PRIVACY ACT MATERIAL REMOVED

403136

Overview of Fallout information From Nevada Atmospheric Tests

PRIVACY ACT MATERIAL REMOVED

TOTAL ANNOUNCED TESTS AND RADIATION MEASURED OFF THE TEST RANGE COMPLEX

12-31-81

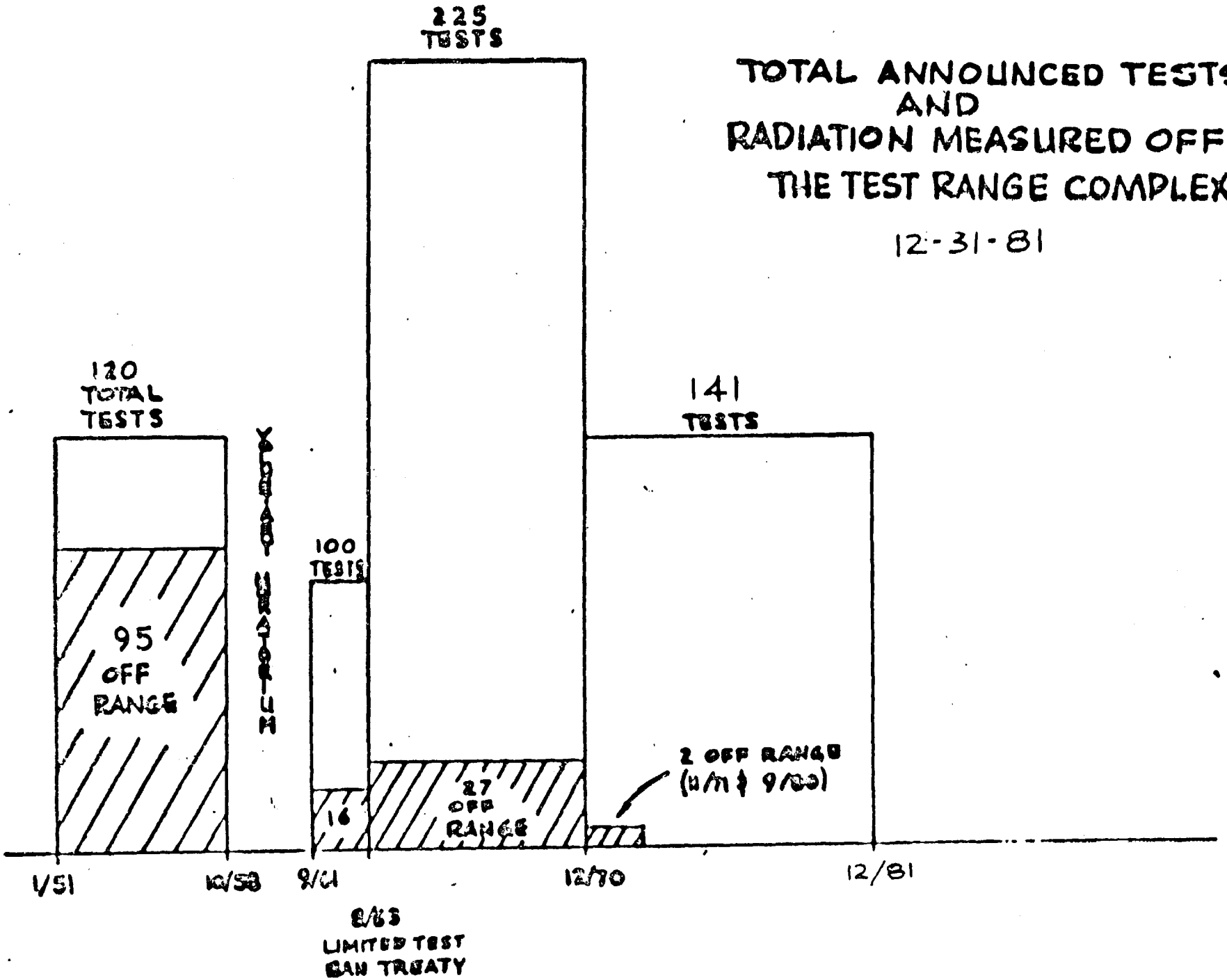
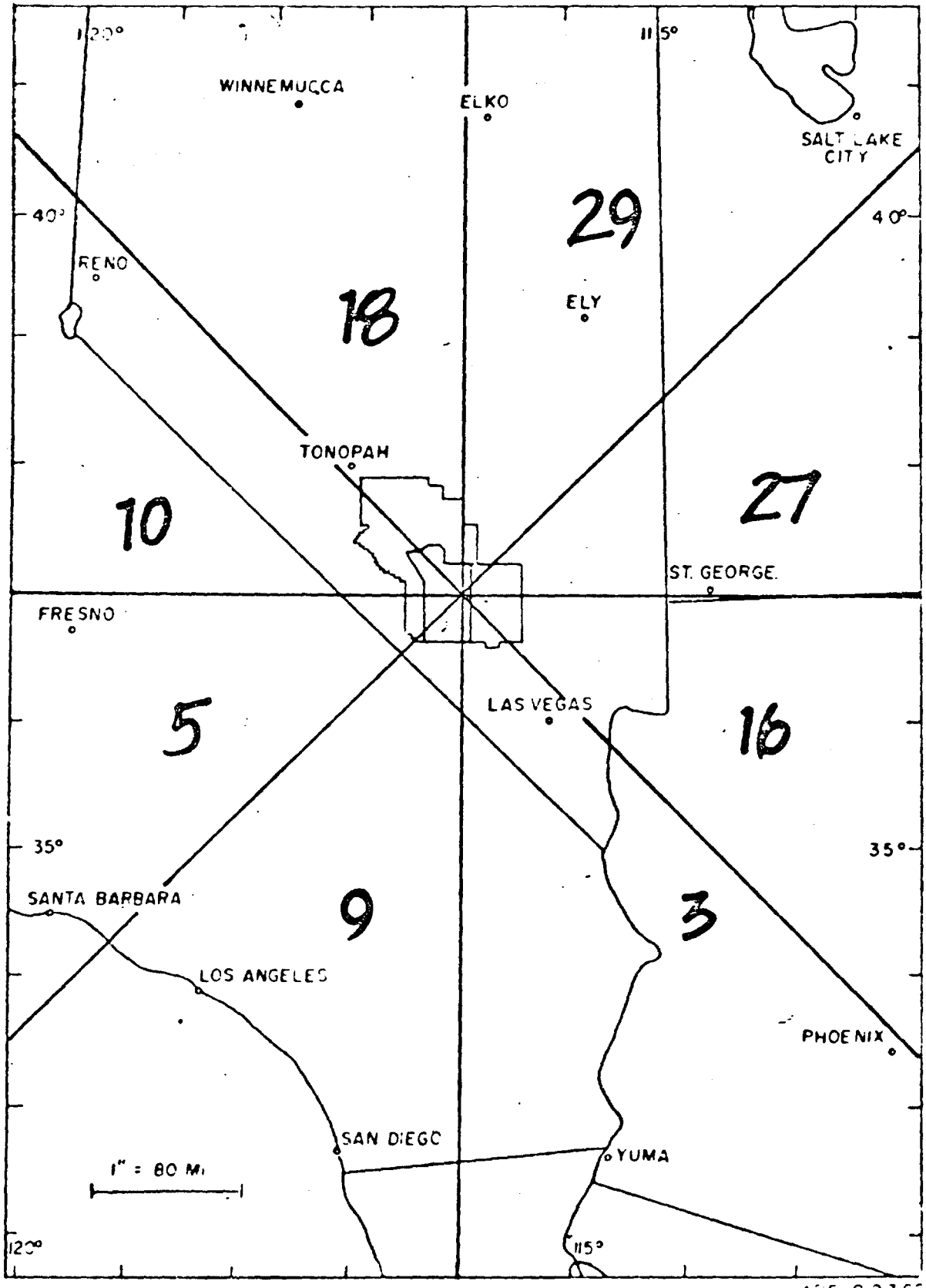


