
16	1730	CC	19/1330	Present	ND		0.5	0.04					
Grand Junction, Colo. 075 ^o	451 mi	12-09	1700	40.4	PF	18/1359	250	36	Present	210/30	0.9	0.1	
		11	0818		CC				No sample received				
		12	0830	PF	24/1423	1.5	0.13	Present	ND	ND			
		13	0830	CC	17/1230	ND	ND	ND					
Rangely, Colorado 067 ^o	458 mi	12-09	0745	23.3	PF	19/1535	75	6.3	Present	100/8.4	ND		
		10	0709		CC	17/1106			ND		ND	ND	
		10	0710	PF	19/1430	19	1.7	Present	ND	ND			
		11	0709	CC	17/1145	ND	ND	ND					
		11	0710	PF	18/2120	4.6	0.42	Present	ND	ND			
12	0759	CC	17/1742	ND	ND	ND							
Pueblo, Colorado 084 ^o	655 mi	12-08	1850	18.8	PF	13/1600	18	1.2	NI	29/2.0	ND		
		09	1343		CC	11/1738			ND		ND	ND	

PF - Particulate filter
 CC - Charcoal cartridge
 NI - Not identified at time of count
 ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN		GROSS BETA (pCi/m ³) (μCi·sec/m ³)		I S O T O P I C R E S U L T S			
			On Off	On Off			181 _W	187 _W	131 _I (pCi/m ³)	131 _I (μCi·sec/m ³)	Other			
084	Pueblo, Colo. (continued)	655 mi	12-09	1347	23.8	PF	13/1537	99	8.5	NI	64/5.5	ND		
			10	1332		CC	12/1740			ND	ND	ND		
			10	1335	24.5	PF	18/1355	280	25	Present	240/21	1.0	0.09	
			11	1405		CC	13/2055			Present	5.6/0.49	ND		
			11	1410	26.0	PF	24/1350	1.6	0.15	Present	ND	ND		
			12	1710		CC	17/1122			Present	ND	ND		
	002	Boise, Idaho	434 mi	12-09	0900	24.0	PF	13/1730	1300	110	NI	860/74	ND	
				10	0900		CC	12/1710			NI	110/9.5	ND	
				10	0900	24.0	PF	18/1148	170	15	Present	130/11	0.4	0.03
				11	0900		CC	13/2212			NI	53/5.1	ND	
				23	0900	24.0	PF	25/1125	1.1	0.093	Present	ND	ND	
				24	0900		CC	27/1237			Present	ND	ND	
029	Idaho Falls, Idaho	486 mi	12-09	0802	25.3	PF	13/1610	16	1.4	NI	14/1.3	ND		
			10	0923		CC	12/1810			ND	ND	ND		
			10	0927	22.3	PF	18/1216	110	9.0	Present	100/8.0	0.3	0.02	
			11	0745		CC	13/2100			NI	49/3.9	0.3	0.02	
			12	0800	32.0	PF		0.2	0.02					
			13	1559		CC	17/1357			Present	ND	ND		
			20	0858	72.8	PF		0.1	0.03					
			23	0948		CC	27/1210			Present	ND	ND		
			24	0759	47.8	PF	1-07/1200	0.6	0.10	ND	ND	ND		
			26	0748		CC	30/1426			Present	ND	ND		
007	Mountain Home, Idaho	402 mi	12-08	1800	22.4	PF	13/1600	1200	97	NI	1200/97	NI		
			09	1630		CC	12/1810			ND	ND	ND		
			09	1630	27.3	PF	18/0949	2600	260	Present	2400/240	6.1	0.60	132 _{TE} =1.2
			10	1930		CC	13/2114			ND	ND	ND		

PF - Particulate filter
 CC - Charcoal Cartridge
 NI - Not identified at time of count
 ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

ISOTOPIC RESULTS

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		ISOTOPIC RESULTS				
			On	On				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	¹³¹ I (μCi·sec/m ³)	Other
Mountain Home, Idaho 007°	(continued)	402 mi	12-10	1930	22.0	PF	19/1448	330	26	Present	240/19	0.8	0.06	
			11	1730		CC	17/1141			ND	ND	ND		
			13	1800	28.4	PF	26/1400	2.5	0.25	Present	ND	ND		
			14	2230		CC	19/1055			ND	ND	ND		
			14	2230	22.8	PF	26/1425	3.4	0.28	Present	ND	ND		
			15	2100		CC	19/1300			ND	ND	ND		
Pocatello, Idaho 030°		438 mi	12-08	2005	18.3	PF	13/1725	85	5.6	NI	57/3.8	ND		
			09	1430		CC	11/1810			ND	ND	ND		
			09	1432	25.8	PF	13/1830	420	39	NI	320/30	ND		
			10	1620		CC	12/1810			NI	32/3.0	ND		
			10	1620	19.1	PF	18/1335	160	11	Present	120/8.2	0.5	0.03	
			11	1130		CC	13/2050			Present	3.2/0.22	ND		
Preston, Idaho 037°		412 mi	12-08	1800	12.0	PF	13/1740	58	2.5	NI	50/2.2	ND		
			09	0600		CC	11/1639			ND	ND	ND		
			09	0600	24.0	PF	18/0856	210	18	Present	190/16	0.4	0.03	
			10	0600		CC	13/2250			ND	ND	ND		
Twin Falls, Idaho 017°		377 mi	12-09	0800	24.0	PF	13/1730	1100	95	NI	880/76	ND		
			10	0800		CC	12/1737			NI	63/5.4	ND		
			10	0800	24.0	PF	18/1216	630	54	Present	600/52	2.0	0.17	
			11	0800		CC	13/2154			NI	200/17	ND		
			11	0800	24.0	PF	19/0951	5.0	0.43	Present	ND	ND		
			12	0800		CC	13/2240			Present	2.3/0.19	ND		
			12	0800	24.0	PF	24/1110	1.3	0.11	Present	ND	ND		
			13	0800		CC	17/1325			ND	ND	ND		
			13	0800	25.0	PF	20/1155	2.5	0.22	Present	ND	ND		
			14	0900		CC	17/1000			ND	ND	ND		

PF - Particulate filter
 CC - Charcoal cartridge
 NI - Not identified at time of count
 ND - Not detected

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
	Twin Falls, Idaho (continued)		12-14	0900	24.0	PF	24/1130	1.3	0.11	Present	ND	ND	
	017°	377 mi	15	0900		CC	17/0920			ND	ND	ND	
			23	0800	24.0	PF	1-02/1107	0.6	0.05	ND	ND	NE	
			24	0800		CC	27/1356			Present	ND	NE	
			24	0800	24.0	PF	1-02/1245	1.1	0.096	Present	ND	ND	
			25	0800		CC	27/1410			ND	ND	ND	
	Iowa City, Iowa					PF		No positive samples collected.					
	077°	1362 mi				CC							
	Sioux City, Iowa		12-11	1000	24.0	PF	17/1940	8.4	0.73	Present	ND	ND	
	072°	1122 mi	12	1000		CC	18/1948			ND	ND	ND	
	Dodge City, Kansas					PF		No positive samples collected.					
	088°	904 mi				CC							
	Lake Charles, Louisiana		12-13	0856	71.4	PF	21/2100	0.6	0.2	Present	ND	ND	
	110°	1423 mi	16	0934		CC				No CC run			
			2-10	0931	24.6	PF	2-26/1405	LT(0.2)		Present	ND	ND	
			11	0829		CC				No CC run			
			13	0831	31.1	PF	2-18/1315	1.8	0.020	Present	ND	ND	
			14	1539		CC				No CC run			
	Monroe, Louisiana		12-13	1500	72.8	PF	26/2240	0.5	0.1	Present	ND	ND	
	104°	1420 mi	16	1600		CC				No CC run			
	New Orleans, Louisiana					PF		No positive samples collected.					
	109°	1594 mi				CC							
	Minneapolis, Minnesota					PF		No positive samples collected.					
	066°	1314 mi				CC							
	Joplin, Missouri		12-13	0755	23.6	PF	21/2218	2.2	0.19	Present	ND	ND	
	091°	1210 mi	14	0735		CC	17/1230			ND	ND	ND	
	St. Joseph, Missouri					PF		No positive samples collected.					
	082°	1182 mi				CC							

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		ISOTOPIC RESULTS			
								(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
101	St. Louis, Missouri 086°	1433 mi	12-12	1801	23.9	PF	26/2210	1.6	0.13	Present	ND	ND	
			13	1757		CC	17/1845	ND	ND	ND			
	Bozeman, Montana 026°	641 mi	12-09	0755	24.0	PF	13/1550	180	16	NI	130/11	ND	
			10	0755		CC	12/1750	NI	16/1.4	ND			
			10	0755	8.7	PF	18/0928	860	27	Present	800/25	2.1	0.066
			10	1650		CC	13/2035	Present	ND	ND			
			10	1655	15.3	PF	18/1359	270	15	Present	200/11	0.8	0.04
			11	0810		CC	13/2100	Present	4.9/0.27	ND			
			11	0810	23.7	PF	18/2140	28	2.4	Present	ND	ND	
			12	0800		CC	17/1141	ND	ND	ND			
	13	0800	25.0	PF	24/1324	1.5	0.13	Present	ND	ND			
	14	0900		CC	17/1742	ND	ND	ND					
	14	0905	25.0	PF	24/1310	1.9	0.17	Present	ND	ND			
	15	1005		CC	17/1703	ND	ND	ND					
	Billings, Montana 036°	716 mi	12-10	0820	7.8	PF	13/1650	110	3.1	NI	60/1.7	ND	
10			1612	CC		12/1759	ND	ND	ND				
10			1612	16.1	PF	18/1335	150	8.7	Present	ND	ND		
11			0815		CC	13/2106	ND	ND	ND				
11			0815	24.2	PF	17/1840	50	4.3	ND	ND	ND		
12			0834		CC	13/2106	Present	4.8/0.41	ND				
12			0835	47.9	PF	24/1324	0.6	0.1	Present	ND	ND		
14	0830	CC	17/0910		ND	ND	ND						
Missoula, Montana 012°	671 mi	12-10	0900	8.2	PF	18/0949	43	1.3	Present	ND	ND		
		10	1700		CC	13/2125	ND	ND	ND				
		10	1700	15.2	PF	18/1355	64	3.5	Present	ND	ND		
		11	0800		CC	17/2215	ND	ND	ND				
North Platte, Nebraska 073°	883 mi	12-10	1130	28.0	PF	18/1450	170	17	Present	130/13	0.6	0.06	
		11	1530		CC	18/2027	ND	ND	ND				

APPENDIX E. AIR SAMPLING RESULTS (continued)

LOCATION	Distance	DATE		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
		On	Off				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Azimuch 083°	77 mi	12-08	0815	24.3	PF	21/2100	22	1.9	Present	ND	ND	
		09	0830		CC	18/1640			ND	ND	ND	
		09	0830	23.6	PF	21/2100	59	5.0	Present	ND	ND	
		10	0810		CC	18/1733			ND	ND	ND	
		11	0855	23.8	PF	21/2110	40	3.4	Present	ND	ND	
		12	0845		CC	19/1506			ND	ND	ND	
Austin, Nevada 350°	150 mi	12-07	0952	47.1	PF	13/1740	1300	220	NI	1109/190	NI	
		09	0900		CC				No CC run			
		09	0900	32.7	PF	19/1507	1900	220	Present	2109/250	4.1	0.48
		10	1740		CC				No CC run			
		10	1740	37.3	PF	19/0935	5.5	0.74	Present	ND	ND	
		12	0702		CC	17/1130			ND	ND	ND	
		13	1227	22.0	PF	21/2125	5.7	0.45	Present	ND	ND	
		14	1030		CC	27/1751			ND	ND	ND	
		14	1032	20.4	PF	21/2130	4.3	0.31	Present	ND	ND	
		15	0711		CC	27/1305			ND	ND	ND	
15	0713	26.9	PF	30/1055	0.9	0.09	Present	ND	ND			
16	1010		CC	27/1850			ND	ND	ND			
Battle Mountain, Nevada 355°	299 mi	12-09	1208	31.9	PF				No PF run			
		10	2004		CC	13/2228			NI	600/67	0.4	0.05
		10	2005	15.9	PF				No PF run			
		11	1200		CC	13/2038			NI	3600/210	2.1	0.12
		11	1201	24.1	PF				No PF run			
		12	1204		CC	17/1118			Present	ND	ND	
		15	1631	20.6	PF				No PF run			
		16	1210		CC	18/1813			Present	ND	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE ON Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
Beatty 201	Nevada	32 mi	12-08	1730	24.2	PF	13/1610	76	6.6	NI	51/3.4	ND		
			09	1734		CC	11/1830			ND	ND	ND		
Blue Eagle 034	Ranch, Currant, Nev.	97 mi	12-08	0710	13.8	PF	09/1819	4300	210	NI	7200/360	NI		
			08	2123		CC	09/1532			NI	410/20	ND		
			08	2130	8.9	PF	10/1937	8800	280	NI	7200/230	NI		
			09	0645		CC	10/1725			NI	1100/35	NI		
			09	0645	23.4	PF	12/2220	6700	560	NI	5100/430	NI		
			10	0705		CC	12/2330			7.9/0.66	83/6.9	1.5	0.13	¹³³ I=17*
			10	0705	22.9	PF	12/2220	1000	82	NI	620/51	ND		
			11	0650		CC	12/2243			NI	120/9.9	ND		
			11	0650	24.6	PF	13/1815	12	1.1	NI	4.0/0.35	ND		
			12	0825		CC	13/2021			NI	4.0/0.35	0.3	0.03	
			14	1020	21.6	PF	19/1100	3.2	0.25	Present	ND	ND		
			15	0850		CC	18/1735			ND	ND	ND		
			16	0650	22.9	PF	26/1145	2.4	0.20	Present	ND	ND		
			17	0650		CC				No CC run				
19	0655	22.7	PF	26/1455	2.1	0.18	Present	ND	ND					
20	0650		CC				No CC run							
Blue Jay, 015	Nevada	75 mi	12-08	0900	22.3	PF	10/1900	15,000	1200	NI	12,000/960	NI		
			09	0720		CC	10/1804			NI	540/43	ND		
			09	0720	23.6	PF	10/2240	7600	640	NI	4800/410	NI		
			10	0720		CC	10/2240			NI	1700/144	NI		
			10	0720	25.5	PF	18/1048	2000	180	Present	1600/150	5.9	0.54	¹³² Te=1.4
			11	0850		CC	12/1623			NI	100/9.4	ND		
11	0850	20.7	PF	14/1900	46	3.4	NI	21/1.6	ND					
12	0540		CC	14/1830			NI	13/0.96	ND					

*Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
			On	Off				(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
015 ^o	Blue Jay, Nevada (continued)	75 mi	12-12	0550	25.6	PF	16/1635	14	1.3	ND	ND	ND		
			13	0725		CC	14/1855			NI	7.8/0.71	0.5	0.046	
			13	0725	25.2	PF	21/2136	6.5	0.59	Present	ND	ND		
			14	0900		CC	18/1805			Present	ND	0.8	0.072	
			14	0900	22.6	PF	21/2140	64	5.2	Present	ND	0.1	0.008	
			15	0745		CC	18/1815			Present	10/0.8	0.4	0.03	
			16	0700	24.1	PF	23/1004	2.6	0.22	Present	ND	ND		
			17	0745		CC	18/1820			ND	ND	ND		
			17	0745	23.8	PF	1-04/1500	1.7	0.15	Present	ND	ND		
			18	0715		CC	27/1730			ND	ND	ND		
			18	0715	23.8	PF	1-04/1457	2.1	0.18	Present	ND	ND		
			19	0710		CC	27/1705			ND	ND	ND		
			19	0710	24.1	PF	1-04/1434	2.6	0.22	Present	ND	ND		
			20	0725		CC	27/1635			ND	ND	ND		
			23	0710	24.3	PF	30/1121	1.5	0.14	Present	ND	ND		
			24	0730		CC	27/1414			ND	ND	ND		
			24	0730	25.4	PF	30/1237	2.0	0.18	Present	ND	ND		
			25	0900		CC	27/1626			ND	ND	ND		
			25	0900	22.6	PF	30/1105	27	2.2	Present	ND	ND		
			26	0740		CC	27/1715			ND	ND	ND		
			1-03	0725	25.6	PF		0.6	0.05			Present	ND	ND
			04	0900		CC	1-08/1215							
			1-13	0700	24.9	PF	1-16/1335	17	1.6	Present	ND	ND		
			14	0800		CC				No CC run				
			19	1115	19.6	PF	1-23/0845	2.3	0.17	Present	ND	ND		
			20	0655		CC				No CC run				
			24	0915	21.2	PF	1-30/1252	8.6	0.65	Present	ND	ND		
			25	0635		CC				No CC run				
			25	0635	27.1	PF	1-28/0320	11	1.0	Present	ND	ND		
			26	0940		CC				No CC run				

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
Blue Jay, 015°	Nevada (continued) 75 mi	2-18	0710	26.2	PF	2-26/0915	2.5	0.23	Present	ND	ND			
		19	0925		CC				No CC run					
		24	0725	24.7	PF	2-28/1030	1.6	0.14	Present	ND	ND			
		25	0835		CC				No CC run					
Caliente, 081°	Nevada 114 mi	12-11	0825	25.7	PF	18/2140	6.9	0.63	Present	ND	ND			
		12	1005		CC	17/1647			Present	ND	ND			
Clark Station, (Stickelman's Farm) 356°	Nevada 55 mi	12-08	0955	11.8	PF	17/0920	200,000	8500	13,000/552	280,000/12,000	28	1.2	¹⁴⁰ Ba=68*	
		08	2145		CC	09/1620			NI	480/21	ND		**	
		08	2145	15.3	PF	10/0240	59,000	3300	NI	47,000/2600	NI			
		09	1320		CC	10/0255			NI	3600/190	NI			¹³⁵ I=95
		09	1320	22.5	PF	11/0310	15,000	1200	NI	12,000/950	NI			
		10	1200		CC	11/0230			NI	750/60	ND			
		10	1205	23.2	PF	18/1320	1700	140	Present	1100/92	2.9	0.24		
		11	1120		CC	12/1603			NI	180/15	ND			
		11	1120	23.5	PF	14/1855	58	4.9	NI	31/2.6	0.1	0.008		
		12	1045		CC	14/1850			NI	31/2.6	0.6	0.05		
		12	1045	21.0	PF					Sample not received.				
		13	0745		CC	17/1134			Present	ND	ND			
		13	0745	73.0	PF	21/2110	21	5.5	Present	ND	ND			
		16	0845		CC	17/2037			Present	ND	ND			
		16	0845	23.5	PF	26/1325	3.4	0.29	Present	ND	ND			
		17	0815		CC	20/1340			Present	ND	ND			
17	0815	26.0	PF	26/1325	2.7	0.25	Present	ND	ND					
18	1020		CC	20/1335			Present	ND	ND					
18	1020	21.5	PF	26/1052	5.7	0.44	Present	ND	ND					
19	0750		CC	20/1335			ND	ND	ND					
19	0750	23.5	PF	27/0930	4.5	0.38	Present	ND	ND					
20	0720		CC	23/1426			Present	ND	ND					