CHART NO 13

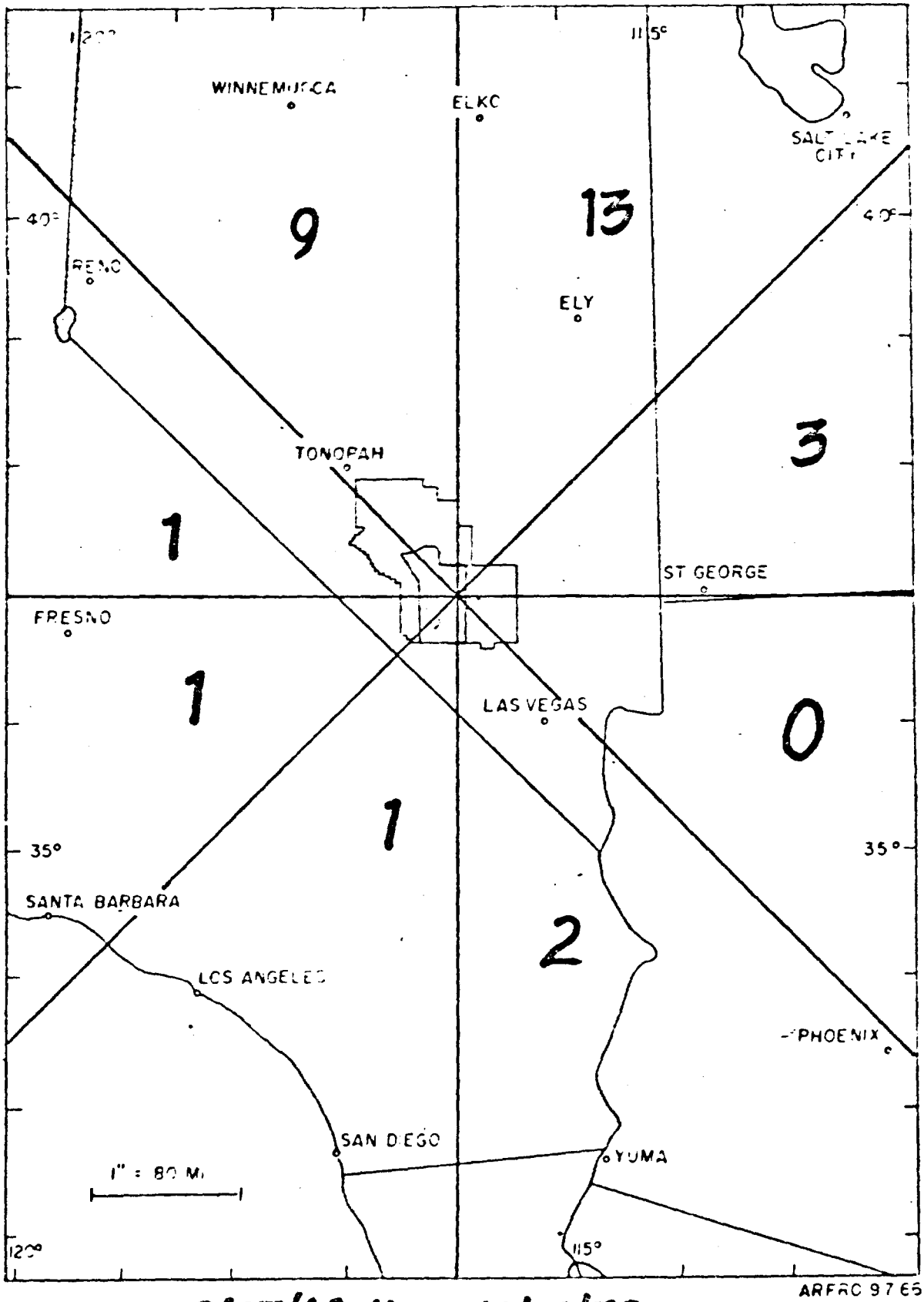
NUMBER OF EVENTS HAVING FALLOUT PER SECTOR



TO 10/58

CHART NO. 16

NUMBER OF EVENTS HAVING FALLOUT PER SECTOR



9/15/61 thru 12/31/70

ESTIMATED DOSE TO POPULATED LOCATIONS *
FOR TESTING PRIOR TO SEPTEMBER 15, 1961

STATE	TOTAL POPULATION OF OFF-SITE LOCATIONS MONITORED	NUMBER OF PEOPLE								
		NO EXPOSURE MEASURED — (BACKGROUND)	OVER BKGD TO 0.99 REM	1.00 REM TO 2.99 REM	3.00 REM TO 3.99 REM	4.00 REM TO 4.99 REM	5.00 REM TO 5.99 REM	6.00 REM TO 7.99 REM	8.00 REM TO 10.99 REM	OVER 11.0 REM
ARIZONA	7,494	931	6,414	149	0	0	0	0	0	0
CALIFORNIA	51,875	26,134	25,741	0	0	0	0	0	0	0
NEVADA	121,618	433	111,958	8,255	154	272	1-515 [1]	2-14 [2]	1-16 [2]	1 [4]
UTAH	28,194	0	16,652	3,462	6,386	1,694	0	0	0	0
TOTAL	**209,181**	**27,498**	**160,765**	**11,866**	**6,540**	**1,966**	1-515 [1]	2-14 [2]	1-16 [2]	1 [4]

1] VARIABLE POPULATION AT LINCOLN MINE & ONE RAILROAD MAINTENANCE STATION

3] VARIABLE POPULATION AT RAILROAD MAINTENANCE STATIONS (ONE INDIVIDUAL 10.5 REM BUTLER RANCH)

2] ZERO POPULATION AFTER TEAPOT SERIES (5/15/55) AT RIVERSIDE, NV.

4] ONE INDIVIDUAL 13.5 REM – BUTLER RANCH

* UNCERTAINTY:

DOSE < 0.1 REM ±80%
DOSE > 0.1 < 1.0 REM ±60%
DOSE > 1.0 REM ± 40%

SOURCE:

GORDON DUNNING, USAEC
FALLOUT FROM NUCLEAR TESTS AT THE NEVADA TEST SITE.
(COMMITTEE REPORT – TABLE I) MAY 1959

OFF-SITE RADIATION EXPOSURE REVIEW

BACKGROUND

1978

- 146 CLAIMS FILED AGAINST DOE
- PRESIDENT FORMS INTERAGENCY TASK FORCE
- NV PROPOSES ACTION TO HQ
- GROWING LOCAL/NATIONAL MEDIA

1979

- CONGRESSIONAL HEARINGS
- FUNDING & DESIGNATION OF NV AS LEAD OFFICE
- INTERAGENCY TASK FORCE ON COMPENSATION
- COMPENSATION LEGISLATION INTRODUCED
- CLAIMS DENIED-SUIT FILED FOR 442 'VICTIMS'
- 213 ADDITIONAL CLAIMS FILED AGAINST DOE

1980

- TRIAL DATE SET FOR 26 PLAINTIFFS ~~SEPTEMBER 1981~~ April 5, 1982
- SUIT EXPANDED TO INCLUDE ~~OVER 1,000 CLAIMANTS~~ 869 Plaintiffs

PRIVACY ACT MATERIAL REMOVED

RADIATION RELATED CLAIMS AND SUITS AGAINST THE GOVERNMENT AND ITS CONTRACTORS IN WHICH THE NEVADA OPERATIONS OFFICE IS INVOLVED

Off-Site Claims and Suits

Total number of off-site radiation tort claims filed: 1,130

Total amount claimed: $2,570,271,444.04

Total number of off-site lawsuits: 4 (885 plaintiffs)

Allen	(869 plaintiffs)	$2,044,000,000
Timothy	(7 plaintiffs)	9,000,000
Mower	(8 plaintiffs)	11,300,000
Church	(1 plaintiff)	500,000*
Total amount of damages sought		$2,064,800,000*

* * * * * * *

On-Site Claims and Suits

Total number of on-site radiation tort claims filed: 367

Total amount claimed: $ 146,028,000.00

Total number of on-site lawsuits: 6 (312 plaintiffs)

v. U.S.	(172 plaintiffs)	$ 51,350,000
v. U.S.,REECo,LLL	(103 pls)	173,300,000
v. U.S.	(27 plaintiffs)	8,950,000
v. U.S.,REECo,LANL	(6 pls)	120,120,000*
v. REECo	(3 plaintiffs)	50,000*
v. U.S. & REECo	(1 pl)	101,500,000
Total amount of damages sought		$455,270,000*

mages sought are in excess of these amounts.