** ¹³³I=680, ¹³⁵I=120.

*-Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS(continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
			On Off	On Off				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
	Clark Station, Nev.(continued)		12-20	0720	49.6	PF	27/1440	1.6	0.29	ND	ND	ND	140Ba=0.1
	(Stickelman's Farm)		22	0915		CC	26/1405			Present	ND	ND	
356°		55 mi	22	0915	47.0	PF	1-02/1125	2.2	0.38	Present	ND	ND	
			24	0830		CC	27/1705			ND	ND	ND	
			24	0830	49.2	PF	1-02/1333	29	5.2	Present	ND	ND	
			26	0930		CC	30/1455			Present	ND	ND	
			30	1120	45.5	PF	1-06/1237	0.9	0.2	Present	ND	ND	
			1-01	0900		CC	1-02/1530			ND	ND	ND	
			1-01	0900	48.1	PF	1-08/1141	0.7	0.1	Present	ND	ND	
			03	0915		CC	1-07/1348			ND	ND	ND	
			06	0830	47.4	PF	1-13/1335	1.6	0.28	Present	ND	ND	
			08	0800		CC	1-17/1315			ND	ND	ND	
			08	0800	47.8	PF	1-14/1510	1.4	0.25	Present	ND	ND	
			10	1000		CC	1-15/1405			ND	ND	ND	
			10	1006	47.4	PF	1-15/1010	9.8	1.7	Present	ND	ND	
			12	0930		CC	1-17/1327			Present	ND	ND	
			12	0930	25.3	PF	1-17/1052	20	1.9	Present	ND	ND	
			13	1050		CC	1-20/1530			Present	ND	ND	
			13	1050	21.3	PF	1-17/1205	55	4.3	Present	ND	ND	
			14	0750		CC	1-20/1510			Present	ND	ND	
			14	0750	24.0	PF	1-17/1142	2.0	0.17	ND	ND	ND	
			15	0840		CC	1-20/1420			Present	ND	ND	
			19	0710	25.2	PF	1-22/0940	3.4	0.30	Present	ND	ND	
			20	0830		CC	1-23/1025			ND	ND	ND	
			2-18	0745	26.4	PF	2-26/0942	2.9	0.27	Present	ND	ND	
			19	1000		CC	2-24/1350			Present	ND	ND	
			25	0715	24.2	PF		0.8	0.07				
			26	0725		CC	3-03/0902			Present	ND	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		181 ^W	187 ^W	131 ^I		Other	
								(pCi/m ³)	(μCi·sec/m ³)			(pCi/m ³)	(μCi·sec/m ³)		
Currant, 033 ^o	Nevada	118 mi	12-08	0700	22.9	PF	13/1835	7300	600	NI	5100/420	NI			
			09	0640		CC	27/1442			Present	ND	ND			
			09	0640	7.1	PF	10/1949	2500	64	NI	2400/61	NI			
			09	1400		CC	10/1854			NI	130/2.3	ND			
			09	1400	22.1	PF	11/0330	440	35	NI	250/20	ND			
			10	1225		CC	11/0215			NI	5.5/0.44	ND			
			10	1226	17.5	PF	12/2230	530	33	NI	360/23	ND			
			11	0625		CC	12/2243			NI	11/0.69	ND			
			11	0630	23.7	PF	13/1815	12	1.0	NI	5.0/0.43	ND			
			12	0640		CC	13/2035			ND	ND	ND			
			13	0640	23.6	PF	21/2125	2.4	0.20	Present	ND	ND			
			14	0710		CC	18/1550			ND	ND	ND			
			14	0710	21.9	PF	21/2158	2.7	0.21	Present	ND	ND			
			15	0600		CC	18/1640			ND	ND	ND			
			19	0640	23.0	PF	31/1021	1.0	0.081	Present	ND	ND			
			20	0645		CC	27/1422			Present	ND	ND			
			1-07	0645	23.3	PF	1-13/1350	1.5	0.12	Present	ND	ND			
			08	0640		CC	17/1248			ND	ND	ND			
			11	0700	23.1	PF	1-17/1512	1.0	0.083	Present	ND	ND			
			12	0700		CC	1-17/1115			ND	ND	ND			
Currie, 026 ^o	Nevada	224 mi	12-08	0718	23.2	PF	13/1545	4500	380	NI	5300/440	NI			
			09	0708		CC	17/2145			ND	ND	ND			
			09	0709	23.8	PF	13/1620	5300	450	NI	3400/290	NI			
			10	0700		CC	12/1725			NI	29/2.5	ND			
			10	0706	23.4	PF	18/1320	440	37	Present	630/53	1.0	0.08		
			11	0655		CC	13/2118			NI	9.2/0.78	ND			
			11	0700	24.2	PF	18/2120	7.7	0.67	Present	ND	ND			
			12	0700		CC	17/1210			ND	ND	ND			
			12	0705	24.1	PF	24/1410	2.8	0.24	Present	ND	ND			
			13	0702		CC	17/1110			ND	ND	ND			

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S					
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other	
Currie 026 ^o	Nevada (continued)	224 mi	12-14	0710	24.4	PF	19/1308	2.7	0.23	Present	ND	ND			
			15	0722		CC	17/2025			ND	ND	ND			
			15	0725	23.8	PF	24/1211	1.2	0.10	Present	ND	ND			
			16	0700		CC	17/1742			ND	ND	ND			
			18	0703	23.8	PF	31/1021	1.1	0.093	Present	ND	ND			
			19	0650		CC	23/1340			ND	ND	ND			
Diablo 035 ^o	Nevada	46 mi	12-08	0650	14.3	PF	09/1936	15,000	770	780/40	14,000/720	10	0.51	¹⁴⁰ Ba=2.6*	
			08	2110		CC	09/1655			78/4.0	2800/144	1.7	0.087	¹³⁵ I=59.**	
			08	2110	9.7	PF	10/0220	4300	150	NI	3100/110	NI			
			09	0645		CC	10/0220			NI	1400/50	NI			
			09	0645	24.0	PF	11/0325	5500	470	NI	3400/290	NI			
			10	0645		CC	11/0220			NI	640/55	ND			
			10	0645	24.3	PF	18/1008	2900	250	Present	2800/240	10	0.87	¹³² Te=1.2	
			11	0645		CC	12/1603			NI	860/75	ND			
			11	0645	24.3	PF	14/1840	200	17	NI	98/8.5	0.5	0.04		
			12	0645		CC	14/1830			NI	94/8.2	1.1	0.10		
			12	0645	23.8	PF	14/1840	19	1.6	NI	8.2/0.7	0.1	0.008		
			13	0645		CC	14/1830			NI	25/2.1	1.2	0.10		
			13	0645	29.4	PF	16/1720	20	2.1	NI	3.5/0.37	0.1	0.01		
			14	1210		CC	16/1555			ND	ND	ND			
			14	1210	22.9	PF	16/1635	49	4.0	NI	4.9/0.40	0.1	0.008		
15	1110		CC	16/1555			ND	ND	0.4	0.03					

* & ** Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE ON Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
Diablo 035	Nevada (continued)	46 mi	12-15	1115	22.4	PF	17/1857	7.9	0.63	Present	ND	ND		
			16	0950		CC	17/1850			NI	4.8/0.39	0.6	0.05	
			16	0950	25.0	PF	20/1420	3.0	0.28	ND	ND	ND		
			17	1145		CC	20/1140			ND	ND	0.3	0.03	
			17	1145	19.4	PF	20/1420	2.0	0.14	ND	ND	ND		
			18	0645		CC	20/1420			Present	ND	0.3	0.02	
			18	0645	24.1	PF	1-07/1235	2.6	0.22	Present	ND	ND		
			19	0645		CC	1-06/1025			Present	ND	ND		
			19	0645	24.0	PF	1-07/1222	1.5	0.13	ND	ND	ND		
			20	0645		CC	1-06/0950			Present	ND	ND		
			23	0645	24.0	PF	1-07/1117	2.2	0.19	Present	ND	ND		
			24	0645		CC	1-06/1020			Present	ND	ND		
			24	0645	27.6	PF	1-07/1117	3.4	0.34	Present	ND	ND		
			25	1045		CC	1-06/1015			Present	ND	ND		
			25	1045	20.1	PF	1-07/1050	7.5	0.54	Present	ND	ND		
			26	0645		CC	1-06/1040			Present	ND	ND		
			26	0645	24.1	PF	1-07/1050	4.0	0.35	Present	ND	ND		
			27	0645		CC	1-06/0935			Present	ND	ND		
			27	0645	72.2	PF	1-07/1025	0.9	0.2	Present	ND	ND		
			30	0645		CC	1-06/1020			ND	ND	ND		
			1-03	0645	28.0	PF	1-14/1115	2.0	0.21	Present	ND	ND		
			04	1145		CC	1-15/1055			ND	ND	ND		
			04	1145	23.0	PF	1-17/1435	1.0	0.082	ND	ND	ND		
			05	1045		CC	1-16/1125			Present	ND	ND		
			05	1045	20.0	PF	1-14/1057	2.4	0.17	Present	ND	ND		
			06	0645		CC	1-15/1030			ND	ND	ND		
			06	0645	24.0	PF	1-21/1557	1.7	0.14	Present	ND	ND		
			07	0645		CC	1-22/0930			ND	ND	ND		
			07	0645	24.0	PF	1-21/1557	7.2	0.62	Present	ND	ND		
			08	0645		CC	1-22/0917			ND	ND	ND		

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
Diablo, 035°	Nevada (continued)	46 mi	1-08	0645	23.1	PF	1-21/1515	2.0	0.17	Present	ND	ND		
				09	0645		CC	1-22/0935			Present	ND	ND	
				10	0645	72.0	PF	1-21/1530	0.9	0.2	Present	ND	ND	
				13	0645		CC	1-22/0935			Present	ND	ND	
				13	0645	23.8	PF	1-21/1515	2.7	0.23	Present	ND	ND	
				14	0645		CC	1-22/0915			Present	ND	ND	
				26	0930	21.7	PF	2-05/0820	2.8	0.22	Present	ND	ND	
				27	0645		CC	2-05/1518			Present	ND	ND	
				28	0645	24.0	PF	2-05/0820	1.9	0.17	Present	ND	ND	
				29	0645		CC	2-05/1345			Present	ND	ND	
				3-03	0630	24.0	PF		0.5	0.04				
				04	0645		CC	3-20/1330			Present	ND	ND	
	19	0645	24.0	PF		0.2	0.02							
	20	0645		CC	4-01/1000			Present	ND	ND				
Diablo, Nevada, 10 mi N (on Highway 25) 030°		56 mi	12-08	0945	11.5	PF	09/1936	43,000	1800	NI	40,000/1600	NI		
				08	2113		CC	09/1717			NI	710/29	ND	¹³⁵ I=47.*
Duckwater, Nevada 025°		117 mi	12-07	0900	25.9	PF	10/1919	41	3.8	NI	48/4.5	ND		
				08	1000		CC	10/1833			NI	9.9/0.92	ND	
				08	1000	21.9	PF	10/1900	16,000	1300	NI	12,000/950	NI	
				09	0800		CC	10/1854			NI	320/25	ND	
				09	0800	24.6	PF	11/0330	5300	470	NI	2800/250	NI	
				10	0800		CC	11/0230			NI	22/1.3	ND	
	10	0800	24.6	PF	12/2250	1100	97	NI	580/51	ND				
	11	0800		CC	12/2314			5.3/0.47	27/2.4	0.3	0.03	*		

*Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS(continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
	Duckwater, Nevada(continued)		12-13	0800	26.6	PF	26/1400	4.6	0.44	Present	ND	ND	
	025°	117 mi	14	1000		CC	20/1404			Present	ND	ND	
			14	1000	26.9	PF	26/1425	6.7	0.64	Present	ND	ND	
			15	1200		CC	20/1340			Present	ND	ND	
			15	1200	26.0	PF	27/1027	7.3	0.70	Present	ND	ND	
			16	1400		CC				No CC run			
			1-07	1700	24.5	PF	1-14/1057	2.5	0.22	Present	ND	ND	
			08	1700		CC				No CC run			
			11	1400	26.5	PF	1-23/1528	1.2	0.11	Present	ND	ND	
			12	1630		CC				No CC run			
			13	1630	22.0	PF	1-21/1420	4.2	0.33	Present	ND	ND	
			14	1430		CC				No CC run			
	Ely, Nevada		12-08	0830	23.5	PF	09/1819	2400	200	NI	2100/180	NI	
	035°	160 mi	09	0800		CC	09/1550			NI	55/4.6	ND	
			09	0800	27.2	PF	11/0325	370	36	NI	290/28	ND	
			10	1115		CC	11/0210			NI	8.3/0.81	ND	
			10	1120	29.0	PF	12/2250	29	3.0	NI	39/4.1	ND	
			11	1620		CC	12/2314			NI	5.2/0.54	ND	
	Ely, Nevada-Antelope Summit		12-08	1030	22.4	PF	09/1948	37,000	3000	NI	43,000/3500	NI	
	(Highway 50)		09	0856		CC	09/1558			NI	2800/220	NI	*
	022°	157 mi											
	Elko, Nevada		12-08	1535	23.2	PF	11/1320	2200	190	NI	2000/170	NI	
	010°	244 mi	09	1450		CC	10/1804			NI	11/0.90	ND	
			09	1450	26.1	PF	19/1525	2100	200	Present	2400/220	4.8	0.45
			10	1700		CC	17/1430			Present	ND	ND	
			10	1700	23.2	PF	19/1410	1200	100	Present	1000/24	3.5	0.29
			11	1614		CC	17/1414			NI	540/45	2.6	0.22
			11	1614	24.1	PF	19/0951	8.3	0.72	Present	ND	ND	
			12	1622		CC	17/1430			Present	ND	ND	

* ¹³⁵I=30; ⁹¹Sr=13.

III

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S							
								(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I		Other			
										(pCi/m ³)	(μCi·sec/m ³)						
Elko, Nevada 010°	(continued)	244 mi	12-12	1622	22.9	PF	19/1540	6.1	0.51	Present	ND	ND					
			13	1521		CC	17/1445			ND	ND	ND					
			13	1521	25.0	PF	21/2147	4.0	0.36	Present	ND	ND					
			14	1619		CC	17/1820			Present	ND	ND					
			14	1619	23.8	PF	21/2130	5.6	0.48	Present	ND	ND					
			15	1610		CC	17/1807			Present	ND	ND					
			18	1600	23.7	PF	30/0952	1.3	0.11	Present	ND	ND					
			19	1542		CC	23/1600			ND	ND	ND					
			19	1542	24.2	PF	26/1110	0.3	0.02	ND	ND	ND					
			20	1555		CC				Present	ND	ND					
			22	1642	23.2	PF	30/1145	2.4	0.20	Present	ND	ND					
			23	1555		CC	27/1410			Present	ND	ND					
			24	0930	32.5	PF	30/1155	6.6	0.78	Present	ND	ND					
			25	1805		CC	27/1700			Present	ND	ND					
					1-11	1612	25.3	PF	1-21/1152	2.2	0.20	Present	ND	ND			
					12	1734		CC				No CC run					
			Eureka, Nevada 012°	(continued)	153 mi	12-08	0700	24.0	PF	13/1750	16,000	1400	NI	13,000/1100	NI		
						09	0700		CC	17/2055			ND	ND	ND		
						09	0700	24.0	PF	13/1758	4300	370	NI	3000/260	NI		
						10	0700		CC	11/1515			NI	420/34	ND		
10	0700	24.0				PF	13/1758	1500	130	NI	1200/96	ND					
11	0700					CC	13/2230			NI	45/3.6	0.5	0.04				
11	0700	24.0				PF	19/0915	28	2.4	Present	21/1.8	ND					
12	0700					CC	13/2220			NI	13/1.1	0.1	0.009				
12	0700	24.0				PF	19/1515	7.1	0.61	ND	ND	ND					
13	0700					CC	17/1500			Present	ND	ND					
13	0700	24.0				PF	20/1110	16	1.4	Present	ND	ND					
14	0700					CC	17/1545			Present	ND	ND					
14	0700	24.0				PF	19/1100	10	0.86	Present	2.0/0.17	ND					
15	0700					CC	17/1035			Present	ND	ND					

APPENDIX E. AIR SAMPLING RESULTS(continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I (pCi/m ³)	(μCi·sec/m ³)	Other
Eureka, 012°	Nevada(continued)	153 mi	12-15	0700	24.0	PF	21/2156	5.9	0.51	ND	ND	ND		
			16	0700		CC	17/1830			Present	ND	ND		
			16	0700	24.0	PF	23/0910	1.5	0.13	Present	ND	ND		
			17	0700		CC	18/1830			ND	ND	ND		
			18	0700	24.0	PF	24/1433	2.3	0.20	ND	ND	ND		
			19	0700		CC	23/1100			Present	ND	ND		
			23	0700	24.0	PF	30/1121	1.9	0.16	Present	ND	ND		
			24	0700		CC	27/1900			Present	ND	ND		
			24	0700	24.0	PF	30/1240	7.4	0.64	Present	ND	ND		
			25	0700		CC	27/1330			ND	ND	ND		
			25	0700	24.0	PF	30/1105	6.0	0.52	Present	ND	ND		
			26	0700		CC	27/1237			Present	ND	ND		
			27	0700	24.0	PF	1-02/1333	1.4	0.12	Present	ND	ND		
			28	0700		CC	30/1737			Present	ND	ND		
			1-11	0700	24.0	PF	1-15/1403	7.9	0.68	Present	ND	ND		
			12	0700		CC				No CC run				
			2-24	0700	24.0	PF	2-28/1012	3.1	0.27	Present	ND	ND		
25	0700		CC				No CC run							
Fallini's (Twin Springs) Ranch, Nevada 019°	62 mi	12-08	0830	13.5	PF	09/1840	2900	140	NI	4000/190	NI			
		08	2130		CC	09/1717			NI	280/14	ND			
		08	2130	17.0	PF	10/0142	4400	270	270/16	3600/220	6.5	0.39	*	
		09	1430		CC	10/0210			220/14	4700/290	2.5	0.15	**	
		09	1455	17.6	PF	11/0310	1800	110	NI	1100/70	NI			
		10	0800		CC	11/0230			NI	270/17	ND			

* ¹³⁵I=55; ¹⁴⁰Ba=10.