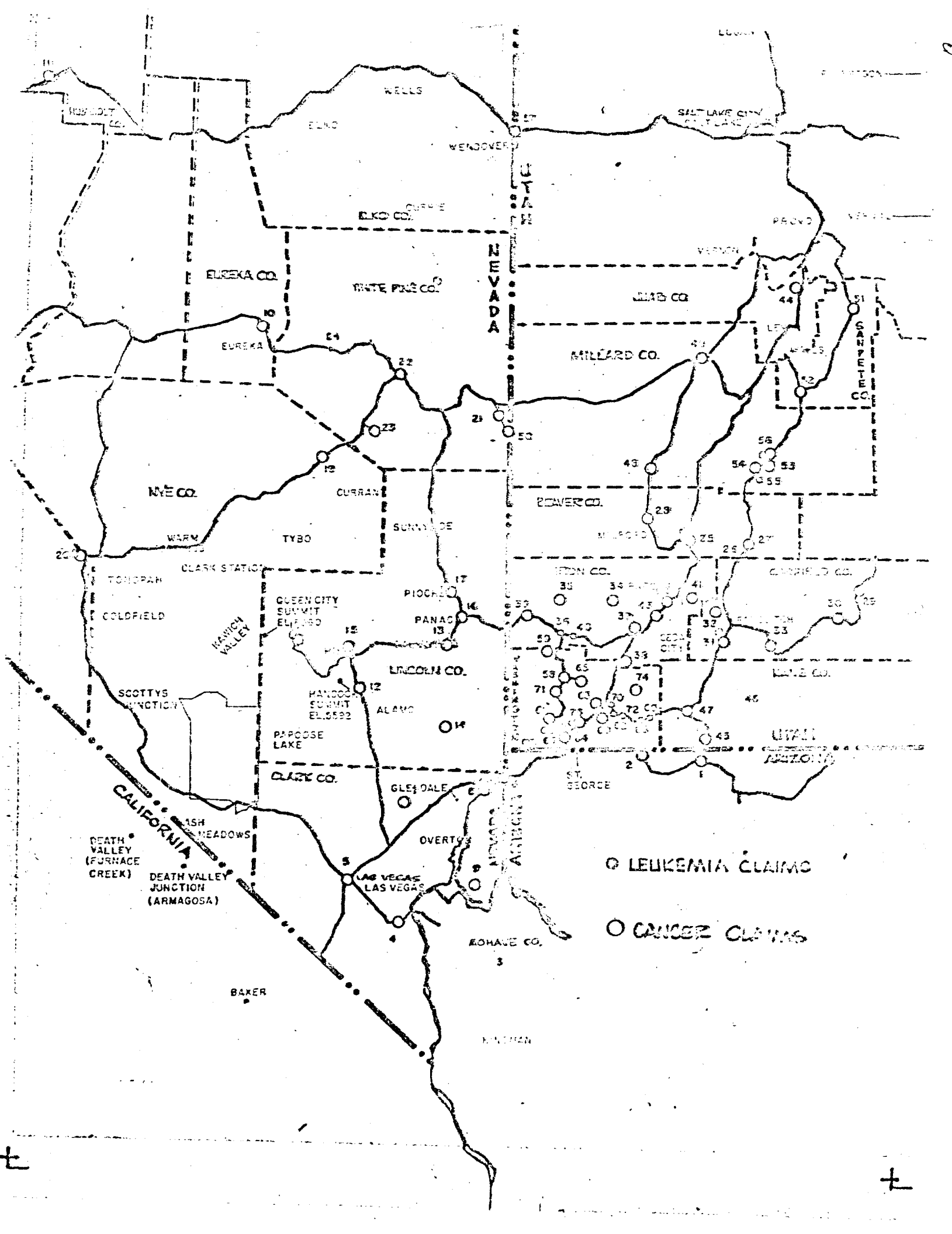
PRIVACY ACT MATERIAL REMOVED

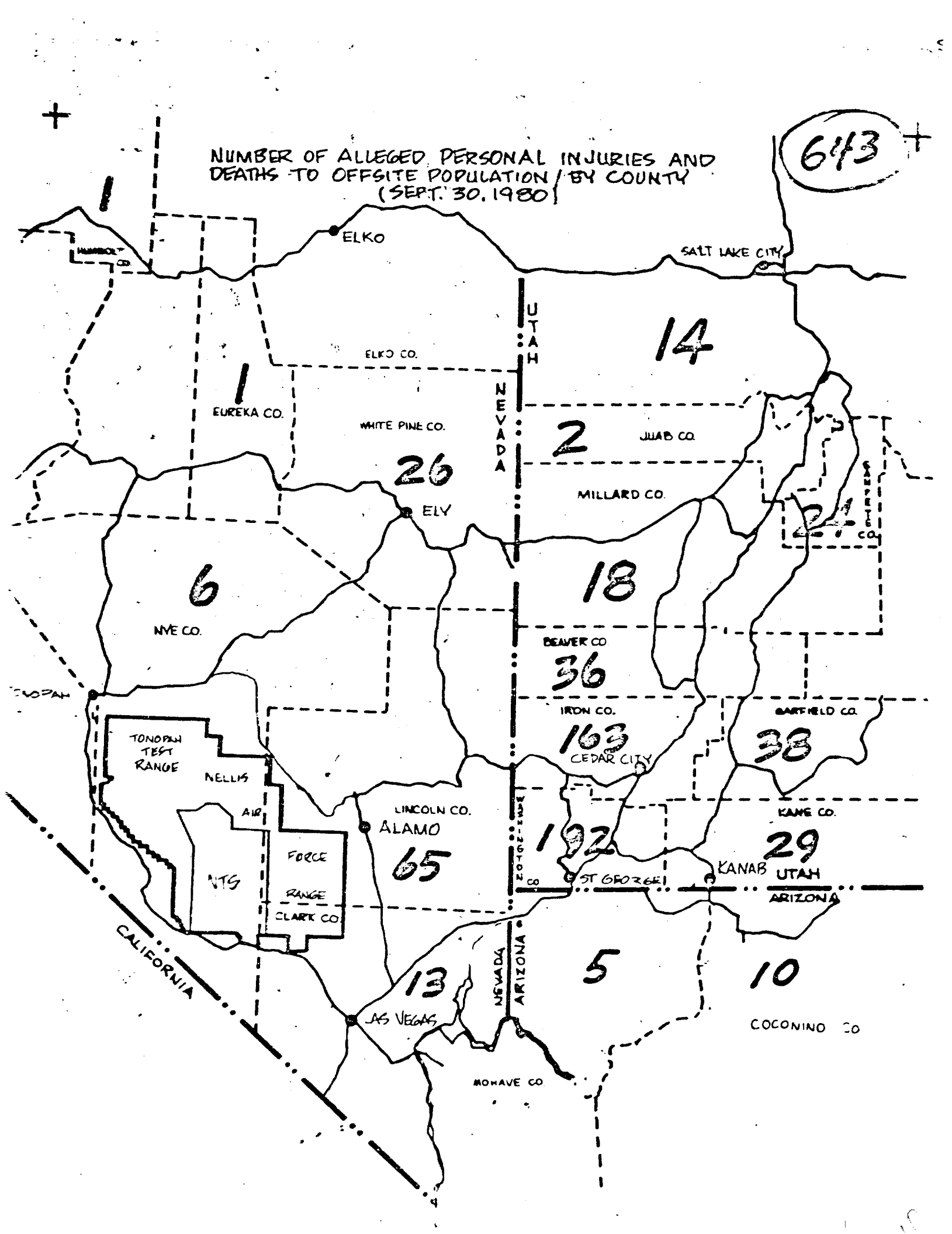
As of 11/15/81

RADIATION RELATED CLAIMS AND SUITS AGAINST THE GOVERNMENT AND IT'S CONTRACTORS IN WHICH THE NEVADA OPERATIONS OFFICE IS INVOLVED

NOVEMBER 15, 1981

OFF-SITE CLAIMS	1.130	$2,570,271,444.04
OFF-SITE SUITS	4	$2,064,800,000.00
ON-SITE CLAIMS	367	$ 149,928,000.00
ON-SITE SUITS	6	$ 455,270,000.00


WELLS
ELKO
WENDOVER
SALT LAKE CITY
ELKO CO.
UTAH
NEVADA
EUREKA CO.
WHITE PINE CO.
EUREKA
MILLARD CO.
SANPETE CO.
NYE CO.
CURRAN
TYBO
SUNNYSIDE
POWER CO.
CLARK STATION
TONOPAH
GOLDFIELD
QUEEN CITY SUMMIT EL.6360
PIOCHE
PANACA
MANCH VALLEY
LINCOLN CO.
SCOTTYS JUNCTION
PANCOOT SUMMIT EL.5592
ALAMO
PAPOOSE LAKE
CLARK CO.
GLENDALE
OVERTON
CALIFORNIA
ASH MEADOWS
DEATH VALLEY (FURNACE CREEK)
DEATH VALLEY JUNCTION (ARMAGOSA)
LAS VEGAS
MOHAVE CO.
BAKER
ST. GEORGE
UTAH
ARIZONA
LEUKEMIA CLAIMS
CANCER CLAIMS