** ¹³⁵I=21.

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S				
			On	Off				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	¹³¹ I (μCi·sec/m ³)	Other
	Fallini's (Twin Springs) Ranch, Nevada	62 mi	12-10	0800	5.1	PF	11/0310	2100	38	NI	1700/31	NI		
	019°		10	1325		CC	11/0210			NI	220/4.0	ND		
			10	1345	23.3	PF	18/1008	730	61	Present	600/50	2.5	0.21	
			11	1255		CC	12/1623			NI	58/4.8	ND		
			11	1255	23.4	PF	14/1840	21	1.8	NI	120/10.1	ND		
			12	1200		CC	14/1855			NI	2.0/0.17	0.7	0.006	
			14	1200	20.8	PF	19/1044	22	1.6	Present	6.0/0.45	ND		
			15	0830		CC	17/1820			Present	ND	ND		
			15	0830	26.8	PF	19/1315	5.7	0.55	Present	ND	ND		
			16	1120		CC	17/2000			Present	ND	ND		
			16	1200	19.0	PF	23/0850	1.7	0.12	Present	ND	ND		
			17	0900		CC	19/1520			ND	ND	ND		
			18	0908	24.1	PF	27/1045	1.4	0.12	Present	ND	ND		
			19	0908		CC	27/1530			ND	ND	ND		
			20	1009	22.8	PF	31/1117	0.7	0.06	Present	ND	ND		
			21	1008		CC	26/1500			ND	ND	ND		
			23	1108	24.3	PF	30/1135	1.4	0.12	Present	ND	ND		
			24	1203		CC	27/1402			ND	ND	ND		
			24	1203	21.0	PF	1-02/1040	2.2	0.16	Present	ND	ND		
			25	0900		CC	30/1715			ND	ND	ND		
			25	0900	22.4	PF	1-02/1040	68	5.5	Present	ND	ND		
			26	1004		CC	30/1705			Present	ND	ND		
			1-04	0730	23.7	PF	1-08/1141	0.6	0.05	Present	ND	ND		
			05	0740		CC	1-14/1210			ND	ND	ND		
			07	0745	23.5	PF	1-14/1040	2.8	0.23	Present	ND	ND		
			08	0745		CC	1-16/1110			ND	ND	ND		
			10	0800	23.8	PF	1-14/1448	1.6	0.14	Present	ND	ND		
			11	0800		CC	1-17/1155			ND	ND	ND		
			11	0800	23.7	PF	1-15/1349	6.6	0.56	Present	ND	ND		
			12	0800		CC	1-17/1130			ND	ND	ND		
			13	0800	23.6	PF	1-20/1540	3.0	0.25	Present	ND	ND		
			14	0800		CC	1-20/1520			Present	ND	ND		

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m^3)	($\mu\text{Ci}\cdot\text{sec/m}^3$)	^{181}W	^{187}W	^{131}I (pCi/m^3)	($\mu\text{Ci}\cdot\text{sec/m}^3$)
Fallon, 321°	Nevada	189 mi	12-08	1611	16.2	PF	11/1345	19	1.1	NI	8.9/0.52	ND	
			09	0827		CC				No CC run			
			09	0828	24.2	PF	13/1706	1300	110	NI	840/73	ND	
			10	0843		CC				No CC run			
			10	0844	23.8	PF	13/2153	18	1.5	NI	12/1.0	ND	
			11	0834		CC				No CC run			
Fleur de Lis Ranch, 211°	Nevada	17 mi	12-08	0942	23.8	PF	11/1505	54	4.6	NI	40/3.4	ND	
			09	0927		CC	10/1913			ND	ND	ND	
			09	0935	23.8	PF	13/1708	42	3.6	NI	36/3.1	ND	
			10	0924		CC	11/1850			ND	ND	ND	
			2-01	0941	22.6	PF		LT(0.2)					
			02	0816		CC	2-07/1425			Present	ND	ND	
	03	0853	23.7	PF	2-06/0825	LT(0.2)			ND	ND	ND		
	04	0839		CC	2-07/1546			Present	ND	ND			
Frenchman Station, 325°	Nevada	162 mi	12-08	0747	23.3	PF	13/1635	37	3.1	NI	29/2.4	ND	
			09	0925		CC				No CC run			
			09	0929	21.0	PF	13/1715	630	48	NI	380/29	ND	
			10	0850		CC				No CC run			
			10	0855	22.5	PF	13/1758	14	1.1	NI	8.8/0.71	ND	
			11	0926		CC				No CC run			
			13	1013	20.0	PF	20/1127	3.0	0.21	Present	ND	ND	
			14	0820		CC				No CC run			
	14	0823	23.3	PF	19/1315	9.9	0.83	Present	ND	ND			
	15	1004		CC				No CC run					
Geyser Maintenance Station 050°		138 mi	12-07	1533	28.4	PF	13/1835	5500	560	NI	5700/580	NI	
			08	1730		CC	26/1605			Present	ND	ND	
			08	1933	20.7	PF	10/0240	14,000	1000	NI	8400/620	NI	
			09	1530		CC	10/0237			NI	100/7.4	ND	
			09	1530	20.7	PF	11/0235	53	3.9	NI	58/4.3	ND	
			10	1435		CC	11/0215			NI	24/1.8	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S						
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	¹³¹ I (μCi·sec/m ³)	Other		
050°	Geyser Maintenance Station, Nevada (continued)	138 mi	12-10	1435	24.0	PF	11/1945	120	10	NI	48/4.1	ND				
			11	1245		CC	11/1945			NI	8.6/0.74	ND				
			11	1245	23.6	PF	13/1817	19	1.6	NI	7.2/0.61	ND				
			12	1137		CC	13/2035			NI	23/2.0	ND				
			12	1140	23.7	PF	13/1817	11	0.94	NI	4.9/0.42	ND				
			13	1050		CC	13/2021			ND	ND	ND				
			13	1050	29.8	PF	21/2147	5.2	0.55	Present	ND	ND				
			14	1630		CC	17/2013			Present	ND	ND				
			14	1633	24.0	PF	21/2115	4.4	0.38	Present	ND	ND				
			15	1545		CC	17/1835			Present	ND	ND				
			15	1547	23.8	PF	24/1325	2.3	0.20	Present	ND	ND				
			16	1530		CC	18/1625			ND	ND	ND				
			18	1533	24.0	PF	27/1123	2.7	0.24	Present	ND	ND				
			19	1500		CC	23/1402			ND	ND	ND				
			19	1503	24.7	PF	30/0948	0.8	0.07	Present	ND	ND				
			20	1515		CC	26/0930			ND	ND	ND				
			21	1547	25.0	PF	1-02/1405	1.4	0.12	Present	ND	ND				
			22	1553		CC	26/1435			ND	ND	ND				
			24	1532	25.4	PF	1-02/1110	1.5	0.13	Present	ND	ND				
			25	1615		CC	27/1347			ND	ND	ND				
			25	1618	24.2	PF	1-07/1200	1.1	0.095	ND	ND	ND				
			26	1610		CC	30/1825			Present	ND	ND				
			052°	Geyser Maintenance Station, Nevada, Kavanaugh Ranch	133 mi	12-08	1150	9.7	PF	09/1923	37,000	1300	NI	36,000/1200	NI	
						08	2130		CC	09/1558			NI	180/6.3	ND	

*¹³³I=36; ¹³⁵I=34.

3

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I (pCi/m ³)	(μCi·sec/m ³)
Goldfield, Nevada 305°	44 mi	12-08	0800	24.0	PF	11/1407	22	1.9	NI	13/1.1	ND		
		09	0800		CC	10/1830			ND	ND	ND		
		09	0800	24.0	PF	13/1630	550	48	NI	340/29	ND		
		10	0800		CC	11/1621			NI	7.0/0.60	ND		
		13	0800	24.0	PF	19/1602	2.5	0.21	Present	ND	ND		
		14	0800		CC	17/1545			ND	ND	ND		
Hiko, Nevada 077°	75 mi	12-08	0900	24.0	PF	10/2210	140	12	NI	79/6.8	ND		
		09	0900		CC	10/2215			ND	ND	ND		
		09	0900	24.0	PF	10/2200	61	5.3	NI	51/4.4	ND		
		10	0900		CC	10/2253			NI	7.0/0.60	ND		
		11	0900	24.0	PF	1-09/1030	19	1.6	Present	ND	ND		
		12	0900		CC	1-03/0909			Present	ND	ND		
		2-27	0900	24.0	PF		0.6	0.05					
		28	0900		CC	3-04/1405			Present	ND	ND		
		28	0900	24.0	PF	3-18/1034	1.3	0.11	Present	ND	ND		
		3-01	0900		CC	3-05/0842			ND	ND	ND		
		03	0900	24.0	PF	3-13/1406	1.0	0.086	Present	ND	ND		
		04	0900		CC	3-07/1505			ND	ND	ND		
Hiko, Nevada, 44 mi. W. of Highway 25 056°	48 mi	12-08	0950	1.0	PF	09/1948	280,000	1000	NI 1,100,000/4000	ND			
		08	1050		CC				No CC run				
Indian Springs, Nevada 137°	73 mi	12-11	0900	24.0	PF	23/1150	480	41	Present	1600/140	1.5	0.13	
		12	0900		CC	18/1935			Present	120/10	0.6	0.05	
		12	0900	24.0	PF	23/1155	11	0.94	Present	ND	ND		
		13	0900		CC	19/1000			ND	ND	ND		
		13	0900	24.0	PF	19/1602	3.8	0.33	Present	ND	ND		
		14	0900		CC	28/0920			ND	ND	ND		

APPENDIX E. AIR SAMPLING RESULTS(continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Indian Springs, 137°	Nevada(continued)	73 mi	12-14	0900	24.0	PF	23/1150	2.5	0.21	Present	ND	ND	
			15	0900		CC	28/0850			Present	ND	ND	
			15	0900	24.0	PF	21/2110	2.0	0.17	Present	ND	ND	
			16	0900		CC	29/1846			ND	ND	ND	
			16	0900	24.1	PF	23/0945	2.3	0.20	Present	ND	ND	
			17	0901		CC	29/1720			ND	ND	ND	
			17	0901	24.0	PF	27/0905	2.9	0.25	Present	ND	ND	
			18	0900		CC	28/0750			Present	ND	ND	
			18	0900	24.0	PF	27/0837	1.6	0.13	Present	ND	ND	
			19	0900		CC	28/1005			ND	ND	ND	
			19	0900	24.0	PF	27/0815	3.8	0.33	Present	ND	ND	
			20	0900		CC	28/1040			ND	ND	ND	
			1-08	0900	24.0	PF	1-14/1133	LT(0.2)		Present	ND	ND	
			09	0900		CC	1-16/1148			ND	ND	ND	
Las Vegas, 137°	Nevada	117 mi	12-11	0850	23.2	PF	17/2225	95	7.9	NI	57/4.7	0.3	0.02
			12	0800		CC	12/1641			ND	ND	ND	
			13	0800	72.0	PF	23/1250	1.0	0.26	Present	ND	ND	
			16	0800		CC	28/1030			ND	ND	ND	
			16	0800	24.0	PF	23/1250	2.0	0.18	Present	ND	ND	
			17	0800		CC	17/1900			ND	ND	ND	
			20	0830	72.0	PF	27/0837	LT(0.1)		Present	ND	ND	
			23	0830		CC	28/1000			ND	ND	ND	
			26	0900	24.0	PF	30/1400	1.7	0.14	Present	ND	ND	
27	0900		CC	29/2022			ND	ND	ND				
Lathrop Wells, 169°	Nevada	49 mi	12-16	1115	19.9	PF	23/0945	1.4	0.10	Present	ND	ND	
			17	0700		CC	18/1923			ND	ND	ND	
			17	0700	23.9	PF	27/0905	1.4	0.12	Present	ND	ND	
			18	0700		CC	28/0840			ND	ND	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Lathrop Wells, Nevada 169°	(continued)	49 mi	12-19	0700	24.5	PF	30/0930	1.1	0.097	Present	ND	ND	
			20	0730		CC	28/0935			ND	ND	ND	
			20	0730	23.5	PF	27/0815	2.0	0.17	Present	ND	ND	
			21	0700		CC	28/1005			ND	ND	ND	
			1-07	0730	47.5	PF	1-14/1133	3.6	0.61	Present	ND	ND	
			09	0700		CC	1-16/1110			ND	ND	ND	
Lida, Nevada 278°		52 mi	12-08	0700	53.5	PF	13/1525	2.9	0.56	NI	5.0/0.96	ND	
			10	1230		CC				No CC run			
Lockes, Nevada 026°		97 mi	12-08	1530	5.9	PF	09/1850	25,000	530	NI	30,000/640	NI	
			08	2125		CC	09/1532			NI	1100/23	NI	
Lockes, Nevada-Black Rock Summit 023°		92 mi	12-08	1000	5.2	PF	09/1840	19,000	350	NI	19,000/360	NI	
			08	1515		CC	09/1540			NI	980/18	ND	
LoveLock, Nevada 332°		222 mi	12-09	1000	24.0	PF	13/1740	1500	130	NI	1100/95	NI	
			10	1000		CC				No CC run			
			10	1000	24.0	PF	13/1740	35	3.0	NI	19/1.6	ND	
			11	1000		CC			No CC run				
Lund, Nevada 039°		135 mi	12-08	0743	14.7	PF	09/1830	7200	380	NI	14,000/760	NI	
			08	2230		CC	09/1540			NI	1600/83	NI	
			08	2235	8.6	PF	13/1545	9800	300	NI	7300/230	NI	
			09	0718		CC	10/1745			NI	690/21	ND	
			09	0718	7.7	PF	09/2318	2300	64	NI	4200/120	NI	
			09	1500		CC	09/2325			NI	140/3.9	ND	
			09	1500	15.5	PF	13/1635	480	27	NI	340/20	ND	
			10	0644		CC	12/1630			NI	57/3.3	ND	
			10	0644	25.1	PF	18/1030	390	35	Present	370/33	1.3	0.12
			11	0747		CC	13/2215			NI	18/1.6	0.1	0.009
			11	0747	24.1	PF	12/2235	13	1.1	NI	4.4/0.38	ND	
			12	0750		CC	12/2318			NI	4.8/0.42	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of GAMMA SCAN	GROSS BETA		I S O T O P I C R E S U L T S			
			On Off	On Off				(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Lund, Nevada 039°	(continued)	135 mi	12-12	0750	24.2	PF		1.2	0.10				
			13	0800		CC	17/1545			Present	ND	ND	
			13	0800	23.9	PF	20/1127	2.3	0.20	Present	ND	ND	
			14	0750		CC	17/1047			ND	ND	ND	
			14	0750	24.6	PF	21/2151	9.2	0.81	Present	ND	ND	
			15	0827		CC	13/1632			ND	ND	ND	
			15	0827	23.7	PF	21/2205	1.4	0.12	Present	ND	ND	
			16	0807		CC	18/1700			ND	ND	ND	
			16	0807	23.8	PF	23/1004	1.2	0.10	Present	ND	ND	
			17	0752		CC	18/1910			ND	ND	ND	
			25	0822	23.5	PF	1-02/1120	1.0	0.081	Present	ND	ND	
			26	0758		CC	27/1730			NE	ND	ND	
			1-13	0802	23.4	PF	1-17/1123	3.6	0.31	ND	ND	ND	
			14	0758		CC	1-20/1533			Present	ND	ND	
Mesquite, Nevada 105°		143 mi	12-11	0700	24.0	PF	23/1233	39	3.3	Present	ND	0.1	0.009
			12	0800		CC				No CC run			
Nyala, Nevada 036°		77 mi	12-08	0800	13.4	PF	09/1850	15,000	720	NI	26,000/1200	NI	
			08	2125		CC	09/1739			NI	670/32	ND	
			08	2128	10.2	PF	10/0203	710	26	NI	820/31	ND	
			09	0800		CC	10/0255			NI	340/12	ND	
			09	0800	24.0	PF	11/0300	4200	360	NI	1800/160	NI	
			10	0800		CC	11/0215			NI	330/28	ND	
			10	0800	22.0	PF	18/1130	700	55	Present	600/48	2.1	0.17
			11	1114		CC	12/1640			NI	94/7.4	ND	
			16	1000	22.0	PF	26/1340	11	0.84	Present	ND	ND	
			17	0800		CC	23/1107			ND	ND	ND	
			17	0800	24.0	PF	30/1045	1.3	0.11	Present	ND	ND	
18	0800		CC	23/1055			ND	ND	ND				
18	0800	24.0	PF	30/1120	1.3	0.11	Present	ND	ND				
19	0800		CC	23/1530			ND	ND	ND				

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
036°	Nyala, Nevada (continued)	77 mi	12-19	0800	17.2	PF	30/0952	3.1	0.19	Present	ND	ND		
			20	0800		CC	27/1530			ND	ND	ND		
			20	0800	24.0	PF	1-04/1415	0.5	0.04	ND	ND	ND		
			21	0800		CC	27/1720			Present	ND	ND		
			21	0800	24.0	PF	1-03/1445	0.4	0.04	ND	ND	ND		
			22	0800		CC	27/1434			Present	ND	ND		
			25	0800	24.0	PF	1-02/1058	2.0	0.18	Present	ND	ND		
			26	0800		CC	30/1535			ND	ND	ND		
			26	0800	22.3	PF	1-03/1417	1.7	0.13	ND	ND	ND		
			27	0800		CC	30/1445			Present	ND	ND		
			31	0800	24.0	PF	1-06/0916	0.5	0.05	Present	ND	ND		
			1-01	0800		CC								
			01	0800	24.0	PF	1-08/1140	0.3	0.02	Present	ND	ND		
			02	0800		CC								
			13	0800	24.0	PF	1-20/1540	3.7	0.32	Present	ND	ND		
			14	0800		CC	1-21/1043			ND	ND	ND		
			25	0800	24.0	PF	1-28/0820	2.6	0.22	Present	ND	ND		
			26	0800		CC	1-30/1005			Present	ND	ND		
2-12	0800	24.0	PF	2-18/1324	0.9	0.08	Present	ND	ND					
13	0800		CC											
158°	Pahrump, Nevada	85 mi	1-08	0950	24.0	PF	1-14/1150	2.6	0.23	Present	ND	ND		
			09	1000		CC				No CC run				
071°	Pioche, Nevada	123 mi	12-11	0700	24.0	PF	18/2157	6.7	0.58	ND	Present	ND		
			12	0700		CC	13/2200				ND	ND		ND
048°	Queen City Summit, Nevada (highway 25)	47 mi	12-08	0938	7.6	PF	16/0925	200,000	5500	15,000/410	300,000/8200	250	6.8	¹⁴⁰ Ba=70*
			08	1713		CC	09/1910			NI	41,000/1100	NI		
311°	Reno, Nevada	233 mi				PF		No positive samples collected						
						CC								

* Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I		Other
									(pCi/m ³)	(μCi·sec/m ³)				
344°	Round Mountain, Nevada	98 mi	12-07	1145	24.0	PF	10/0203	20	1.7	NI	5.1/0.44	ND		
			08	1144		CC	10/0258			NI	5.6/0.48	ND		
			08	1145	23.9	PF	10/0214	15,000	1300	NI	9900/850	NI		
			09	1140		CC	10/0210			NI	150/13	ND		**
			09	1141	24.1	PF	11/0300	1900	160	NI	1200/100	NI		
			10	1147		CC	11/0230			NI	53/4.6	ND		
			10	1148	23.8	PF	18/1115	330	28	Present	220/19	0.8	0.07	
			11	1134		CC	13/2250			NI	1.2/0.10	ND		
			12	1141	29.5	PF	19/1515	3.1	0.33	ND	ND	ND		
			13	1710		CC	17/1430			Present	ND	ND		
			13	1711	18.5	PF	20/1110	39	2.6	Present	ND	ND		
			14	1143		CC	17/1445			Present	ND	ND		
			14	1144	24.5	PF	19/1308	11	0.97	Present	ND	ND		
			15	1225		CC	17/1900			Present	ND	ND		
			15	1226	24.3	PF	19/1345	7.0	0.61	Present	ND	ND		
			16	1240		CC	17/1820			Present	ND	ND		
			22	1211	23.6	PF	1-02/1355	0.6	0.05	Present	ND	ND		
			23	1146		CC	26/1435			ND	ND	ND		
			24	1200	23.5	PF	30/1237	3.4	0.25	Present	ND	ND		
			25	1131		CC	27/1700			ND	ND	ND		
			1-12	1245	23.0	PF	1-17/1545	1.1	0.09	Present	ND	ND		
			13	1147		CC				No CC run				
			13	1148	23.7	PF	1-21/1200	1.5	0.13	Present	ND	ND		
			14	1132		CC				No CC run				
			259°	Scotty's Junction, Nevada	26 mi	12-08	1630	24.0	PF	13/1708	490	42	NI	320/28
09	1630					CC	11/1607			ND	ND	ND		

** ¹³³I=44; ¹³⁵I=21; ⁹¹Sr=13.

APPENDIX E. AIR SAMPLING RESULTS(continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S				
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
259°	Scotty's Junction, Nev. (continued)	26 mi	12-09	1630	23.9	PF	13/1630	41	3.5	NI	26/2.2	ND		
			10	1630		CC	12/1740			ND	ND	ND		
			12	1630	PF	19/1540	4.4	0.38	Present	ND	ND			
			13	1630	CC	17/1118			ND	ND	ND			
048°	Sunnyside, Nevada	113 mi	12-07	1630	23.5	PF	09/2318	930	79	NI	3400/290	NI		
			08	1610		CC	09/2325			NI	1400/120	NI		
			08	1610	5.1	PF	09/1710	12,000	220	NI	5300/97	NI		
			08	2130		CC	09/1550			NI	2000/37	NI		
			08	2130	18.5	PF	09/2310	1500	100	NI	1100/73	NI		
			09	1600		CC	09/2314			NI	940/63	ND		
			09	1600	20.6	PF	10/2225	360	27	NI	250/18	ND		
			10	1310		CC	10/2200			NI	120/8.9	ND		
			10	1320	26.1	PF	12/2230	97	9.1	NI	76/7.1	ND		
			11	1600		CC	12/2318			6.2/0.58	27/2.5	0.1	0.009	*
			11	1600	23.4	PF	27/0950	6.1	0.51	Present	ND	ND		
			12	1600		CC	23/1530			ND	ND	ND		
			12	1600	48.6	PF	27/1008	1.7	0.29	Present	ND	ND		
			14	1645		CC	23/1503			Present	ND	ND		
			15	1730	22.9	PF	27/1027	4.7	0.38	Present	ND	ND		
			16	1620		CC	23/1510			ND	ND	ND		
18	1600	24.5	PF	27/1105	1.5	0.14	Present	ND	ND					
19	1700		CC	23/1530			Present	ND	ND					
20	1630	23.0	PF	1-07/1138	0.6	0.05	ND	ND	ND					
21	1700		CC	30/1455			Present	ND	ND					
1-12	1700	22.4	PF	1-21/1420	1.6	0.13	Present	ND	ND					
13	1600		CC	1-21/1020			Present	ND	ND					

*Results of sequential counting for evaluating minor components.

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S		
			On	Off				On	Off	(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W
	Sunnyside, Nevada (continued)		1-14	1645	24.3	PF	27/1008	3.3	0.29	Present	ND	ND
	048°	113 mi	15	1730		CC	23/1448			ND	ND	ND
			18	1645	47.2	PF		0.2	0.032			
			20	1615		CC	1-29/0852			Present	ND	ND
	Tonopah, Nevada		12-08	1430	21.2	PF	10/0214	28,000	2100	NI	21,000/1600	NI
	324°	61 mi	09	1145		CC	10/0237			NI	4700/360	NI
			09	1145	23.1	PF	11/0305	700	58	NI	460/38	ND
			10	1055		CC	11/0215			NI	200/16	ND
			10	1055	28.0	PF	18/1030	27	2.7	Present	ND	ND
			11	1505		CC	13/2227			NI	7.6/0.77	ND
			11	1505	24.5	PF	18/2157	5.3	0.46	Present	ND	ND
			12	1530		CC	17/1632			Present	ND	ND
			12	1530	24.0	PF	19/1449	5.4	0.47	ND	ND	ND
			13	1530		CC	17/1616			Present	ND	ND
			13	1530	23.0	PF	20/1155	14	1.1	Present	ND	ND
			14	1430		CC	17/1616			Present	ND	ND
			14	1430	24.0	PF	19/1044	6.7	0.58	Present	ND	ND
			15	1430		CC	17/1047			Present	ND	ND
			15	1430	22.5	PF	19/1345	1.5	0.12	Present	ND	ND
			16	1300		CC	17/1945			Present	ND	ND
			17	1300	25.0	PF	30/1135	0.6	0.06	Present	ND	ND
			18	1400		CC	23/1120			ND	ND	ND
			18	1400	24.0	PF	30/1217	1.5	0.13	Present	ND	ND
			19	1400		CC	27/1555			ND	ND	ND
			25	1600	22.9	PF		0.3	0.02			
			26	1500		CC	27/1306			Present	ND	ND
			1-11	1530	24.0	PF	1-14/1425	4.2	0.37	Present	ND	ND
			12	1530		CC	1-17/1118			Present	ND	ND
			13	1500	24.0	PF		5.2	0.45	ND	ND	ND
			14	1500		CC	1-20/1524			Present	ND	ND

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S			Other	
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)		(μCi·sec/m ³)
Tonopah, 324°	Nevada(continued)	61 mi	1-18	1530	24.0	PF	1-22/0930	2.2	0.19	Present	ND	ND		
			19	1530		CC	1-22/0915			Present	ND	ND		
			25	1600	19.6	PF		0.3	0.02					
			26	1600		CC	1-29/1005			Present	ND	ND		
			28	1530	23.5	PF		0.3	0.03					
		29	1500		CC	2-03/1555			Present	ND	ND			
Warm Springs, 011°	Nevada	60 mi	12-08	0700	14.5	PF	09/1910	31,000	1600	1300/68	40,000/2100	3.0	0.16	*
			08	2130		CC	09/1655			130/6.8	4000/210	5.2	0.27	**
			08	2130	11.3	PF	13/1750	43,000	1800	NI	32,000/1300	ND		
			09	0850		CC	10/1742			NI	3700/150	ND		
			09	0850	3.7	PF	10/1937	41,000	550	NI	41,000/530	ND		
			09	1240		CC	10/1745			NI	130/17	ND		
			09	1240	22.8	PF	11/0323	6300	520	NI	5000/410	ND		
			10	1130		CC	11/0220			NI	1100/90	ND		
			10	1130	1.2	PF	11/0323	22,000	93	NI	20,000/86	NI		
			10	1300		CC	11/0235			NI	8000/34	NI		
			10	1300	22.7	PF	18/1048	560	46	Present	510/42	1.7	0.14	
			11	1150		CC	12/1640			NI	340/28	ND		
			11	1150	23.4	PF	14/1900	21	1.8	NI	11/0.93	ND		
			12	1105		CC	14/1830			NI	44/3.7	ND		
			12	1105	22.0	PF	21/2110	9.1	0.72	Present	ND	ND		
13	1000		CC	17/1616			NI	14/1.1	ND					
13	1000	22.0	PF	26/1145	72	5.7	Present	ND	ND					
14	0800		CC	18/1720			Present	ND	0.4	0.03				
14	0800	28.0	PF	24/1450	3.3	0.33	ND	ND	ND					
		15	1200		CC	23/1115			Present	ND	ND			

* Results of sequential counting for evaluating minor components. ¹³⁵I=110; ¹⁴⁰Ba=16.

** Results of sequential counting for evaluating minor components. ¹³⁵I=110; ⁹¹Sr=11; ¹⁴⁰Ba=4.2.

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE TIME			COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S		
			On	On	SAMPLING PERIOD (hours)			(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I
			Off	Off						(pCi/m ³)	(μCi·sec/m ³)	
	Warm Springs, Nev. (continued)		12-16	1100	97.0	PF	27/0930			Present	ND	ND
011 ⁰	60 mi		21	1200		CC	26/1350			ND	ND	ND
			21	1200	19.0	PF	27/1440	3.0	0.21	Present	ND	ND
			22	0700		CC	26/1317			Present	ND	ND
			22	1200	20.3	PF	1-20/0832	1.8	0.13	Present	ND	ND
			23	0830		CC	1-08/1112			Present	ND	ND
			23	0830	25.5	PF	1-02/1318	27	2.4	Present	ND	ND
			24	1000		CC	30/1740			Present	ND	ND
			27	1000	74.0	PF	1-09/1110	0.5	0.1	ND	ND	ND
			30	1130		CC	1-03/0915			Present	ND	ND
			1-01	1030	23.6	PF	1-10/1550	0.6	0.05	ND	ND	ND
			02	1000		CC	1-06/1040			Present	ND	ND
			02	1000	22.0	PF	1-10/1307	1.3	0.10	Present	ND	ND
			03	0800		CC	1-08/1056			Present	ND	ND
			03	0800	27.5	PF	1-10/1250	0.8	0.08	ND	ND	ND
			04	1130		CC	1-08/1045			Present	ND	ND
			04	1130	23.9	PF	1-08/1150	6.1	0.52	ND	ND	ND
			05	1100		CC	1-09/1124			Present	ND	ND
			05	1100	22.2	PF	1-08/1107	1.4	0.11	Present	ND	ND
			06	0930		CC	1-09/1220			Present	ND	ND
			06	0930	23.7	PF	1-09/0950	1.3	0.11	ND	ND	ND
			07	0900		CC	1-14/1130			Present	ND	ND
			07	0900	25.0	PF	1-13/1350	2.7	0.24	Present	ND	ND
			08	1000		CC	1-15/1145			Present	ND	ND
			08	1000	24.0	PF	1-15/0820	1.5	0.13	ND	ND	ND
			09	1000		CC	1-15/1115			Present	ND	ND
			09	1000	69.0	PF	1-15/1349	3.5	0.86	Present	ND	ND
			12	1000		CC	1-17/1136			Present	ND	ND
			12	1000	24.7	PF	1-15/1148	1.9	0.17	Present	ND	ND
			13	1045		CC	1-17/1130			Present	ND	ND

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
	Warm Springs, Nevada (continued)		1-13	1045	23.2	PF	1-16/1245	16	1.3	Present	ND	ND	
	011 ^o	60 mi	14	1000		CC	1-20/1500			ND	ND	ND	
			20	1000	23.4	PF	1-23/0845	1.4	0.12	Present	ND	ND	
			21	0930		CC	1-24/0855			Present	ND	ND	
			22	0930	47.3	PF		0.3	0.05				
			24	0930		CC	1-28/1054			Present	ND	ND	
			24	0930	47.9	PF	1-29/0913	2.5	0.43	Present	ND	ND	
			26	0925		CC	1-30/0951			ND	ND	ND	
			27	0930	49.0	PF		0.3	0.05				
			29	1000		CC	2-04/1037			Present	ND	ND	
			2-04	1030	24.2	PF		0.7	0.06				
			05	1030		CC	2-11/1005			Present	ND	ND	
			18	0900	72.0	PF	2-26/1346	0.7	0.2	Present	ND	ND	
			21	0900		CC	2-24/1430			Present	ND	ND	
			21	0900		PF	3-03/1353			Present	ND	ND	
			26	0900		CC	2-28/1417			Present	ND	ND	
	Warm Springs, Nevada		12-08	1042	6.0	PF	09/1830	9400	200	NI	7000/150	NI	
	Bellehelen Mines		08	1642		CC	09/1635			NI	450/9.7	ND	¹³⁵ I=29.
	008 ^o	52 mi											
	Warm Springs Ranch, Nevada		12-10	0700	24.0	PF	24/1040	4.3	0.37	Present	ND	ND	
	113 ^o	111 mi	11	0700		CC	29/1946			ND	ND	ND	
			11	0700	23.1	PF	23/1225	84	6.9	Present	ND	ND	
			12	0700		CC	18/2012			ND	ND	ND	
			12	0700	24.0	PF	23/1310	3.0	0.26	Present	ND	ND	
			13	0700		CC	19/0935			ND	ND	ND	
	Wells, Nevada		12-08	1703	23.9	PF	13/1550	6900	590	NI	5500/470	NI	
	018 ^o	274 mi	09	1700		CC	12/1824			NI	61/5.3	ND	
			09	1703	23.9	PF	19/1535	660	56	Present	600/52	1.2	0.10
			10	1700		CC	13/2305			NI	630/54	1.4	0.11
			10	1703	24.0	PF	18/1325	480	41	Present	330/38	1.6	0.14
			11	1704		CC	13/2212			NI	56/4.8	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S				
			On Off	On Off				(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I (pCi/m ³)	(μCi·sec/m ³)	Other
018°	Wells, Nevada (continued)	274 mi	12-12	1721	23.9	PF	24/1155	0.5	0.05	ND	ND	ND		
			13	1717		CC	17/0920			Present	ND	ND		
			13	1719	23.7	PF	24/1341	2.0	0.17	Present	ND	ND		
			14	1700		CC	17/0910			ND	ND	ND		
			14	1703	24.0	PF	21/2115	2.4	0.20	Present	ND	ND		
			15	1702		CC	17/1750			Present	ND	ND		
			23	1703	23.9	PF	30/1135	2.6	0.22	Present	ND	ND		
			24	1700		CC	27/1323			Present	ND	ND		
			24	1702	24.1	PF	1-02/1110	2.3	0.20	Present	ND	ND		
			25	1704		CC	27/1623			ND	ND	ND		
			27	1703	23.9	PF	1-02/1317	1.9	0.16	Present	ND	ND		
			28	1700		CC	30/1515			ND	ND	ND		
			1-11	1701	24.0	PF	1-21/1152	2.8	0.25	Present	ND	ND		
			12	1702		CC				No CC run				
			13	1701	23.9	PF	1-21/1300	0.9	0.08	Present	ND	ND		
14	1700	CC		No CC run										
346°	Winnemucca, Nevada	257 mi	12-09	0545	24.5	PF	13/1706	1000	88	NI	630/56	NI		
			10	0610		CC	11/1515			NI	59/5.2	ND		
			10	0610	23.9	PF	18/1130	270	23	Present	240/21	0.8		0.07
			11	0605		CC	13/2142			Present	7.5/0.65	ND		
106°	Albuquerque, New Mexico	574 mi			PF		No positive samples collected.							
116°	Carlsbad, New Mexico	776 mi	12-12	0800	24.0	PF	23/1308	5.0	0.44	Present	ND	ND		
			13	0800		CC				No CC run				
095°	Muskogee, Oklahoma	1179 mi				PF		No positive samples collected.						
					CC									
343°	Burns, Oregon	450 mi	12-09	0830	24.0	PF	13/1642	36	3.1	ND	34/2.9	ND		
			10	0828		CC				No CC run				

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE		TIME	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		ISOTOPIIC RESULTS			
			On	Off					(pCi/m ³)	(μCi·sec/m ³)	181 _W	187 _W	131 _I	Other
	Burns, Oregon 343°	450 mi	12-10 11	0829 0828		24.0	PF CC	18/1148	6.2	0.53	Present No CC run	ND	ND	
	Medford, Oregon 316°	481 mi					PF CC		No positive samples collected.					
	Aberdeen, South Dakota 059°	1086 mi	12-11 12	1143 1157		24.2	PF CC	23/1155 19/0945	4.6	0.40	Present ND	ND ND	ND ND	
	Rapid City, South Dakota 056°	838 mi	12-09 10	1801 1800		24.0	PF CC	23/1310 18/1948	30	2.6	Present ND	ND ND	ND ND	
	Abilene, Texas 110°	1011 mi					PF CC		No positive samples collected.					
	Amarillo, Texas 100°	833 mi	12-10 11	0745 0750		24.1	PF CC	18/1515	8.3	0.72	Present No CC run	ND	ND	
	Austin, Texas 114°	1181 mi					PF CC		No positive samples collected.					
	Fort Worth, Texas 106°	1133 mi					PF CC		No positive samples collected.					
	Bryce Canyon Nat'l Park, Utah 085°	242 mi					PF CC		No positive samples collected.					
	Cedar City, Utah 083°	193 mi					PF		No positive samples collected.					
	Delta, Utah 057°	256 mi	12-08 09 08 09 09 10 11 12	1305 0725 1805 0725 0730 0730 0720 0730		18.7 13.3 24.2 24.2	PF CC PF CC PF CC	16/1235 13/2212 11/0310 11/0215 19/1025 17/1045	790 160 27	53 14 2.3	NI NI NI NI Present Present	940/63 110/5.0 110/9.8 7.7/0.67 24/2.1 ND	1.8 0.3 ND ND ND ND	0.12 0.001

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S			Other
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	
	Delta, Utah (Hwy Jct. 99,6,50)		12-08	1845	1.1	PF	10/1952	3700	15	ND	6000/24	NI	
	057°	256 mi	08	1951		CC				No CC run			
	Dugway, Utah		12-08	2152	22.0	PF	18/0856	3.9	0.31	Present	ND	ND	
	046°	286 mi	09	1952		CC	11/1755			NI	1000/79	NI	
			09	1957	23.0	PF	18/0912	77	6.4	Present	ND	ND	
			10	1857		CC	17/1253			Present	ND	ND	
			10	1950	24.0	PF	19/1435	28	2.4	NI	16/1.4	ND	
			11	1952		CC	17/1310			Present	ND	ND	
	Enterprise, Utah					PF		No positive samples collected.					
	085°	157 mi				CC							
	Garrison, Utah		12-08	0800	24.0	PF	11/1320	3700	320	NI	2800/240	NI	
	052°	176 mi	09	0800		CC	10/1742			NI	10/0.86	ND	
			09	0800	24.0	PF	13/1626	570	49	NI	430/37	ND	
			10	0800		CC	12/1656			NI	28/2.4	ND	
			10	0800	6.1	PF	11/0305	670	15	NI	390/8.6	ND	
			10	1300		CC	11/0215			NI	9.5/0.20	ND	
			10	1300	19.0	PF	18/1115	70	4.8	Present	ND	ND	
			11	0800		CC	13/2230			ND	ND	ND	
			11	0800	24.0	PF	19/0915	13	1.1	Present	ND	ND	
			12	0800		CC	17/1455			Present	ND	ND	
			16	0800	24.0	PF	23/0850	1.0	0.083	Present	ND	ND	
			17	0800									
			16	0800	48.0	CC	27/1810			ND	ND	ND	
			18	0800									
			19	0800	24.0	PF	26/1455	2.4	0.21	Present	ND	ND	
			20	0800		CC				No CC run			
	Logan, Utah		12-09	0815	24.3	PF	13/1652	71	6.2	NI	52/4.5	ND	
	040°	394 mi	10	0830		CC	11/1700			ND	ND	ND	
			10	0830	23.7	PF	18/1305	63	5.4	Present	ND	ND	
			11	0815		CC	13/2118			ND	ND	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan		GROSS BETA (pCi/m ³) (μCi·sec/m ³)		I S O T O P I C R E S U L T S		
			On Off	On Off			181 _W	187 _W	131 _I (pCi/m ³)	131 _I (μCi·sec/m ³)	Other		
	Logan, Utah (continued)	394 mi	12-11	0815	24.0	PF	24/1130	3.8	0.33	Present	ND	ND	
	040°		12	0815		CC	17/1310			ND	ND	ND	
	Milford, Utah	207 mi	12-11	1200	24.0	PF	24/1052	2.5	0.21	Present	ND	ND	
	069°		12	1200		CC	17/1013			ND	ND	ND	
	Monticello, Utah	397 mi				PF		No positive samples collected.					
	085°					CC							
	Parowan, Utah	207 mi				PF		No positive samples collected.					
	081°					CC							
	Provo, Utah	330 mi	12-08	1810	14.7	PF	13/1715	60	3.2	NI	34/1.8	ND	
	053°		09	0900		CC	10/1805			ND	ND	ND	
			09	0900	24.0	PF	13/1700	440	38	NI	310/27	ND	
			10	0900		CC	12/1751			ND	ND	ND	
			10	0900		PF	18/1305	37	3.2	Present	ND	ND	
		11	0902	CC	13/2240			ND	ND	ND			
	Roosevelt, Utah	408 mi	12-09	0740	23.4	PF	13/1830	180	15	NI	130/11	ND	
	060°		10	0715		CC	12/1736			ND	ND	ND	
			10	0715	24.1	PF	18/1245	30	2.6	Present	ND	ND	
			11	0725		CC	13/2250			ND	ND	ND	
	Salt Lake City, Utah	345 mi	12-09	0855	23.6	PF	13/1700	380	32	NI	270/23	ND	
	047°		10	0830		CC	11/1720			NI	4.5/0.38	ND	
			10	0830	24.5	PF	18/1325	29	2.6	Present	ND	ND	
			11	0900		CC	13/2043			ND	ND	ND	
	St. George, Utah	166 mi	12-11	0545	22.9	PF				No PF run			
	096°		12	0450		CC	13/2154			NI	11/0.91	0.5	0.04
			12	0455	24.4	PF					No PF run		
			13	0520		CC	17/1647			Present	ND	ND	