613
NUMBER OF ALLEGED PERSONAL INJURIES AND DEATHS TO OFFSITE POPULATION / BY COUNTY (SEPT. 30, 1980)
1
ELKO
SALT LAKE CITY
HUMBOLDT CO.
ELKO CO.
1
EUREKA CO.
WHITE PINE CO.
26
ELY
UTAH
NEVADA
14
2
JUAB CO.
MILLARD CO.
6
NYE CO.
18
BEAVER CO.
36
IRON CO.
163
CEDAR CITY
GARFIELD CO.
38
TONOPAH
TONOPAH TEST RANGE
NELLIS AIR FORCE RANGE
NTS
CLARK CO.
LINCOLN CO.
ALAMO
65
192
WASHINGTON CO.
ST GEORGE
KANE CO.
29
KANAB
UTAH
ARIZONA
CALIFORNIA
13
LAS VEGAS
NEVADA
ARIZONA
5
10
COCONINO CO.
MOHAVE CO.

NV LEAD OFFICE DESIGNATION

MARCH 28, 1979	NV DESIGNATED AS LEAD OFFICE FOR DATA COLLECTION & INFORMATION COORDINATION
JUNE 8, 1979	NV ESTABLISHED AS LEAD OFFICE FOR DOSE ASSESSMENT

OBJECTIVES

- COLLECT AND ORGANIZE AT ONE CENTRAL LOCATION ALL RELEVANT DATA PERTAINING TO FALLOUT IN THE OFF-SITE AREA
  - ESTABLISH LIBRARY OPEN TO PUBLIC

- PRODUCE DOSIMETRIC RE-EVALUATION OF OFF-SITE AREA CHARACTERIZING IT BY:
  - REGION
  - COMMUNITY/LOCALE
  - AGE/OCCUPATION

OFF-SITE MONITORS WORKSHOP

JUNE 25 - 27, 1980

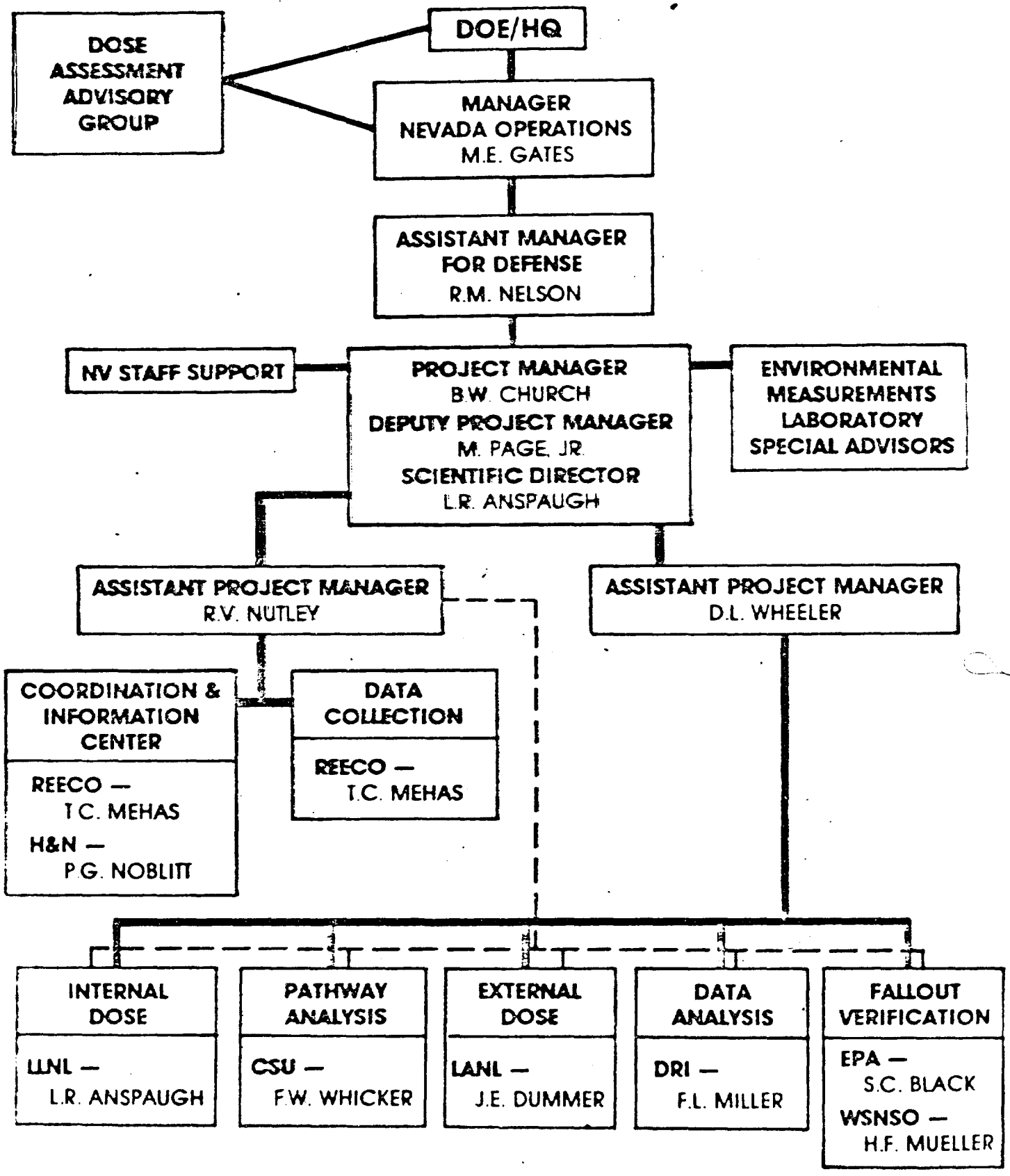
OBJECTIVES:

1. CONVENE ORIGINAL OFFSITE MONITORS
2. OBTAIN HISTORICAL PERSPECTIVE
3. OBTAIN ANSWERS TO SPECIFIC QUESTIONS
4. DOCUMENT PROCEEDINGS

RESULTS:

1. 26 PARTICIPANTS
2. HISTORICAL PRACTICES CLARIFIED
3. SPECIFIC PRACTICES CLARIFIED
4. VERBATIM TRANSCRIPT RECORDED

OFFSITE RADIATION EXPOSURE REVIEW PROJECT



——— REPORTING CHANNEL — — — ADMINISTRATIVE SUPPORT

EFFECTIVE JANUARY 25 1982

EVENTS DEPOSITING RADIOACTIVITY ON ST. GEORGE, UTAH.

SERIES / EVENT	ESTIMATED EXPOSURE (R)
UPSHOT-KNOTHOLE (1953)	
NO. 1 - ANNIE	0.35
NO. 7 - SIMON	0.01
NO. 9 - HARRY	2.50
TEAPOT (1955)	
NO. 3 - TELSA	0.10
NO. 14 - ZUCCHINI	0.04
PLUMBOB (1957)	
PRISCILLA	0.03
SMOKY	0.66
MORGAN	0.01
	3.70

OFF-SITE RADIATION EXPOSURE REVIEW PROJECT DIRECTIVES

PROJECT DIRECTIVE # 1

SUBJECT: WORK PRIORITIES

ALL ACTIVITIES WILL DIRECT THEIR EFFORTS TO THE FOLLOWING PRIORITIES:

A. GEOGRAPHICAL

1 - WASHINGTON COUNTY, UTAH -(1-ST. GEORGE, 2-HURRICANE)
2 - IRON COUNTY, UTAH -(1-CEDAR CITY, 2-PAROWAN)
3 - LINCOLN COUNTY, NEVADA -(1-PIOCHE, 2-CALIENTE)