APPENDIX E. AIR SAMPLING RESULTS (continued)

Azimuth	LOCATION	Distance	DATE On Off	TIME On Off	SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan	GROSS BETA		I S O T O P I C R E S U L T S			
								(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)
Wendover, Utah 030°	269 mi	12-08	0800	24.0	PF	13/1758	0.8	0.06					
		09	0800										
		08	0800	9.5	CC	11/1621			NI	29/0.99	ND		*
		08	1730										
		08	1730	14.5	PF	11/1545			ND	ND	ND		
		09	0800		CC								
		09	0800	24.0	PF	18/0912	580	50	Present	660/57	1.2	0.10	
		10	0800		CC	12/1723			NI	1.6/0.14	ND		
		10	0800	24.0	PF	19/1435	270	24	Present	220/19	0.5	0.04	
		11	0800		CC	13/2130			ND	ND	ND		
		11	0800	24.0	PF	19/1025	4.9	0.42	Present	ND	ND		
		12	0800		CC	17/1045			Present	ND	ND		
		1-11	0800	24.0	PF	1-20/0850	1.2	0.11	Present	ND	ND		
		12	0800		CC			No CC run					
Seattle, Washington 338°	767 mi				PF		No positive samples collected.						
					CC								
Spokane, Washington 356°	713 mi	12-10	0800	12.0	PF	19/1525	280	12	Present	ND	ND		
		10	2000		CC				No CC run				
Casper, Wyoming 055°	661 mi	12-09	1830	24.0	PF	18/0928	190	16	Present	200/17	0.6	0.05	
		10	1830		CC	13/2250			ND	ND	ND		
		10	1832	24.0	PF	19/1448	13	1.1	Present	ND	ND		
		11	1830		CC	17/0850			ND	ND	ND		
		12	1842	24.2	PF	19/1548	3.2	0.28	Present	ND	ND		
		13	1850		CC	17/0855			ND	ND	ND		

* Contaminated cartridge.

APPENDIX E. AIR SAMPLING RESULTS (concluded)

I S O T O P I C R E S U L T S

Azimuth	LOCATION	Distance	DATE TIME		SAMPLING PERIOD (hours)	COLL. MEDIUM	DATE-TIME of Gamma Scan		GROSS BETA		I S O T O P I C R E S U L T S		
			On Off	On Off			(pCi/m ³)	(μCi·sec/m ³)	¹⁸¹ W	¹⁸⁷ W	¹³¹ I (pCi/m ³)	(μCi·sec/m ³)	Other
Rock Springs, Wyoming 053°	489 mi	12-10	0700	24.0	PF	18/1231	79	6.8	Present	91/7.9	0.2	0.02	
		11	0700		CC	13/2125			ND	ND	ND		
		11	0700	23.9	PF	24/1416	1.7	0.14	ND	ND	ND		
		12	0700		CC	13/2038			Present	2.4/0.21	ND		
Worland, Wyoming 044°	643 mi	12-10	0740	24.0	PF	18/1231	94	8.1	Present	ND	ND		
		11	0740		CC	13/2228			ND	ND	ND		
		11	0740	24.0	PF	19/1010	13	1.2	Present	ND	ND		
		12	0740		CC	17/1340			ND	ND	ND		

APPENDIX F Milk Sampling Results

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131 _I	187 _W
Alamosa, Colorado Alamosa Milk Co. (89°, 581 mi)	A.M.	0900		
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.			
	12/12/68	12/12/68	< 20	< 50
	A.M.			
	12/13/68	12/13/68	< 20	< 50
	A.M.	0900		
	12/14/68	12/14/68	< 20	< 50
	A.M.			
	12/15/68	12/15/68	< 20	< 50
	A.M.			
	12/16/68	12/16/68	< 20	< 50
Colorado Springs, Colo. Senton Dairy Company (82°, 646 mi)	P.M.			
	12/12/68	12/13/68	< 20	< 50
	P.M.			
	12/13/68	12/14/68	< 20	< 50
	P.M.			
	12/15/68	12/16/68	< 20	< 50
	P.M.			
	12/17/68	12/18/68	< 20	< 50
	12/18/68	12/19/68	< 20	< 50
	P.M.			
	12/20/68	12/20/68	< 20	< 50
Craig, Colorado Yampa Valley Dairy (65°, 533 mi)	P.M.			
	12/9/68	12/10/68	< 20	< 50
	P.M.			
	12/11/68	12/12/68	< 20	< 50
	P.M.			
	12/13/68	12/14/68	< 20	< 50
	P.M.			
	12/15/68	12/16/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Ft. Collins, Colorado Poudre Valley Dairy (cont.)	A.M.			
	12/16/68	12/16/68	<20	<50
	A.M.			
	12/16/68	12/16/68	<20	<50
Glenwood Springs, Colorado Glenwood Creamery (73°, 522 mi)	A.M.			
	12/9/68	12/9/68	<20	<50
	A.M.			
	12/10/68	12/10/68	<20	<50
	A.M.			
	12/11/68	12/11/68	<20	<50
	A.M.			
	12/12/68	12/12/68	<20	<50
	A.M.			
	12/13/68	12/13/68	<20	<50
	A.M.			
	12/14/68	12/14/68	<20	<50
Grand Junction, Colo. Clymer's Dairy (75°, 450 mi)	A.M.	1400		
	12/10/68	12/10/68	<20	<50
	A.M.			
	12/11/68	12/11/68	<20	<50
	P.M.			
	12/12/68	12/12/68	<20	<50
	P.M.			
	12/13/68	12/13/68	<20	<50
	A.M.			
12/14/68	12/14/68	<20	<50	
	P.M.			
	12/15/68	12/15/68	<20	<50
	A.M.			
	12/16/68	12/16/68	<20	<50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131I	187W
Monte Vista, Colorado Sunrise Creamery (88°, 570 mi)	A.M.			
	12/10/68	12/10/68	< 20	< 50
	P.M.			
	12/12/68	12/13/68	< 20	< 50
	A.M.			
	12/14/68	12/14/68	< 20	< 50
Rocky Ford, Colorado Rocky Ford Co-op. (86°, 703 mi)	A.M.			
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.			
	12/12/68	12/12/68	< 20	< 50
	A.M.			
	12/13/68	12/13/68	< 20	< 50
A.M.				
12/14/68	12/14/68	< 20	< 50	
A.M.				
12/15/68	12/15/68	< 20	< 50	
A.M.				
12/16/68	12/16/68	< 20	< 50	
Salida, Colorado Monarch Dairy (82°, 580 mi)	P.M.			
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/13/68	12/13/68	< 20	< 50
Blackfoot, Idaho Cammack Dairy (28°, 469 mi)	A.M.	0600		
	12/10/68	12/10/68	< 20	< 50
	A.M.	0800		
	12/11/68	12/11/68	< 20	< 50
	A.M.	0800		
	12/12/68	12/12/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131I	187W
Boise, Idaho Idaho Creameries (2°, 434 mi)	12/9/68	12/9/68	< 20	< 50
	12/10/68	12/10/68	< 20	< 50
	12/12/68	12/12/68	< 20	< 50
	12/13/68	12/13/68	< 20	< 50
	12/14/68	12/14/68	< 20	< 50
Buhl, Idaho Smith's Dairy Products (15°, 376 mi)	P.M.	1000		
	12/9/68	12/10/68	< 20	< 50
	P.M.	0700		
	12/10/68	12/11/68	< 20	< 50
	P.M.	0630		
	12/11/68	12/12/68	< 20	< 50
	P.M.	0700		
	12/12/68	12/13/68	< 20	< 50
P.M.	0600			
12/13/68	12/14/68	< 20	< 50	
P.M.				
12/15/68	12/16/68	< 20	< 50	
P.M.				
12/16/68	12/17/68	< 20	< 50	
Burley, Idaho Stoker's Jersey Farm (22°, 388 mi)	A.M.	1700		
	12/10/68	12/10/68	< 20	< 50
	A.M.	0900		
	12/11/68	12/11/68	< 20	< 50
	A.M.	0800		
12/12/68	12/12/68	< 20	< 50	
A.M.				
12/13/68	12/13/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Burley, Idaho Stoker's Jersey Farm (cont.)	A.M.			
	12/14/68	12/14/68	< 20	< 50
	A.M.			
	12/15/68	12/15/68	< 20	< 50
Idaho Falls, Idaho Wallace Dairy (29°, 487 mi)	A.M.			
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/12/68	12/12/68	< 20	< 50
	P.M.			
	12/15/68	12/15/68	< 20	< 50
	P.M.			
	12/16/68	12/16/68	< 20	< 50
Jerome, Idaho Ida Gem Dairymen (16°, 387 mi)	A.M.			
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/11/68	12/11/68	< 20	< 50
Pocatello, Idaho Wards Dairy (30°, 440 mi)	P.M.			
	12/11/68	12/11/68	< 20	< 50
	P.M.			
	12/12/68	12/13/68	< 20	< 50
	P.M.			
	12/12/68	12/13/68	< 20	< 50
	12/16/68	12/16/68	< 20	< 50
	12/18/68	12/18/68	< 20	< 50
12/20/68	12/20/68	< 20	< 50	
12/21/68	12/21/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Big Timber, Montana Sweet Grass Dairy (30°, 678 mi)	A.M.	1000		
	12/12/68	12/12/68	< 20	< 50
	A.M.	1000		
	12/13/68	12/13/68	< 20	< 50
	A.M.	0900		
	12/14/68	12/14/68	< 20	< 50
	A.M.			
	12/15/68	12/15/68	< 20	< 50
	A.M.			
	12/16/68	12/16/68	< 20	< 50
Billings, Montana Beatrice Foods (35°, 715 mi)	P.M.			
	12/15/68	12/16/68	< 20	< 50
	A.M.			
	12/16/68	12/16/68	< 20	< 50
Bozeman, Montana Darigold Farms (26°, 643)				
	12/11/68	12/13/68	< 20	< 50
	12/13/68	12/14/68	< 20	< 50
	P.M.			
	12/14/68	12/14/68	< 20	< 50
Glendive, Montana Gate City Dairy (43°, 922 mi)	P.M.	1000		
	12/12/68	12/12/68	< 20	< 50
	P.M.			
	12/13/68	12/13/68	< 20	< 50
	P.M.	1045		
	12/14/68	12/14/68	< 20	< 50
Great Falls, Montana Ayrshire Dairy (29°, 752 mi)		1030		
	12/14/68	12/15/68	< 20	< 50
	12/15/68	12/16/68	< 20	< 50
	12/16/68	12/17/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Miles City, Montana Sanitary Dairy (41°, 833 mi)	12/15/68	12/16/68	<20	<50
	A.M.			
	12/15/68	12/15/68	<20	<50
	12/17/68	12/17/68	<20	<50
Austin, Nevada Triple T Ranch (348°, 128 mi)	P.M.	1800		
	12/9/68	12/10/68	<20	<50
	A.M.	1500		
	12/11/68	12/11/68	<20	<50
	A.M.	1230		
	12/12/68	12/12/68	<20	<50
Austin, Nevada Young's Ranch (348°, 134 mi)	A.M.	1500		
	12/9/68	12/9/68	<20	530
	A.M.	1430		
	12/10/68	12/10/68	<20	410
	A.M.			
	12/11/68	12/11/68	<20	<50
	A.M.	1130		
	12/12/68	12/14/68	<20	<50
A.M.	1130			
12/13/68	12/14/68	<20	<50	
A.M.	1130			
12/14/68	12/14/68	<20	<50	
Battle Mt., Nevada T Lazy S Ranch (359°, 231 mi)	P.M.	1200		
	12/10/68	12/11/68	<20	<50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l ^a)		
	MILKED	COLLECTED	131 _I	187 _W	
Belmont, Nevada Pine Creek Ranch (353°, 102 mi)	A.M.	1915			
	12/9/68	12/9/68	< 50	2,300	
	A.M.	1630			
	12/10/68	12/10/68	< 20	640	
	A.M.	1400			
	12/11/68	12/11/68	< 20	500	
	A.M.	1200			
	12/12/68	12/12/68	< 20	< 50	
Beowawe, Nevada Friesen Ranch (1°, 223 mi)	A.M.	1430			
	12/13/68	12/13/68	< 20	220	
	A.M.	0945			
	12/14/68	12/14/68	< 20	180	
Caliente, Nevada Young's Ranch (80°, 113 mi)	A.M.	1630			
	12/15/68	12/16/68	< 20	< 50	
	P.M.	1100			
	12/10/68	12/11/68	< 20	340	
	A.M.				
	12/10/68	12/11/68	< 20	< 50	
	Currant, Nevada Blue Eagle Ranch (33°, 98 mi)	P.M.			
		12/9/68	12/9/68	< 50	1,700
P.M.		1345			
12/10/68		12/12/68	< 50	1,400	
P.M.		1345			
12/11/68		12/12/68	70	700	
P.M.		1230			
12/12/68		12/13/68	70	< 50	
P.M.	1015				
12/13/68	12/14/68	< 20	< 50		
P.M.					
12/16/68	12/16/68	< 20	< 50		

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Currant, Nevada Manzonie Ranch (32°, 116 mi)	A.M.			
	12/9/68	12/9/68	< 50	5,300
	A.M.	1330		
	12/10/68	12/10/68	< 20	350
	A.M.	1230		
	12/11/68	12/11/68	< 20	270
	A.M.	1130		
	12/12/68	12/12/68	< 20	< 50
	A.M.	1130		
	12/13/68	12/13/68	< 20	< 50
Currie, Nevada Bill Lear Ranch (26°, 225 mi)	A.M.	1030		
	12/11/68	12/12/68	< 20	1,300
	P.M.	1700		
	12/14/68	12/14/68	< 20	< 50
Deeth, Nevada Lotspeich Ranch (15°, 266 mi)	P.M.	1515		
	12/10/68	12/11/68	< 20	220
Duckwater, Nevada Halstead Ranch (24°, 117 mi)	A.M.			
	12/9/68	12/9/68	< 50	3,400
	A.M.	1445		
	12/10/68	12/10/68	< 50	980
	A.M.	1525		
	12/11/68	12/11/68	90	1,300
	A.M.	1500		
	12/12/68	12/12/68	60	< 50
	A.M.	1415		
12/13/68	12/13/68	< 50	< 50	
A.M.				
12/14/68	12/14/68	60	< 50	
P.M.				
12/16/68	12/16/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131I	187W
Elko, Nevada Anchor S Ranch (11°, 251 mi)	P.M.	1730		
	12/10/68	12/10/68	< 50	3,300
	A.M.	1500		
	12/14/68	12/14/68	< 20	< 50
Eureka, Nevada Morrison Ranch (11°, 167 mi)	A.M.			
	12/9/68	12/9/68	< 20	830
	P.M.	1200		
	12/9/68	12/10/68	< 20	460
	P.M.	1650		
	12/11/68	12/11/68	< 20	< 50
	A.M.	1000		
12/12/68	12/12/68	< 20	690	
Geyser Maint. Sta., Nevada Chavis Ranch (57°, 127 mi)	A.M.	1100		
	12/13/68	12/13/68	< 20	< 50
	A.M.			
	12/15/68	12/15/68	< 20	< 50
	P.M.			
	12/9/68	12/9/68	< 50	9,100
	A.M.			
12/10/68	12/10/68	< 50	7,300	
A.M.				
12/11/68	12/11/68	< 50	4,100	
A.M.				
12/12/68	12/12/68	< 50	2,800	
A.M.	1120			
12/13/68	12/13/68	< 50	950	
A.M.	0945			
12/14/68	12/14/68	40	420	
A.M.				
12/15/68	12/15/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED COLLECTED		131 _I	187 _W
Hiko, Nevada Schofield Dairy (79°, 74 mi)	P.M.			
	12/10/68	12/10/68	< 20	70
	A.M.	1015		
	12/13/68	12/13/68	< 20	< 50
Lund, Nevada McKenzie Dairy (39°, 134 mi)	A.M.			
	12/9/68	12/9/68	< 20	890
	P.M.			
	12/9/68	12/9/68	< 50	1,200
	A.M.			
	12/10/68	12/10/68	< 50	1,700
	P.M.	1500		
	12/11/68	12/11/68	< 20	340
	A.M.			
	12/12/68	12/12/68	< 20	160
	P.M.			
	12/12/68	12/12/68	< 20	290
	A.M.			
	12/13/68	12/13/68	< 20	< 50
	P.M.			
	12/13/68	12/13/68	< 20	< 50
A.M.				
12/14/68	12/14/68	< 20	< 50	
P.M.				
12/14/68	12/14/68	< 20	< 50	
A.M.				
12/15/68	12/15/68	< 20	< 50	
P.M.				
12/15/68	12/15/68	< 20	< 50	
A.M.				
12/16/68	12/16/68	< 20	< 50	
P.M.				
12/16/68	12/16/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131I	187W
McGill, Nevada Larsen Ranch (33°, 169 mi)	A.M.			
	12/9/68	12/9/68	< 50	2,500
	A.M.			
	12/11/68	12/11/68	< 20	910
	A.M.			
	12/16/68	12/16/68	< 20	< 50
Montello, Nevada Gamble 4 Mile Ranch (25°, 305 mi)	A.M.	1345		
	12/10/68	12/10/68	< 20	< 50
Nyala, Nevada Casey's Ranch (39°, 82 mi)	A.M.			
	12/9/68	12/9/68	< 50	3,400
	A.M.			
	12/10/68	12/10/68	< 50	4,400
	A.M.			
	12/11/68	12/11/68	< 20	830
	A.M.	1330		
	12/12/68	12/12/68	< 20	550
	A.M.	1420		
12/13/68	12/13/68	< 20	210	
A.M.	1330			
12/14/68	12/14/68	< 20	< 50	
A.M.	1130			
12/15/68	12/15/68	< 20	< 50	
A.M.				
12/16/68	12/16/68	< 20	< 50	
Nyala, Nevada Sharp's Ranch (34°, 76 mi)	A.M.			
	12/9/68	12/9/68	< 50	3,100
	A.M.			
	12/10/68	12/10/68	< 50	3,600
	A.M.			
12/11/68	12/11/68	< 20	1,200	
A.M.	1300			
12/12/68	12/12/68	40	480	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131I	187W
Nyala, Nevada Sharp's Ranch (cont'd)	A.M.	1355		
	12/13/68	12/13/68	< 20	< 50
	A.M.	1300		
	12/14/68	12/14/68	< 20	< 50
	A.M.	1100		
	12/15/68	12/15/68	< 20	< 50
	A.M.			
12/16/68	12/16/68	30	< 50	
Panaca, Nevada Kenneth Lee Ranch (75°, 122 mi)	A.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.	1235		
	12/12/68	12/12/68	< 20	< 50
Shoshone, Nevada Kirkeby Ranch (47°, 160 mi)	A.M.			
	12/9/68	12/9/68	< 20	550
	A.M.			
	12/10/68	12/10/68	< 50	1,200
	A.M.			
	12/11/68	12/11/68	< 50	810
	A.M.	1045		
	12/12/68	12/12/68	< 20	470
	A.M.	1000		
	12/13/68	12/13/68	< 20	< 50
Ursine, Nevada Harold Hammond (70°, 136 mi)	A.M.			
	12/11/68	12/11/68	< 20	< 50
Ursine, Nevada 7 L Ranch (69°, 140 mi)	P.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.	1410		
	12/12/68	12/12/68	< 20	< 50
Wells, Nevada Willow Creek Ranch (17°, 273 mi)	P.M.	1545		
	12/10/68	12/10/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹³⁷ W
Abraham, Utah Ray Hoelzle (55°, 252 mi)	P.M.	1200		
	12/10/68	12/10/68	< 50	900
Abraham, Utah Boyd Schena (56°, 252 mi)	P.M.	1630		
	12/10/68	12/10/68	< 50	2,200
	P.M.	1830		
	12/11/68	12/11/68	100	1,400
	A.M.			
	12/12/68	12/12/68	60	790
	A.M.	1130		
	12/13/68	12/13/68	< 20	< 50
	P.M.			
	12/13/68	12/14/68	< 20	< 50
Beaver, Utah Smith and Roberts Dairy (73°, 223 mi)	A.M.			
	12/10/68	12/10/68	< 20	< 50
	A.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.	1100		
	12/12/68	12/12/68	< 20	< 50
Cedar City, Utah Meadow Gold Dairy (83°, 192 mi)	A.M.			
	12/13/68	12/13/68	< 20	< 50
	A.M.			
	12/14/68	12/14/68	< 20	< 50
	A.M.			
	12/15/68	12/15/68	< 20	< 50
	A.M.			
	12/16/68	12/16/68	< 20	< 50
	A.M.			
	12/21/68	12/21/68	< 20	< 50

^a Activity at time of milking.

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131 _I	187 _W
Delta, Utah Jefferies' Dairy (57°, 254 mi)	A.M.	1330		
	12/10/68	12/10/68	< 20	240
	P.M.	1145		
	12/11/68	12/11/68	< 20	< 50
Delta, Utah Harold Taylor (58°, 256 mi)	A.M.	0800		
	12/12/68	12/12/68	< 20	< 50
	A.M.	1200		
	12/13/68	12/13/68	< 20	< 50
Delta, Utah Harold Taylor (58°, 256 mi)	A.M.			
	12/11/68	12/11/68	< 20	< 50
	A.M.	0800		
	12/12/68	12/12/68	< 20	< 50
Delta, Utah Harold Taylor (58°, 256 mi)	A.M.	1230		
	12/13/68	12/13/68	< 20	< 50
	A.M.			
	12/14/68	12/14/68	< 20	< 50
Deseret, Utah Ernest Anderson (58°, 254 mi)	A.M.	1245		
	12/11/68	12/11/68	< 20	< 50
	A.M.			
Deseret, Utah Ernest Anderson (58°, 254 mi)	12/12/68	12/12/68	< 20	< 50
	A.M.			
	12/13/68	12/13/68	< 20	< 50
Ephraim, Utah Arthur King (63°, 303 mi)	A.M.	0730		
	12/12/68	12/12/68	< 20	< 50
Fillmore, Utah Sam Wade (64°, 256 mi)	P.M.	1800		
	12/10/68	12/10/68	< 20	460
	P.M.	0955		
Fillmore, Utah Sam Wade (64°, 256 mi)	12/11/68	12/12/68	< 20	< 50
	A.M.	0955		
Fillmore, Utah Sam Wade (64°, 256 mi)	12/12/68	12/12/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131 _I	187 _W
Fillmore, Utah Sam Wade (cont'd)	P.M.	0930		
	12/13/68	12/14/68	< 20	< 50
	A.M.	0930		
	12/14/68	12/14/68	< 20	< 50
Garrison, Utah Davies Ranch Inc. (56°, 171 mi)	P.M.	1230		
	12/10/68	12/11/68	< 20	1,500
	P.M.	1225		
	12/11/68	12/12/68	< 20	410
	P.M.			
	12/12/68	12/13/68	< 20	< 50
Garrison, Utah Wheeler Ranch (51°, 176 mi)	P.M.	1515		
	12/9/68	12/9/68	< 20	2,700
	A.M.	1400		
	12/10/68	12/10/68	< 50	2,200
	A.M.	1140		
	12/11/68	12/11/68	< 20	890
	A.M.	1205		
12/12/68	12/12/68	< 20	390	
	A.M.	1115		
	12/13/68	12/13/68	< 20	< 50
	A.M.			
	12/14/68	12/14/68	< 20	< 50
Gunnison, Utah Kirby E. Pickett (64°, 286 mi)	P.M.	1400		
	12/11/68	12/11/68	< 20	< 50
	A.M.	0920		
	12/12/68	12/12/68	< 20	< 50
Hinckley, Utah Walt Ekins (57°, 252 mi)	P.M.	1620		
	12/10/68	12/10/68	< 20	370
	P.M.	1745		
	12/11/68	12/11/68	< 20	140

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Hinckley, Utah Walt Ekins (cont'd)	A.M.	0630		
	12/12/68	12/12/68	< 20	140
	A.M.	1100		
	12/13/68	12/13/68	<20	<50
	A.M.	0900		
	12/14/68	12/14/68	< 20	<50
Holden, Utah Evan Stevens (62°, 262 mi)	A.M.	1530		
	12/10/68	12/10/68	< 20	670
	P.M.	1015		
	12/11/68	12/12/68	< 20	<50
	A.M.	1015		
	12/12/68	12/12/68	< 20	140
	A.M.	1030		
12/13/68	12/13/68	< 20	<50	
	A.M.	0950		
	12/14/68	12/14/68	< 20	<50
Lynndyl, Utah Howard Nielson (56°, 272 mi)	A.M.	1230		
	12/10/68	12/10/68	<50	1,100
	A.M.	1330		
	12/12/68	12/12/68	<20	<50
	A.M.	1110		
	12/14/68	12/14/68	<20	<50
Manti, Utah Lyle Alder (63°, 297 mi)	A.M.	1715		
	12/11/68	12/11/68	<20	<50
	A.M.	0700		
	12/12/68	12/12/68	< 20	< 50
Mills, Utah Clayton Williams (59°, 287 mi)	A.M.	1700		
	12/10/68	12/10/68	< 20	< 50
	A.M.	1200		
	12/11/68	12/11/68	< 20	290
	A.M.	1110		
	12/12/68	12/12/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	131 _I	187 _W
Minersville, Utah Minersville Dairy (73°, 208 mi)	A.M.	1400		
	12/9/68	12/9/68	< 20	< 50
	P.M.	2000		
	12/10/68	12/10/68	< 20	< 50
	P.M.			
	12/11/68	12/11/68	< 20	< 50
	P.M.			
	12/12/68	12/12/68	< 20	< 50
Mt. Pleasant, Utah Brooklawn Creamery (61°, 315 mi)	P.M.			
	12/13/68	12/13/68	< 20	< 50
	P.M.	1630		
	12/14/68	12/14/68	< 20	< 50
	P.M.			
	12/15/68	12/15/68	< 20	< 50
	A.M.			
	12/10/68	12/10/68	< 50	950
A.M.	1045			
12/11/68	12/11/68	< 20	< 50	
A.M.	1030			
12/12/68	12/12/68	< 20	< 50	
12/13/68	12/13/68	< 20	< 50	
A.M.				
12/14/68	12/14/68	< 20	< 50	
A.M.				
12/15/68	12/15/68	< 20	< 50	
A.M.				
12/16/68	12/16/68	< 20	< 50	
Oak City, Utah D. J. Finlinson (58°, 268 mi)	A.M.	1530		
	12/10/68	12/10/68	< 50	1,900
P.M.	1930			
12/11/68	12/11/68	< 20	650	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Oak City, Utah D. J. Finlinson (cont'd)	A.M.	0645		
	12/12/68	12/12/68	<20	410
	A.M.	1345		
	12/13/68	12/13/68	<20	<50
	A.M.	1030		
	12/14/68	12/14/68	<20	<50
Ogden, Utah Maple Leaf Dairy (42°, 363 mi)	A.M.			
	12/11/68	12/11/68	<20	<50
	A.M.			
	12/12/68	12/12/68	<20	<50
	A.M.			
	12/13/68	12/13/68	<20	<50
	P.M.			
12/13/68	12/13/68	<20	<50	
	A.M.			
	12/15/68	12/15/68	<20	<50
	A.M.			
	12/16/68	12/16/68	<20	<50
Redmond, Utah Merrill Hampton (66°, 279 mi)	P.M.	1240		
	12/11/68	12/11/68	<20	<50
	A.M.	1020		
	12/12/68	12/12/68	<20	<50
Richfield, Utah Ideal Dairy (68°, 263 mi)	A.M.	0730		
	12/10/68	12/10/68	<20	<50
	A.M.	0830		
	12/13/68	12/13/68	<20	<50
		12/16/68	12/17/68	<20
	P.M.			
	12/22/68	12/23/68	<20	<50

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a		
	MILKED	COLLECTED	131 _I	187 _W	
St. George, Utah St. George Ice Co. (90°, 190 mi)	A.M.				
	12/12/68	12/12/68	< 20	< 50	
	A.M.				
	12/13/68	12/13/68	< 20	< 50	
Smithfield, Utah Cache Valley Dairy (39°, 400 mi)	P.M.	0700			
	12/9/68	12/10/68	< 20	< 50	
	P.M.				
	12/10/68	12/11/68	< 20	< 50	
	A.M.				
	12/11/68	12/12/68	< 20	< 50	
	P.M.				
	12/12/68	12/13/68	< 20	< 50	
	P.M.				
	12/13/68	12/14/68	< 20	< 50	
	A.M.				
	12/14/68	12/15/68	< 20	< 50	
	P.M.				
	12/15/68	12/16/68	< 20	< 50	
	Spanish Fork, Utah Town Pride Dairy (54°, 326 mi)	A.M.	0900		
		12/8/68	12/9/68	< 20	< 50
A.M.		0900			
12/9/68		12/10/68	< 20	< 50	
A.M.		0930			
12/11/68		12/11/68	< 20	< 50	
A.M.		0945			
12/12/68		12/12/68	< 20	< 50	
A.M.	1000				
12/13/68	12/13/68	< 20	< 50		
	12/15/68	12/15/68	< 20	< 50	
	12/17/68	12/17/68	< 20	< 50	

^a Activity at time of milking

APPENDIX F (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Spring Glen, Utah Blue Hill Dairy Farm (62°, 348 mi)	A.M. 12/12/68	1155 12/13/68	< 20	< 50
Spring Glen, Utah John J. Thayn (63°, 354 mi)	A.M. 12/13/68	1025 12/13/68	< 20	< 50
Casper, Wyoming Meadow Gold Dairies (55°, 661 mi)	A.M. 12/11/68	0830 12/11/68	< 20	< 50
Cheyenne, Wyoming Dairy Gold Foods (67°, 680 mi)	P.M. 12/9/68	0900 12/10/68	< 20	< 50
	P.M. 12/10/68	0800 12/11/68	< 20	< 50
	P.M. 12/12/68	1230 12/13/68	< 20	< 50
	P.M. 12/13/68	12/14/68	< 20	< 50
	P.M. 12/15/68	12/16/68	< 20	< 50
	P.M. 12/16/68	12/17/68	< 20	< 50
	Powell, Wyoming Cream of the Valley (38°, 653 mi)	A.M. 12/12/68	1500 12/13/68	< 20
	A.M. 12/12/68	12/13/68	< 20	< 50
	P.M. 12/12/68	12/13/68	< 20	< 50

^a Activity at time of milking

APPENDIX F (concluded)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	TIME AND DATE		ISOTOPIC RESULTS (pCi/l) ^a	
	MILKED	COLLECTED	¹³¹ I	¹⁸⁷ W
Rawlins, Wyoming Wyoming Dairy Products (58°, 583 mi)	A.M.			
	12/9/68	12/9/68	< 20	< 50
	A.M.			
	12/10/68	12/11/68	< 20	< 50
	A.M.			
	12/13/68	12/13/68	< 20	< 50
	A.M.			
	12/16/68	12/16/68	< 20	< 50
	12/17/68	12/18/68	< 20	< 50
Riverton, Wyoming Morning Star Dairy (48°, 582 mi)	A.M.	1600		
	12/9/68	12/9/68	< 20	< 50
	A.M.	1700		
	12/10/68	12/10/68	< 20	< 50
	A.M.	1600		
	12/11/68	12/11/68	< 20	< 50
	A.M.	1800		
	12/12/68	12/12/68	< 20	< 50
	A.M.	1600		
	12/13/68	12/13/68	< 20	< 50
Sheridan, Wyoming Jersey Creamery (44°, 717 mi)	P.M.			
	12/11/68	12/12/68	< 20	< 50
	A.M.	1030		
	12/12/68	12/13/68	< 20	< 50
	A.M.			
	12/14/68	12/14/68	< 20	< 50

^a Activity at time of milking

APPENDIX G. Milk Cow Feed Sampling Results

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg)
Austin, Nevada Young's Ranch (348°, 134 mi)	Hay	1430 12/10/68	530,000
	Hay	1500 12/10/68	30,000
	Hay	1200 12/11/68	2,700
Austin, Nevada Triple T Ranch (348°, 128 mi)	Hay	1800 12/10/68	12,000
Battle Mt., Nevada T Lazy S Ranch (359°, 231 mi)	Hay	1200 12/11/68	15,000
Belmont, Nevada Pine Creek Ranch (353°, 102 mi)	Hay	1915 12/9/68	480,000
	Hay	1635 12/10/68	43,000
	Hay	1430 12/11/68	24,000
Beowawe, Nevada Friesen Ranch (1°, 223 mi)	Hay	1100 12/11/68	24,000
Caliente, Nevada Young's Ranch (80°, 113 mi)	Hay	1235 12/11/68	20,000

^a Activity at time of collection.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg) ^a
Currant, Nevada Blue Eagle Ranch (33°, 98 mi)	Hay	1830 12/9/68	350,000
Currant, Nevada Manzonie Ranch (32°, 116 mi)	Hay	1450 12/9/68	360,000
	Silage	1455 12/9/68	83,000
	Silage	1305 12/10/68	23,000
	Hay	1300 12/10/68	120,000
Currie, Nevada Bill Lear Ranch (26°, 225 mi)	Hay	1045 12/12/68	33,000
Deeth, Nevada Lotspeich Ranch (15°, 266 mi)	Hay	1515 12/11/68	21,000
Duckwater, Nevada Halstead Ranch (24°, 117 mi)	Hay	1625 12/9/68	380,000
	Hay	1445 12/10/68	350,000
Elko, Nevada Anchor S Ranch (11°, 251 mi)	Hay	1730 12/10/68	58,000
Eureka, Nevada Morrison Ranch (11°, 167 mi)	Hay	1600 12/9/68	74,000
	Hay	1215 12/10/68	25,000

^aActivity at time of collection.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg) ^a
Geyser Maint. Sta. Chavis Ranch (57°, 127 mi)	Hay	1830 12/9/68	8,200,000
	Hay	1435 12/10/68	780,000
Hiko, Nevada Schofield Dairy (79°, 74 mi)	Hay	1730 12/10/68	8,600
	Silage	1725 12/10/68	1,100
	Hay	1040 12/12/68	8,800
	Silage	1045 12/12/68	9,300
	Hay	1030 12/13/68	11,000
	Silage	1025 12/13/68	350
Lund, Nevada McKenzie Dairy (39°, 134 mi)	Hay	1000 12/9/68	830,000
	Hay	1515 12/9/68	1,400,000
	Hay	1135 12/10/68	680,000
McGill, Nevada Larsen Ranch (33°, 169 mi)	Hay	1650 12/9/68	660,000
Montello, Nevada Gamble 4-Mile Ranch (25°, 305 mi)	Hay	1400 12/10/68	55,000

^aActivity at time of collection.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg) ^a
Nyala, Nevada Casey's Ranch (39°, 82 mi)	Hay	1330 12/9/68	880,000
	Hay	1415 12/10/68	730,000
Nyala, Nevada Sharp's Ranch (34°, 76 mi)	Hay	1300 12/9/68	1,200,000
	Hay	1330 12/10/68	420,000
Panaca, Nevada Kenneth Lee Ranch (75°, 122 mi)	Hay	1330 12/11/68	10,000
	Hay	1255 12/12/68	9,300 ^b
Shoshone, Nevada Kirkeby Ranch (47°, 160 mi)	Hay	1945 12/9/68	160,000
	Hay	1235 12/10/68	670,000
Ursine, Nevada Donohue Ranch (63°, 145 mi)	Hay	1710 12/12/68	40,000
	Hay	1430 12/11/68	ND
Ursine, Nevada 7L Ranch (69°, 140 mi)	Hay	1500 12/11/68	5,000
	Hay	1430 12/12/68	4,100

^aActivity at time of collection.

^bSample also contained 70 pCi/kg ¹³¹I.