B. EVENTS

1 - HARRY (UPSHOT-KNOTHOLE) - 1953
2 - SMOKY (PLUMBBOB) - 1957
3 - ANNIE (UPSHOT-KNOTHOLE) - 1953

C. RADIONUCLIDES

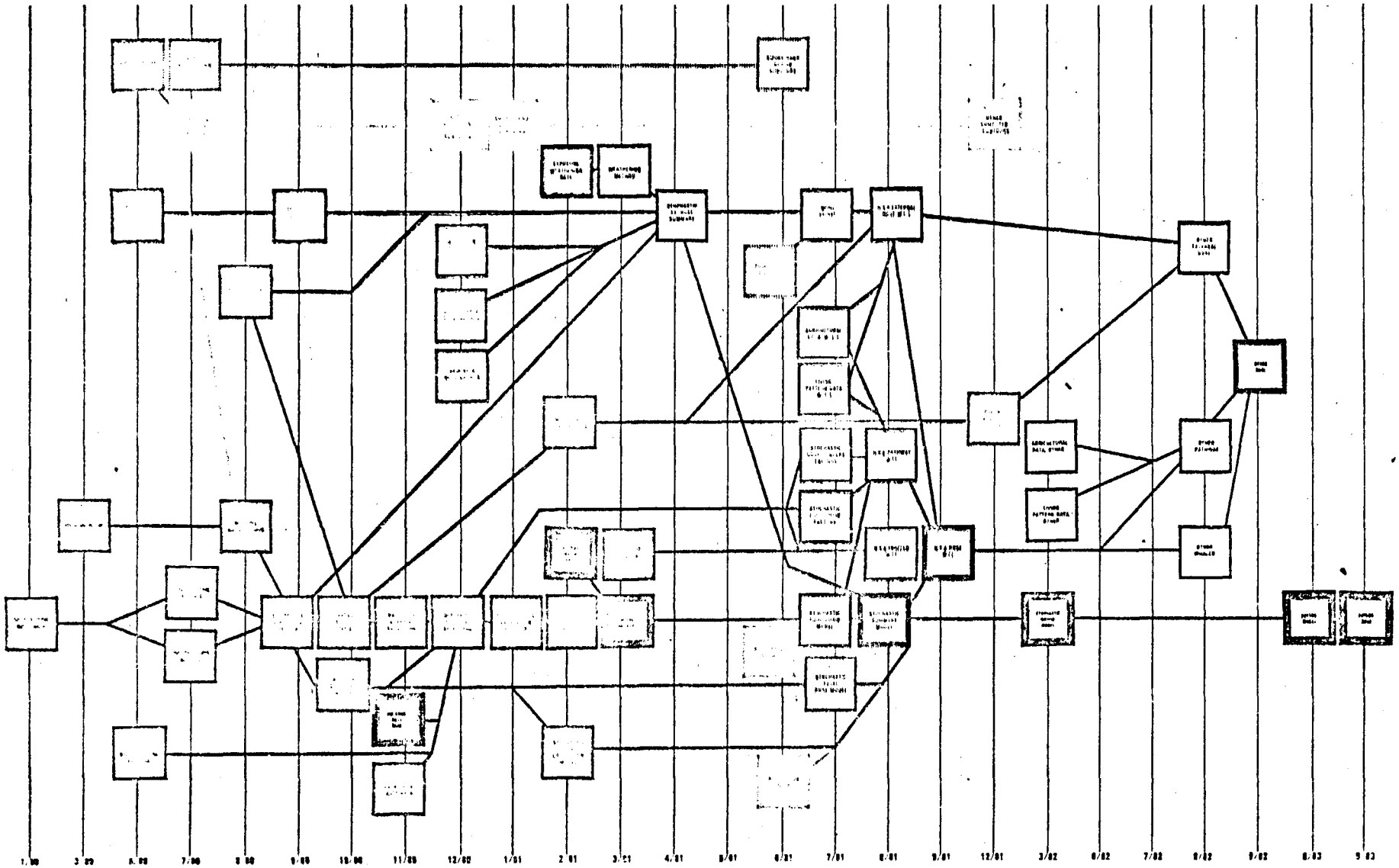
1 - Cs-137
2 - Sr-90 (all Isotopes)
3 - IODINE (ALL ISOTOPES)
4 - Pu-239, 240

CONCURRENCE:

PROJECT OFFICER

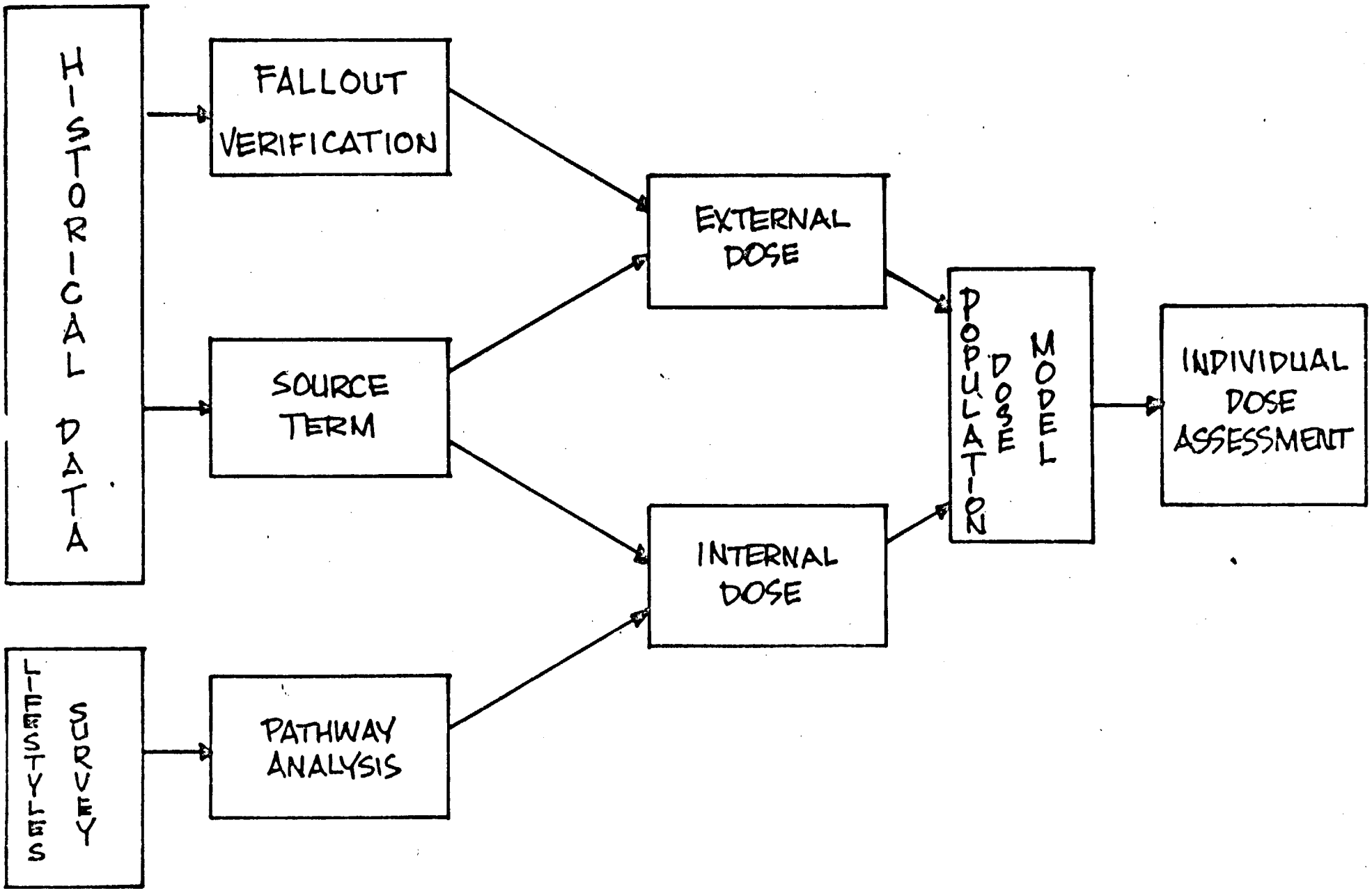
PROJECT MANAGER

O.R.E.R.P. FLOW CHART



EXTERNAL DOSE——— INTERNAL DOSE——— PATHWAY ANALYSIS——— DATA ANALYSIS ------ FALLOUT VERIFICATION——— DATA COLLECTION———

OFF-SITE DOSE ASSESSMENT



DOSE ASSESSMENT TASK GROUPS

FALLOUT VERIFICATION	—	DETERMINE DISTRIBUTION AND LEVELS OF FALLOUT
PATHWAYS ANALYSIS	—	DEVELOP PATHWAY FACTORS FOR DOSE ASSESSMENT
EXTERNAL DOSE	—	ESTABLISH EXTERNAL COMPONENT OF DOSE
INTERNAL DOSE	—	ASSESS DOSE BY INGESTION/ INHALATION
DATA ANALYSIS	—	PROVIDE STATISTICS/MODELING SUPPORT
DATA COLLECTION	—	COLLECT DATA/ESTABLISH RETRIEVAL SYSTEM

Objective and Tasks
For
PATHWAY ANALYSIS

OBJECTIVES:

- Obtain and/or, develop the various pathway factors necessary to determine a complete and objective dose assessment which will characterize the offsite environs by region, community or locale, age and occupation.

TASKS:

- Determine ecological concentration mechanisms and other variables/parameters which may influence the ingestion/inhalation factors necessary for dose determination.
- Develop the food chain uptake parameters for various age groups, occupations, life-styles etc.
- Investigate the various life-styles of the offsite public and how these various living patterns may influence dose assessment. Particularly investigate the impact of specifi outdoor life-styles, i.e., sheepherders, ranchers, farmers, construction workers, etc., and the individually supplied family (i.e., family cow, garden, etc.).

- Determine impact of import/export of foodstuffs in and out of fallout areas.

GENERAL

- Assure that state-of-the-art parameters, methods, techniques and best available information is used. Where possible employ new and innovative techniques to obtain and develop the essential pathway data required to best predict the dose commitment to the offsite individuals and to offsite population locations.

DOSE ASSESSMENT ADVISORY GROUP

JULY 13, 1979 - BRIEFING OF GOVERNORS AND/OR THEIR REPRESENTATIVES ON THE OFF-SITE RADIATION EXPOSURE PROJECT.

AUGUST 23-24, 1979 - DOSE ASSESSMENT STEERING GROUP ORGANIZATION MEETING.

OCTOBER 10-11, 1979 - CHARTER APPROVAL FOR DOSE ASSESSMENT STEERING GROUP.

JULY 12, 1980 - CREATION OF DOSE ASSESSMENT ADVISORY GROUP VIA ANNOUNCEMENT IN FEDERAL REGISTER.

DECEMBER 2-4, 1980 - FIRST MEETING OF DOSE ASSESSMENT ADVISORY GROUP.

DOSE ASSESSMENT ADVISORY GROUP

PURPOSE

- REVIEW PROPOSALS FROM TASK GROUPS
- ASSIST IN ESTABLISHING PRIORITIES
- MONITOR TASK PROGRESS
- RECOMMENDATIONS TO MANAGER/NV

COMPOSITION

- BROAD RANGE OF EXPERTISE & INSTITUTIONS

DOSE ASSESSMENT ADVISORY GROUP
CHARTER

ADVISE THE SECRETARY OF ENERGY AND THE MANAGER OF NV IN THE ACCOMPLISHMENT OF THE PRIMARY OBJECTIVES OF THE OVERALL PROJECT, IN A MANNER TO INCLUDE, BUT NOT LIMITED TO:: REVIEWING/EVALUATING TASK GROUP PROPOSALS, CONTRACTOR SCOPE OF WORK AND MONITORING PROGRESS AS THE PROJECT DEVELOPS.

SPECIFICALLY, THE ADVISORY GROUP WILL BE EXPECTED TO REVIEW THE PROPOSAL FROM EACH TASK GROUP LEADER AND THROUGH THE REVIEW AND COMMENT PROCESS, HELP GUIDE THE DEVELOPMENT OF EACH TASK, SUBTASK OR TASK GROUP. FURTHER, THE ADVISORY GROUP WILL REVIEW AND COMMENT ON THE PRODUCTS FROM SUCH GROUPS.

THE CHAIRMAN OF THE ADVISORY GROUP IS TO CALL PERIODIC PROGRESS MEETINGS, AT LEAST QUARTERLY, TO MONITOR THE WORK AND PROGRESS OF THE TASK GROUP ELEMENTS. THESE PROGRESS MEETINGS ARE TO CULMINATE WITH A WRITTEN REPORT TO THE MANAGER, NV, AND THE SECRETARY OF ENERGY, OUTLINING ANY RECOMMENDATIONS TO BE DIRECTED BY THE PROJECT MANAGEMENT TO THE TASK GROUPS OR ELEMENTS.

DOSE ASSESSMENT ADVISORY GROUP

MEMBERSHIP

DR. ROBERT D. MOSELEY, PROFESSOR
DEPARTMENT OF RADIOLOGY, SCHOOL
OF MEDICINE, UNIVERSITY OF NEW MEXICO

DR. EDWARD L. ALPEN, DIRECTOR
DONNER LABORATORY
UNIVERSITY OF CALIFORNIA

DR. JOHN A. AUXIER, DIRECTOR
INDUSTRIAL SAFETY & APPLIED HEALTH
PHYSICS, OAK RIDGE NATIONAL LABORATORY

DR. GLYN C. CALDWELL, CHIEF
CANCER BRANCH, CENTER FOR DISEASE CONTROL

DR. JAMES E. CAROTHERS, PHYSICIST
MEMBER OF DIRECTOR'S TECHNICAL STAFF
LAWRENCE LIVERMORE NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA

DR. GEORGE W. CASARETT
DEPARTMENT OF RADIOBIOLOGY & BIOPHYSICS
SCHOOL OF MEDICINE, UNIVERSITY OF ROCHESTER

MR. SEYMOUR JABLON, DIRECTOR
MEDICAL FOLLOW-UP AGENCY
NATIONAL ACADEMY OF SCIENCES

DR. JOHN S. MALIK, PHYSICIST
STAFF MEMBER, NATIONAL SECURITY PROGRAM
LOS ALAMOS NATIONAL SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA

DR. BERNARD MANOWITZ, CHAIRMAN
DEPARTMENT OF ENERGY & ENVIRONMENT
BROOKHAVEN NATIONAL LABORATORY

DR. ROGER O. MC CLELLAN, DIRECTOR
INHALATION TOXICOLOGY RESEARCH INSTITUTE
LOVELACE FOUNDATION

DR. JAMES E. SARN, ASSISTANT DIRECTOR
DIVISION OF DISEASE CONTROL SERVICES
ARIZONA DEPARTMENT OF HEALTH SERVICES

MR. WILLIAM J. BREED, ANTHROPOLOGIST
MUSEUM OF NORTHERN ARIZONA

MR. JOSEPH O. WARD, CHIEF, RADIOLOGIC
HEALTH SECTION, DEPARTMENT OF HEALTH SERVICES
STATE OF CALIFORNIA

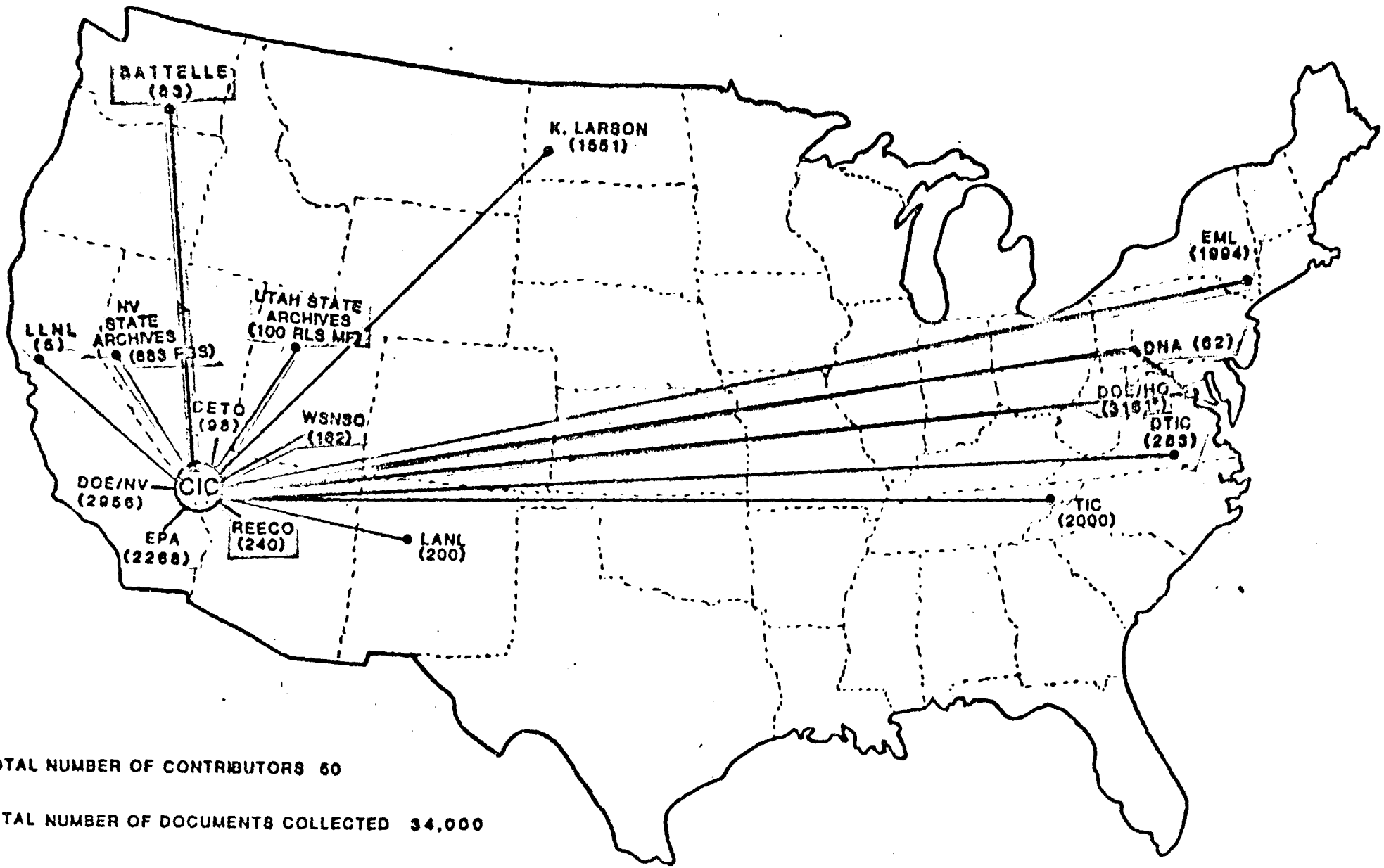
DR. ERNEST L. MAZZAFERRI, ACTING DEAN
UNIVERSITY OF NEVADA-RENO
SCHOOL OF MEDICAL SCIENCES

DR. ROGER D. MIERCORT, CHIEF
DEPARTMENT OF RADIOLOGY
WASHOE MEDICAL CENTER, RENO, NEVADA

DR. MC DONALD E. WRENN, DEPARTMENT OF
PHARMACOLOGY, RADIOBIOLOGY DIVISION
UNIVERSITY OF UTAH

MR. MICHAEL D. ZIMMERMAN, PARTNER
WATKISS AND CAMPBELL (ATTORNEYS-AT-LAW)
SALT LAKE CITY, UTAH

MAJOR SOURCES OF DOCUMENTS FOR THE CIC



TOTAL NUMBER OF CONTRIBUTORS 60

TOTAL NUMBER OF DOCUMENTS COLLECTED 34,000

*DOES NOT INCLUDE 25 BOXES RECEIVED ON SEPTEMBER 29, 1981.