ND = Not detectable.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg) ^a
Wells, Nevada Willow Creek Ranch (17°, 273 mi)	Hay	1545 12/10/68	62,000
Abraham, Utah Ray Hoelzle (155°, 252 mi)	Hay	1630 12/10/68	1,100,000
Abraham, Utah Boyd Schena (56°, 252 mi)	Hay	1115 12/10/68	1,100,000
	Hay	1830 12/11/68	120,000
Beaver, Utah Smith and Roberts Dairy (73°, 223 mi)	Silage	1230 12/10/68	3,500
	Hay	1227 12/10/68	ND
	Hay	1230 12/11/68	6,900
	Silage	1230 12/11/68	ND
Delta, Utah Jefferies Dairy (57°, 254 mi)	Hay	1330 12/10/68	5,000,000
Delta, Utah Harold Taylor Ranch (58°, 256 mi)	Hay	1445 12/10/68	210,000
Deseret, Utah Ernest Anderson (58°, 254 mi)	Hay	1515 12/10/68	160,000

^a Activity at time of collection

ND = Not detectable.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹³⁷ W (pCi/kg) ^a
Ephraim, Utah Arthur King (63°, 303 mi)	Hay	0730 12/12/68	110,000
	Grain	0730 12/12/68	2,900
Fillmore, Utah Sam Wade (64°, 254 mi)	Hay	1040 12/11/68	32,000
	Hay	1800 12/10/68	78,000
Garrison, Utah Whceler Ranch (51°, 176 mi)	Hay	1400 12/10/68	280,000
	Hay	1515 12/9/68	390,000
Garrison, Utah Davies Ranch, Inc. (56°, 171 mi)	Hay	1230 12/11/68	120,000
Gunnison, Utah Kirby Pickett (64°, 286 mi)	Hay	12/12/68	11,000
	Hay	1400 12/11/68	3,800
	Green Chop	1400 12/11/68	37,000
	Green Chop	12/12/68	17,000
Hinckley, Utah Walt Ekins (57°, 252 mi)	Hay	1220 12/10/68	370,000
	Hay	12/11/68	ND
Holden, Utah Evan Stevens (62°, 262 mi)	Hay	1530 12/10/68	110,000
	Hay	1200 12/11/68	12,000

^aActivity at time of collection.

ND = Not detectable.

APPENDIX G (continued)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	187W (pCi/kg) ^a
Lynndyl, Utah. Howard Nielsen (56°, 272 mi)	Grain	1210 12/10/68	710,000
	Hay	1210 12/10/68	1,100,000
Manti, Utah Lyle Alder (63°, 297 mi)	Hay	0700 12/12/68	790,000
	Hay	1715 12/11/68	140,000
	Grain	0700 12/12/68	ND
	Grain	1715 12/11/68	ND
Mills, Utah Clayton Williams (59°, 287 mi)	Hay	1030 12/11/68	62,000
	Hay	1700 12/10/68	ND
Oak City, Utah D. J. Finlinson (58°, 268 mi)	Grain	1530 12/10/68	240,000
	Hay	1530 12/10/68	440,000
	Silage	1930 12/12/68	5,300
	Hay	1930 12/11/68	13,000
Redmond, Utah Merrill Hampton (66°, 279 mi)	Hay	1240 12/11/68	3,900
	Hay	12/12/68	14,000

^aActivity at time of collection

ND = Not detectable.

APPENDIX G (concluded)

NEAREST TOWN AND LOCATION (Azimuth, Distance)	FEED TYPE	TIME- DATE COLLECTED	¹⁸⁷ W (pCi/kg) ^a
Redmond, Utah	Grain		ND
Merrill Hampton (cont'd)		12/12/68	
	Grain	1240 12/11/68	ND

^aActivity at time of collection.

ND = Not detectable.

APPENDIX H. Water Sampling Results

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME- DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			187W	³ H
Coeur D'Alene, Idaho 58.4 mi E on Ida-Mont Line (4°, 701 mi)	Snow	0900 12/11/68	<50	NA
Adaven, Nevada Simpson Ranch (42°, 75 mi)	Spring ^b	1420 12/11/68	21,000	480
	Spring ^b	1500 12/13/68	2,800	NA
Adaven, Nevada Uhalde's Ranch (45°, 75 mi)	Spring ^b	1200 12/10/68	10,000	550
	Spring ^b	1530 12/13/68	<50	NA
Adaven, Nevada Walsh's Pine Creek (46°, 72 mi)	Spring ^b	1615 12/13/68	<50	NA
Adaven, Nevada 5.7 mi W Pine Creek Ranch (46°, 68 mi)	Snow	1620 12/09/68	23,000,000	5,200
Austin, Nevada Triple T Ranch (348°, 128 mi)	Well ^b	1800 12/10/68	<50	870
Austin, Nevada Young's Ranch (348°, 134 mi)	Stock Tank	1500 12/09/68	15,000	NA
Battle Mountain, Nevada Glen's Chevron Station (355°, 230 mi)	Well ^b	1240 12/11/68	<50	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			187W	3H
Battle Mountain, Nevada T Lazy S Ranch (359°, 231 mi)	Stock Tank	1200 12/11/68	<50	NA
Belmont, Nevada Pine Creek Ranch (353°, 102 mi)	Stock Tank	1915 12/09/68	4,500	NA
Beowawe, Nevada Friesen Ranch (1°, 223 mi)	Stock Tank	1100 12/11/68	1,700	NA
Blue Jay Highway Maintenance Station, Nevada (14°, 76 mi)	Well ^b	1225 12/11/68	<50	NA
	Well ^b	1220 12/13/68	<50	NA
Blue Jay Highway Maintenance Station, Nevada - Site C (12°, 68 mi)	Well ^b	1215 12/11/68	<50	NA
Carlin, Nevada Carlin Conoco Station (6°, 235 mi)	Well and Spring ^b	0950 12/11/68	<50	NA
Clark Station, Nevada Five Mile Ranch (352°, 57 mi)	Spring ^b	1145 12/10/68	<50	<400
	Pond	1145 12/10/68	110,000	3,500
	Stock Tank	1130 12/13/68	<50	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a	
			(pCi/l) 187W	3H
Clark Station, Nevada John Stickelman (357°, 55 mi)	Well ^b	1130 12/11/68	<50	NA
	Well ^b	1135 12/13/68	<50	NA
Clark Station, Nevada Stone Cabin Ranch (356°, 61 mi)	Spring ^b	1100 12/11/68	8,300	<400
	Spring ^b	1700 12/13/68	<50	NA
Coyote Summit, Nevada ^c Sand Springs Well (57°, 48 mi)	Pond	1500 12/10/68	51,000	<400
	Pond	1700 12/13/68	1,400	<400
	Pond	--- 4/9/69	NA	<400
Carrant, Nevada Blue Eagle Ranch (33°, 98 mi)	Spring	1820 12/09/68	920	NA
	Well ^b	1400 12/12/68	<50	NA
Carrant, Nevada Carrant Pond (31°, 113 mi)	Pond	1400 12/10/68	470	930
	Pond	--- 7/10/69	NA	<400
Carrant, Nevada Carrant Ranch Cafe (33°, 116 mi)	Spring ^b	1415 12/10/68	<50	NA
Carrant, Nevada Manzonie Ranch (32°, 116 mi)	Stream	1500 12/09/68	1,600	NA
	Stream	1340 12/10/68	1,100	NA
	Stream ^b	1330 12/10/68	<50	NA

^a Activity at time of collection^b Domestic water supply^c 181W present in detectable quantities as recently as October, 1969.

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME- DATE COLLECTED	ISOTOPIC RESULTS ^a	
			187W (pCi/l)	3H
Currie, Nevada Bill Lear Ranch (26°, 225 mi)	Stream	1045 12/12/68	<50	<400
Deeth, Nevada Lotspeich Ranch (15°, 266 mi)	Pond ^b	1515 12/11/68	560	2,800
Diablo, Nevada Highway Maintenance Station (33°, 47 mi)	Well ^b	1230 12/10/68	290	<400
	Well ^b	1240 12/13/68	<50	NA
	Well ^b	1230 12/12/68	<50	NA
	Well ^b	1120 12/15/68	<50	NA
	Well ^b	1205 12/14/68	<50	NA
Diablo, Nevada ^c Reed Ranch (38°, 37 mi)	Well ^b	1245 12/16/68	<50	NA
	Stock Tank	1650 12/10/68	54,000	590
	Stock Tank	--- 7/8/69	NA	<400
Duckwater, Nevada Duckwater School (23°, 119 mi)	Spring ^b	1500 12/10/68	<50	NA
Duckwater, Nevada Halstead Ranch (24°, 117 mi)	River	1615 12/09/68	21,000	NA
	Well ^b	1445 12/10/68	1,400	1,300
	Well ^b	1415 12/13/68	<50	NA

^a Activity at time of collection^b Domestic water supply^c 181W present in detectable quantities as recently as October, 1969.

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME- DATE COLLECTED	ISOTOPIC RESULTS ^a	
			(pCi/l) 187W	3H
Elko, Nevada Anchor S Ranch (11°, 251 mi)	Stock Tank	1730 12/10/68	2,100	NA
Elko, Nevada Phillips 66 Service Station (10°, 245 mi)	Well ^b	0845 12/11/68	<50	NA
Ely, Nevada (34°, 160 mi)	Snow	2100 12/11/68	12,000	5,900
Ely, Nevada Chevron Service Station (34°, 160 mi)	Well and Spring ^b	1130 12/10/68	<50	NA
Eureka, Nevada Morrison Ranch (11°, 167 mi)	Pond	1600 12/09/68	2,400	NA
	Well ^b	1215 12/10/68	2,400	<400
Geyser Maintenance Station, Nevada - Chavis Ranch (57°, 127 mi)	Stock Tank	1830 12/09/68	12,000	NA
Hiko, Nevada Schofield Dairy (79°, 74 mi)	Well ^b	1710 12/10/68	<50	NA
	Well ^b	1100 12/12/68	<50	NA
Lund, Nevada McKenzie Dairy (39°, 134 mi)	Stock Tank	1530 12/09/68	3,600	NA
	Stock Tank	1000 12/09/68	3,000	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			¹⁸⁷ W	³ H
Lund, Nevada Gardner Grocery Store (39°, 135 mi)	Well ^b	1150 12/10/68	<50	NA
Manhattan, Nevada Lee Hiatt Ranch (340°, 88 mi)	Well ^b	1140 12/10/68	<50	NA
	Well ^b	1210 12/13/68	<50	NA
	Well ^b	0815 12/14/68	<50	NA
Manhattan, Nevada Seyler Reservoir (337°, 92 mi)	Reservoir	1115 12/10/68	15,000	<400
	Reservoir	1050 12/13/68	460	NA
	Reservoir	0710 12/14/68	160	NA
McGill, Nevada Larsen Ranch (33°, 169 mi)	Stock Tank	1655 12/09/68	2,100	1,000
	Well ^b	1800 12/11/68	<50	NA
Montello, Nevada Gamble 4 Mile Ranch (25°, 305 mi)	Stock Tank	1410 12/10/68	7,000	NA
Nyala, Nevada Casey's Ranch (39°, 82 mi)	Stock Tank	1300 12/09/68	<50	NA
	Spring ^b	1415 12/10/68	320	<400
	Spring ^b	1420 12/13/68	<50	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME- DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			187W	³ H
Nyala, Nevada (cont'd) Casey's Ranch	Spring ^b	1130 12/15/68	<50	NA
	Spring ^b	1330 12/14/68	<50	NA
	Spring ^b	1230 12/16/68	<50	NA
Nyala, Nevada Gibson Farm (35°, 77 mi)	Well ^b	1255 12/10/68	<50	NA
Nyala, Nevada Sharp's Ranch (34°, 76 mi)	Well ^b	1300 12/09/68	<50	NA
	Well ^b	1330 12/10/68	320	<400
	Well ^b	1355 12/13/68	<50	NA
	Well ^b	1300 12/14/68	<50	NA
	Well ^b	1100 12/15/68	<50	NA
	Well ^b	1200 12/16/68	<50	NA
Oasis, Nevada Chevron Service Station (24°, 279 mi)	Well ^b	1310 12/10/68	<50	NA
Panaca, Nevada Kenneth Lee Ranch (75°, 122 mi)	Stock Tank	1250 12/12/68	<50	NA
Pioche, Nevada County Court House (69°, 121 mi)	Well ^b	1430 12/10/68	360	<400
	Well ^b	1200 12/14/68	<50	NA

^a Activity at time of collection^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			187 _W	3 _H
Pioche, Nevada Williams and Son (63°, 129 mi)	Spring ^b	1610 12/09/68	1,200	<400
Preston, Nevada Blackjack Inn (34°, 139 mi)	Snow	1630 12/11/68	63,000	10,000
Round Mountain, Nevada Mobil Service Station (342°, 100 mi)	Well and Spring ^b	1215 12/10/68	<50	NA
	" "	1120 12/13/68	<50	NA
	" "	0745 12/14/68	<50	NA
Shoshone, Nevada Kirkeby Ranch (47°, 160 mi)	Well ^b	1945 12/09/68	420	<400
Sunnyside, Nevada 30 mi S on Highway 38 (60°, 100 mi)	Pond	1820 12/09/68	880	<400
Sunnyside, Nevada - Wildlife Management Headquarters (47°, 112 mi)	Spring ^b	1250 12/10/68	<50	NA
	Pond	1300 12/10/68	270	<400
Tonopah, Nevada David's L and L Motel (322°, 63 mi)	Well ^b	1020 12/10/68	<50	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a	
			187W (pCi/l)	³ H
Ursine, Nevada Donahue Ranch (63°, 145 mi)	Stream ^b	1540 12/12/68	2,100	<400
Ursine, Nevada 7 L Ranch (69°, 140 mi)	Stream	1425 12/12/68	<50	NA
Warm Springs, Nevada Bellhelen Ranch (8°, 50 mi)	Spring ^b	1310 12/13/68	<50	NA
Warm Springs, Nevada ^c Fallini's Pond (23°, 61 mi)	Pond	1345 12/10/68	770,000	16,000
	Pond	1315 12/13/68	1,700	NA
	Pond	--- 7/8/69	NA	2,000
	Pond	--- 8/7/69	NA	460
	Pond	--- 9/11/69	NA	<400
	Pond	--- 10/14/69	NA	610
Warm Springs, Nevada Service Station and Cafe (10°, 61 mi)	Spring ^b	1300 12/10/68	1,200	2,000
	Spring ^b	1155 12/13/68	<50	NA
Warm Springs, Nevada Twin Springs Ranch (18°, 63 mi)	Well ^b	1345 12/10/68	<50	NA
	Well ^b	1155 12/13/68	<50	NA
Wells, Nevada Willow Creek Ranch (17°, 273 mi)	Stock Tank	1545 12/10/68	970	NA
Wells, Nevada 4 Way Truck Stop (18°, 275 mi)	Well ^b	1530 12/10/68	<50	NA

^a Activity at time of collection^b Domestic water supply^c 181W present in detectable quantities as recently as October, 1969.

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a	
			¹⁸⁷ W (pCi/l)	³ H
Abraham, Utah Ray Hoelzle (55°, 252 mi)	Well ^b	1700 12/10/68	<50	NA
	Well ^b	1645 12/10/68	<50	NA
Abraham, Utah Boyd Schena (56°, 252 mi)	Stock Tank	1830 12/11/68	1,000	NA
	Stock Tank	1200 12/12/68	<50	NA
	Stock Tank	0940 12/14/68	<50	NA
	Stock Tank	1130 12/13/68	<50	NA
	Stream	1227 12/10/68	<50	NA
Beaver, Utah Smith and Roberts (73°, 223 mi)	Stream	1230 12/11/68	<50	NA
	Stream	1100 12/12/68	<50	NA
	Well ^b	1330 12/10/68	<50	NA
Delta, Utah Jefferies Dairy (57°, 254 mi)	Stock Tank	1145 12/11/68	<50	NA
	Stock Tank	1230 12/12/68	<50	NA
	Stock Tank	1200 12/13/68	<50	NA
	Stock Tank	1030 12/11/68	840	NA
Delta, Utah Harold Taylor (58°, 256 mi)	Stock Tank	1015 12/12/68	<50	NA
	Stock Tank	1230 12/13/68	<50	NA

^a Activity at time of collection^b Domestic water supply.

NA = No analysis.

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME- DATE COLLECTED	ISOTOPIC RESULTS ^a (pCi/l)	
			187W	3H
Deseret, Utah Ernest Anderson (58°, 254 mi)	Stock	1245	<50	NA
	Tank	12/11/68		
	Stock	1200	<50	NA
	Tank	12/12/68		
	Stock	1300	<50	NA
	Tank	12/13/68		
Ephraim, Utah Arthur King (63°, 303 mi)	Stock	0730	<50	NA
	Tank	12/12/68		
Fillmore, Utah Sam Wade (64°, 254 mi)	Stock	1800	<50	NA
	Tank	12/10/68		
	Stock	1000	<50	NA
	Tank	12/11/68		
	Stock	0955	<50	NA
	Tank	12/12/68		
Garrison, Utah Davies Ranch, Inc. (56°, 171 mi)	Well ^b	1230	<50	NA
		12/11/68		
	Stream	1230	3,500	<400
		12/11/68		
Garrison, Utah Pruess Reservoir (52°, 174 mi)	Reservoir	1230	4,900	<400
		12/10/68		
Garrison, Utah Rowley Grocery (51°, 176 mi)	Well ^b	1125	<50	NA
		12/11/68		
Garrison, Utah Wheeler Ranch (51°, 176 mi)	Well ^b	1400	<50	NA
		12/10/68		
	Stock	1515	41,000	NA
	Tank	12/09/68		

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (continued)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a	
			(pCi/l) ^a 187W	³ H
Gunnison, Utah Kirby Pickett (64°, 286 mi)	Spring ^b	1400 12/11/68	< 50	NA
	Spring ^b	1200 12/12/68	< 50	NA
Hinckley, Utah Walt Ekins (57°, 252 mi)	Well ^b	1620 12/10/68	150	< 400
	Stock Tank	1745 12/11/68	< 50	NA
	Stock Tank	1200 12/12/68	< 50	NA
	Stock Tank	1100 12/13/68	< 50	NA
Holden, Utah Evan Stevens (62°, 262 mi)	Stock Tank	1530 12/10/68	< 50	NA
	Stock Tank	1030 12/11/68	1,100	NA
	Stock Tank	1030 12/13/68	< 50	NA
	Stock Tank	1015 12/12/68	< 50	NA
	Stock Tank	1210 12/10/68	840	NA
Lynndyl, Utah Howard Nielson (56°, 272 mi)	Stock Tank	1210 12/10/68	840	NA
	Stock Tank	1715 12/11/68	< 50	NA
Manti, Utah Lyle Alder (63°, 297 mi)	Stock Tank	1715 12/11/68	< 50	NA
	Stock Tank	1700 12/12/68	< 50	NA

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX H. (concluded)

NEAREST TOWN and LOCATION (Azimuth, Distance)	SAMPLE SOURCE	TIME-DATE COLLECTED	ISOTOPIC RESULTS ^a	
			(pCi/l) ^a 187W	3H
Mills, Utah Clayton Williams (59°, 287 mi)	Stock	1700	<50	NA
	Tank	12/10/68		
	Stock	1200	660	NA
	Tank	12/11/68		
	Stock	1110	<50	NA
	Tank	12/12/68		
Oak City, Utah D.J. Finlinson (58°, 268 mi)	Stock	1530	1,400	NA
	Tank	12/10/68		
	Stock	0645	340	NA
	Tank	12/12/68		
	Stock	1940	370	970
	Tank	12/11/68		
Redmond, Utah Merrill Hampton (66°, 279 mi)	Stock	1345	<50	NA
	Tank	12/13/68		
	Stock	1240	<50	NA
	Tank	12/11/68		
Spring Glen, Utah Blue Hill Dairy Farm (62°, 348 mi)	Stock	1020	<50	NA
	Tank	12/12/68		
Spring Glen, Utah John J. Thayn (63°, 354 mi)	Stock	1155	<50	NA
	Tank	12/13/68		
Wendover, Utah State Line Cafe (30°, 271 mi)	Stock	1025	<50	NA
	Tank	12/13/68		
Wendover, Utah State Line Cafe (30°, 271 mi)	Well ^b	1230	<50	1,000
		12/10/68		

^a Activity at time of collection

^b Domestic water supply

NA = No analysis

APPENDIX I. Calculation of Radiation Dose Equivalent to the Gastrointestinal Tract from the Ingestion and Inhalation of ^{187}W .

Since elemental tungsten or its compounds are generally insoluble, the critical organ for ingested or inhaled ^{187}W is the gastrointestinal (G.I.) tract.

Dose from Ingested ^{187}W

For estimating the radiation dose equivalent to the various compartments of the G.I. tract, the model (Figure 1) recommended by ICRP-2* was used. The model is for a single intake, A_0 , of ^{187}W . A_0 represents the initial quantity of ^{187}W ingested reaching the stomach, and A_1 , A_2 , and A_3 are the quantities entering the other compartments. The quantity of ^{187}W is corrected for radioactive decay by the term $e^{-0.693t/\tau}$ where t is the time from ingestion and τ is the radioactive half-life of ^{187}W , 24.0 hours.

According to the ICRP model, the ingested radioactivity is assumed to remain in the stomach for exactly one hour with the dose equivalent (D.E.) to the lining of the stomach being one-half of the total D.E. to its contents. No adsorption of the stomach contents is assumed to occur. With these assumptions and the above model, the dose-rate equation for the

stomach at any time t between 0 and 1 hour becomes $\frac{d(\text{D.E.})}{dt} = \frac{1}{2} \times \frac{K E_{\text{eff}} A_0 e^{-0.693t/\tau}}{W}$

where $K = \frac{51(\text{rem})(\text{dis})(\text{g})}{(\text{MeV})(\mu\text{Ci})(\text{day})}$

E_{eff} = effective energy per disintegration, MeV/dis

A_0 = initial quantity of ^{187}W entering organ, μCi

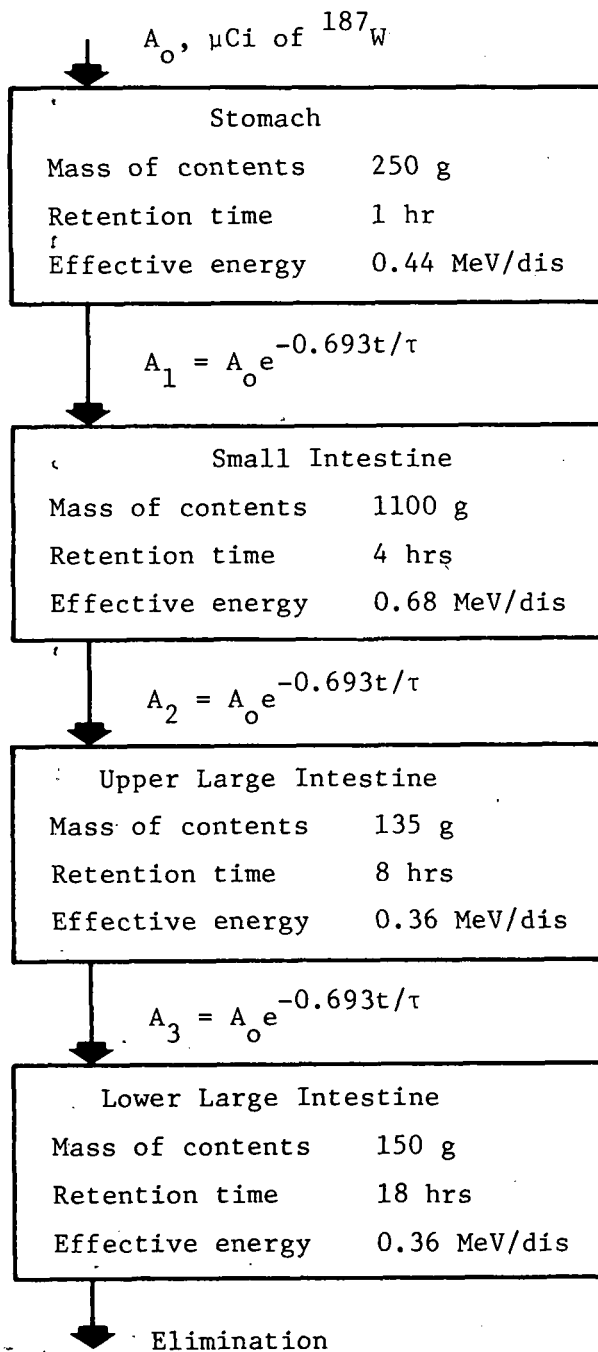
W = organ weight, g

t = time after ingestion, hours

τ = half-life for tungsten, 24 hr.

* "Report of Committee II on Permissible Dose for Internal Radiation." Recommendation of the International Commission on Radiological Protection ICRP Publication 2. Pergamon Press, New York. 1959.

Figure 1. Schematic of Dose Equivalent Model for Ingested ^{187}W .



The total dose equivalent to the stomach is estimated by integrating the above equation from the time of ingestion ($t = 0$) to the end of the retention period in the stomach (1 hr).

$$\begin{aligned}
 D. E. &= \frac{1}{2} \times \frac{51(\text{rem})(\text{dis})(\text{g})}{(\text{MeV})(\mu\text{Ci})(\text{day})} \times \frac{0.44 \text{ MeV}}{\text{dis}} \times \frac{A_0}{250\text{g}} \int_0^{1 \text{ hr}} e^{-0.693t/24} dt \\
 &= \left[\frac{0.0449 \text{ rem}}{(\text{day})(\mu\text{Ci})} \right] \left[\frac{(24 \text{ hr})(1-e^{\frac{-(0.693)(1)}{24}})}{0.693} \right] \frac{(\text{day})}{(24 \text{ hr})} \\
 &= (0.0018 \text{ rem}/\mu\text{Ci}) A_0 \text{ or } (1.8 \text{ mrem}/\mu\text{Ci}) A_0
 \end{aligned}$$

For the other compartments of the G.I. tract the dose equivalent equation below is based upon the assumption that the quantity of radioactivity reaching a particular compartment remains constant during its passage through the compartment with no adsorption of compartment contents. The equation is as follows with T = retention time in the compartment and t = the time between ingestion and the time the activity reaches the compartment.

$$D. E. = \frac{1/2 \text{ KE}_{\text{eff}} T(A_1, A_2 \text{ or } A_3) e^{\frac{-(0.693)(t)}{T}}}{W}$$

With this equation applied to each compartment of the G.I. tract,

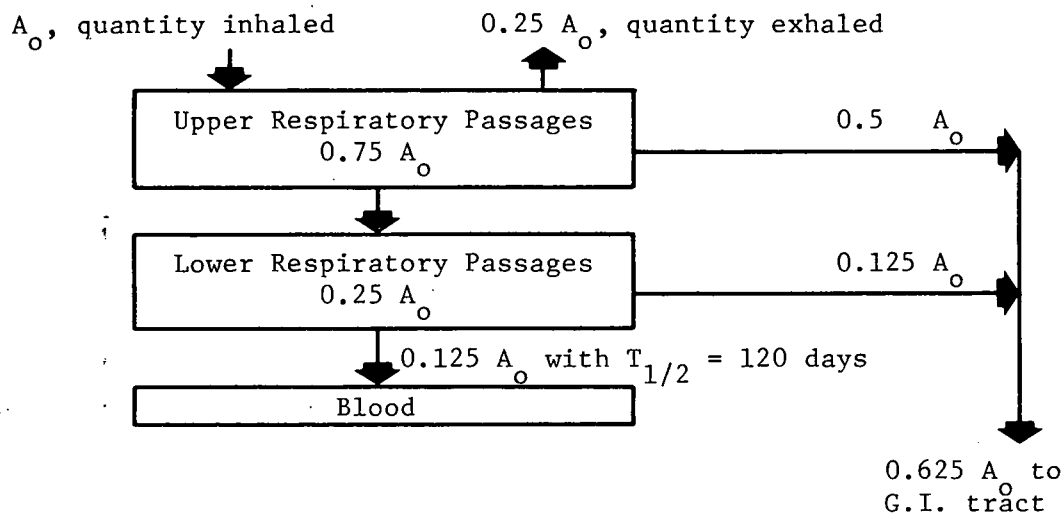
$$\begin{aligned}
 D. E. \text{ (small intestine)} &= (51)(0.68)(4) A_0 e^{\frac{-(0.693)(1)}{24}} \\
 &= \underline{\underline{(0.0026 \text{ rem}/\mu\text{Ci}) A_0 \text{ or } (2.6 \text{ mrem}/\mu\text{Ci}) A_0}}
 \end{aligned}$$

$$\begin{aligned}
 D. E. \text{ (upper large intestine)} &= \frac{(51)(0.36)(8) e^{\frac{-(0.693)(5)}{24}}}{(2)(135)(24)} \\
 &= \underline{\underline{(0.020 \text{ rem}/\mu\text{Ci}) (A_0 \text{ or } 20 \text{ mrem}/\mu\text{Ci}) A_0}}
 \end{aligned}$$

$$\begin{aligned}
 D. E. \text{ (lower large intestine)} &= \frac{(51)(0.36)(18) e^{\frac{-(0.693)(13)}{24}}}{(2)(150)(24)} \\
 &= \underline{\underline{(0.032 \text{ rem}/\mu\text{Ci}) A_0 \text{ or } (32 \text{ mrem}/\mu\text{Ci}) A_0}}
 \end{aligned}$$

Dose from Inhaled ^{187}W

The estimation of radiation dose to body organs from the inhalation of ^{187}W is based upon the ICRP-2 dose model below.



For insoluble material such as tungsten, the critical organ will be the G. I. tract, specifically the lower large intestine. The dose equation for inhalation would then be

$$\begin{aligned}
 D(\text{Lower Large Intestine}) &= (0.625)(32 \text{ mrem}/\mu\text{Ci})A_o \\
 &= \underline{\underline{(20 \text{ mrem}/\mu\text{Ci})A_o}}
 \end{aligned}$$

PROJECT SCHOONER REPORTS

<u>Report No.</u>	<u>Agency</u>	<u>Author</u>	<u>Title</u>
PNE-520	LRL	H. A. Tewes	Schooner Summary
PNE-521	Sandia	L. Vortman	Close-In Air Blast
PNE-522	ERC	W. W. Hays R. A. Mueller C. T. Spiker, Jr.	A Contribution to the Analysis of Seismic Data from Cratering and Contained Events
PNE-523	ESSA/ARL		Weather and Radiation Predictions, Schooner Event
PNE-524	EPA		Off-Site Surveillance, Schooner Event
PNE-525	REECo		On-Site Radiological Safety, Schooner Event
PNE-526	EG&G	H. Nishita W. A. Rhoads	Ecological and Environmental Effects from Local Fallout from Schooner. 1. Soil Thermoluminescence in Relation to Radiation Exposure Under Field Conditions
UCRL-50844	LRL	P. H. Gudiksen	Mass Concentrations and Particle Size Distributions as a Function of Time within a Nuclear Cratering Cloud

DISTRIBUTION LIST
(TID-4500, Category UC-35)

No. Copies

1 AEC ALBUQUERQUE OPERATIONS OFFICE
 1 AEC BETHESDA TECHNICAL LIBRARY
 1 AEC DIVISION OF BIOLOGY AND MEDICINE
 25 AEC DIVISION OF PEACEFUL NUCLEAR EXPLOSIVES
 1 AEC DIVISION OF RAW MATERIALS
 1 AEC LIBRARY, WASHINGTON
 1 AEC MISSION TO THE IAEA
 10 AEC NEVADA OPERATIONS OFFICE
 1 AEC NEW YORK OPERATIONS OFFICE
 1 AEC PATENT OFFICE
 1 AEC SAN FRANCISCO OPERATIONS OFFICE
 1 AEC SAVANNAH RIVER OPERATIONS OFFICE
 1 AEC SCIENTIFIC REPRESENTATIVE, ARGENTINA
 1 AEC SCIENTIFIC REPRESENTATIVE, BELGIUM
 1 AEC SCIENTIFIC REPRESENTATIVE, BRAZIL
 1 AEC SCIENTIFIC REPRESENTATIVE, ENGLAND
 1 AEC SCIENTIFIC REPRESENTATIVE, FRANCE
 1 AIR FORCE AERO PROPULSION LABORATORY (APE)
 1 AIR FORCE AIR UNIVERSITY LIBRARY
 1 AIR FORCE INSTITUTE OF TECHNOLOGY
 1 AIR FORCE TECHNICAL APPLICATIONS CENTER (AEC)
 1 AIR FORCE WEAPONS LABORATORY
 1 AMES LABORATORY (AEC)
 1 ARGONNE NATIONAL LABORATORY (AEC)
 9 ARMY ABERDEEN PROVING GROUND
 1 ARMY, COMBAT DEVELOPMENTS COMMAND
 1 ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY
 3 ARMY ENGINEER NUCLEAR CRATERING GROUP
 6 ARMY ENGINEER WATERWAYS EXPERIMENT STATION
 1 ARMY LETTERMAN ARMY INSTITUTE OF RESEARCH
 1 ARMY MEDICAL FIELD SERVICE SCHOOL
 1 ARMY MEDICAL RESEARCH & DEVELOPMENT COMMAND
 1 ARMY OFFICE, CHIEF OF ENGINEERS
 1 ARMY PICATINNY ARSENAL
 1 ARMY WALTER REED MEDICAL CENTER
 1 ATOMIC POWER DEVELOPMENT ASSOCIATES, INC. (AEC)
 1 ATOMICS INTERNATIONAL (AEC)
 1 AUSTRAL OIL COMPANY (AEC)
 2 BATTTELLE MEMORIAL INSTITUTE (AEC)
 3 BATTTELLE-NORTHWEST (AEC)
 1 BROOKHAVEN NATIONAL LABORATORY (AEC)
 1 BUREAU OF MINES, ALBANY (AEC)
 1 BUREAU OF MINES, BARTLESVILLE (AEC)
 1 BUREAU OF MINES, BARTLESVILLE (INT)
 1 BUREAU OF MINES, DENVER (AEC)
 1 BUREAU OF MINES, LARAMIE (INT)
 1 CER GEONUCLEAR CORPORATION (AEC)
 1 COLUMBIA UNIVERSITY, GROSS (AEC)
 1 DASA LIVERMORE
 1 DASA WASHINGTON
 1 DEPARTMENT OF AGRICULTURE NATIONAL LIBRARY
 1 DEPT. OF AGRICULTURE RESEARCH SERVICE
 1 DU PONT COMPANY, AIKEN (AEC)
 1 DU PONT COMPANY, WILMINGTON (AEC)
 1 EBERLINE INSTRUMENT CORPORATION (AEC)
 1 EG&G, INC., ALBUQUERQUE (AEC)
 1 EG&G, INC., LAS VEGAS (AEC)
 5 EL PASO NATURAL GAS COMPANY (AEC)
 8 ENVIRONMENTAL RESEARCH CORPORATION (AEC)
 1 ENVIRONMENTAL RESEARCH CORPORATION, LAS VEGAS (AEC)

No. Copies

1 ENVIRONMENTAL SCIENCE SERVICES
 ADMINISTRATION, LAS VEGAS (COMM.)
 1 ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION (AEC)
 1 ENVIRONMENTAL SCIENCE SERVICE
 ADMINISTRATION, MARYLAND (COMM.)
 1 GENERAL DYNAMICS/FORT WORTH (AF)
 1 GENERAL ELECTRIC COMPANY, CINCINNATI (AEC)
 1 GENERAL ELECTRIC COMPANY, SAN JOSE (AEC)
 1 GEOLOGICAL SURVEY, FLAGSTAFF (INT)
 1 GEOLOGICAL SURVEY, MENLO PARK (INT)
 2 GEOLOGICAL SURVEY, PECORA (INT)
 2 GULF GENERAL ATOMIC INCORPORATED (AEC)
 2 HOLMES AND NARVER, INC. (AEC)
 1 HOLMES & NARVER, INC., LOS ANGELES (AEC)
 1 IDAHO NUCLEAR CORPORATION (AEC)
 1 INSTITUTE FOR DEFENSE ANALYSIS (ARMY)
 1 JET PROPULSION LABORATORY (NASA)
 1 JOHN A. BLUME AND ASSOCIATES (AEC)
 1 LAWRENCE RADIATION LABORATORY, BERKELEY (AEC)
 1 LAWRENCE RADIATION LABORATORY, LIVERMORE (AEC)
 1 LIBRARY OF CONGRESS
 1 LOCKHEED-GEORGIA COMPANY (AF)
 2 LOS ALAMOS SCIENTIFIC LABORATORY (AEC)
 1 LOVELACE FOUNDATION (AEC)
 1 MASON AND HANGER-SILAS MASON CO., INC. AMARILLO (AEC)
 1 NASA JOHN F. KENNEDY SPACE CENTER
 1 NATIONAL BUREAU OF STANDARDS (COMM.)
 1 NAVY ATOMIC ENERGY DIVISION
 2 NAVY ORDNANCE LABORATORY
 1 NAVY POSTGRADUATE SCHOOL
 1 NAVY SHIP SYSTEMS COMMAND HEADQUARTERS
 2 NUCLEAR ENERGY LIABILITY INSURANCE ASSOCIATION (AEC)
 1 NUS CORPORATION (AEC)
 4 OAK RIDGE NATIONAL LABORATORY (AEC)
 1 PENNSYLVANIA STATE UNIVERSITY (AEC)
 3 PUBLIC HEALTH SERVICE, LAS VEGAS (HEW)
 1 PUBLIC HEALTH SERVICE, MONTGOMERY (HEW)
 1 PUBLIC HEALTH SERVICE, ROCKVILLE (HEW)
 1 PUBLIC HEALTH SERVICE, WINCHESTER (HEW)
 1 PUERTO RICO NUCLEAR CENTER (AEC)
 1 PUERTO RICO NUCLEAR CENTER, AT-40-1-1833 (AEC)
 1 PURDUE UNIVERSITY (AEC)
 1 RADIOPTICS, INC. (AEC)
 1 REYNOLDS ELECTRICAL AND ENGINEERING CO. INC. (AEC)
 1 SANDIA CORPORATION, LIVERMORE (AEC)
 1 SOUTHWEST RESEARCH INSTITUTE (AEC)
 1 STANFORD UNIVERSITY (AEC)
 1 SYSTEMS, SCIENCE & SOFTWARE (DASA)
 1 TELEDYNE ISOTOPES (AEC)
 1 TEXAS NUCLEAR CORPORATION (AEC)
 1 UNION CARBIDE CORPORATION (ORGDP) (AEC)
 1 UNIVERSITY OF CALIFORNIA, DAVIS, TALLEY (AEC)
 1 UNIVERSITY OF MINNESOTA (AEC)
 1 UNIVERSITY OF TENNESSEE (AEC)
 1 UNIVERSITY OF UTAH (AEC)
 1 UNIVERSITY OF WASHINGTON (AEC)
 1 WESTINGHOUSE ELECTRIC CORPORATION, (WAL) (AEC)
 31 AEC DIVISION OF TECHNICAL INFORMATION EXTENSION
 25 CLEARINGHOUSE FOR FEDERAL SCIENTIFIC
 AND TECHNICAL INFORMATION