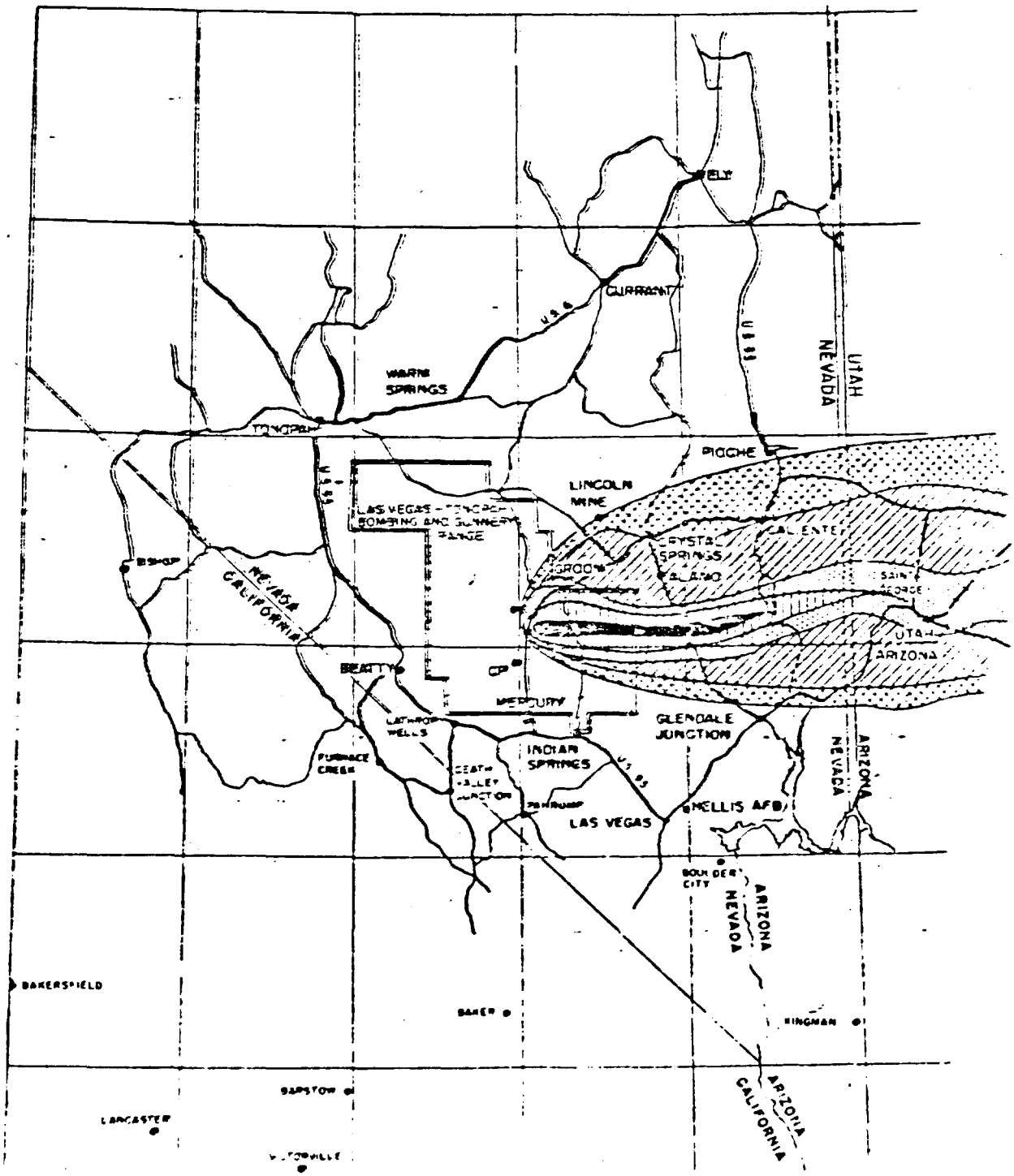
DAVID WARRINER CIC
VIEWGRAPH 1

CIC DOCUMENT COLLECTION
JULY - DECEMBER 1981

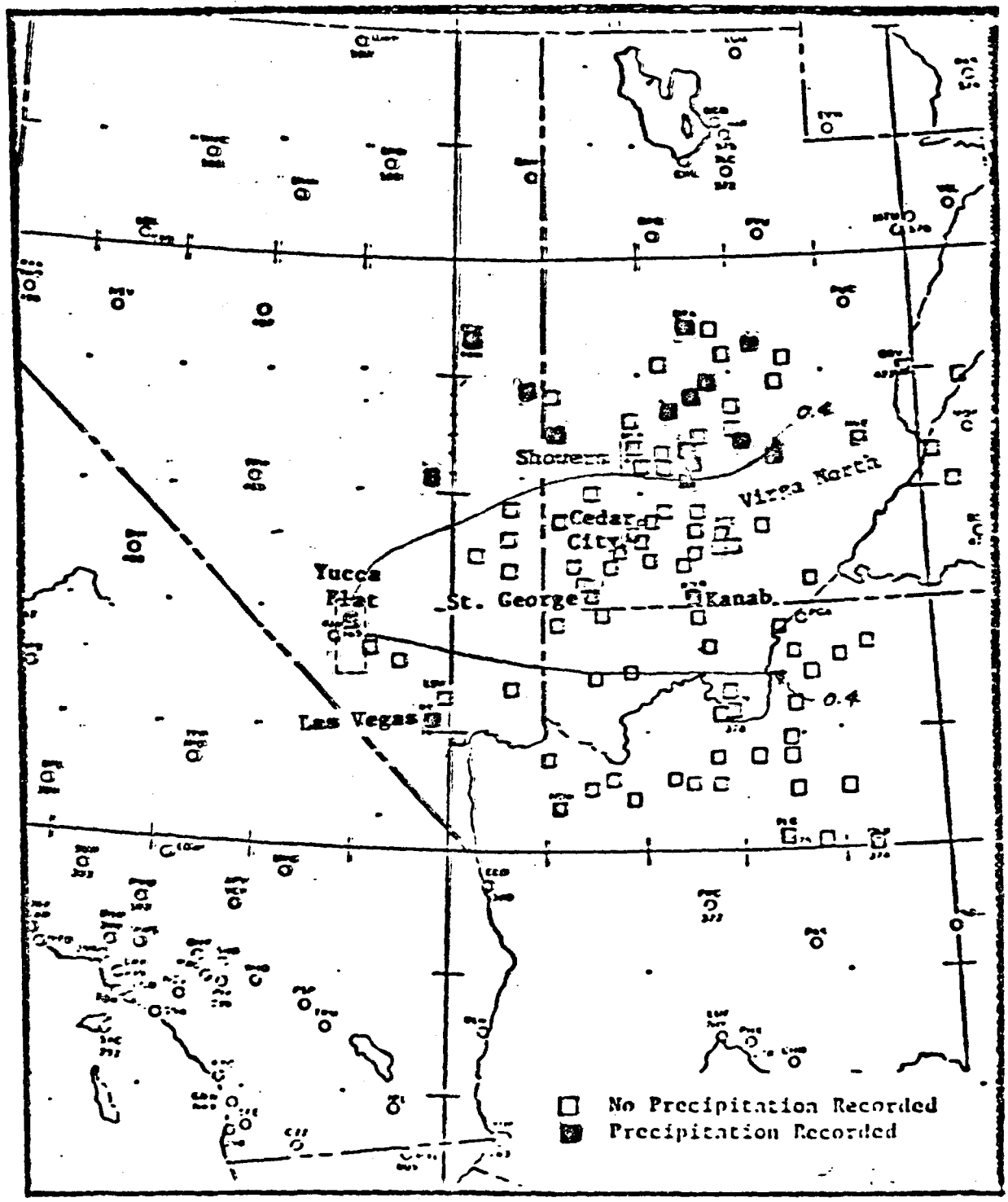
SOURCE	QUANTITY
DEPARTMENT OF ENERGY HEADQUARTERS, HISTORIANS OFFICE	25 BOXES
DEPARTMENT OF ENERGY NEVADA OPERATIONS OFFICE	16 BOXES
ENVIRONMENTAL PROTECTION AGENCY, LAS VEGAS, TECHNICAL LIBRARY	5 BOXES
KERMIT LARSON	2 BOXES
DEPARTMENT OF ENERGY TECHNICAL INFORMATION CENTER	154 DOCUMENTS (MICROFICHE)
WEATHER SERVICE NUCLEAR SUPPORT OFFICE, LAS VEGAS	162 MICROFICHE
DEFENSE TECHNICAL INFORMATION CENTER	45 DOCUMENTS
DEFENSE NUCLEAR AGENCY	25 DOCUMENTS
REYNOLDS ELECTRICAL & ENGINEERING TECHNICAL LIBRARY	11 DOCUMENT
NATIONAL TECHNICAL INFORMATION SERVICES	7 MICROFICHE
LOS ALAMOS NATIONAL LABORATORY	7 DOCUMENTS
LAWRENCE LIVERMORE NATIONAL LABORATORY	3 DOCUMENTS
UTAH STATE ARCHIVES	100 REELS (APPROXIMATE) OF 35 MM MICROFILM
UNIVERSITY OF UTAH LIBRARY	111 PAGES
NEVADA STATE ARCHIVES	683 PAGES

Inclosure 8

RADIATION INTENSITY AT TIME OF FALL-OUT, SHOT HARRY

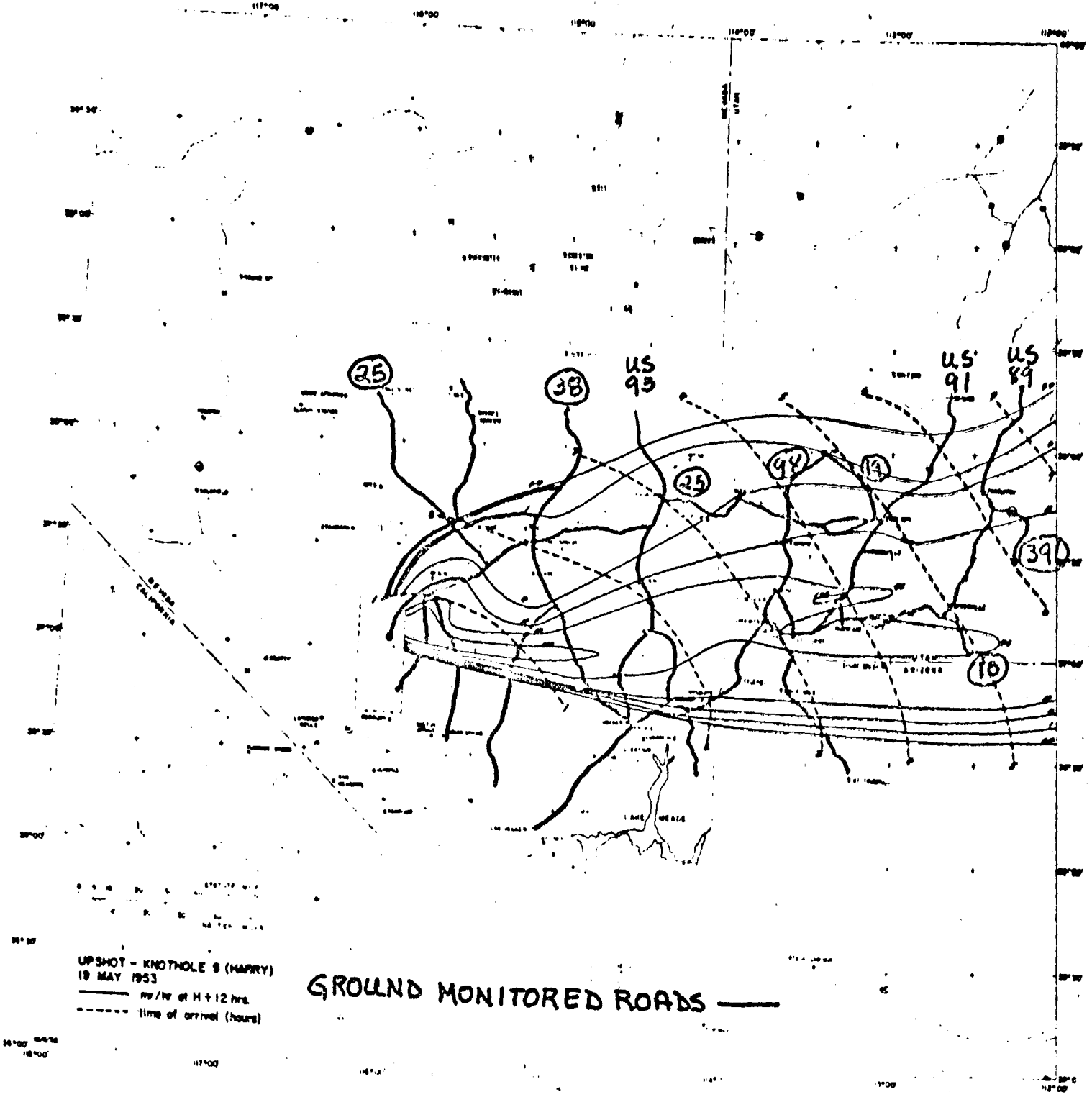


2 to 20 mr hr, 20 to 200 mr hr, 200 to 500 mr hr, 500 to 1000 mr hr, over 1000 mr hr. Heavy lines indicate the major runs.



Occurrence or non-occurrence of precipitation. Period of measurement is from 5PM May 18, 1953 to 5PM May 19, 1953 for most locations. Some are from midnight May 18 to midnight May 19. Source: Climatological Data, Nevada, Utah, Arizona. May 1953, U.S. Weather Bureau.

UPSHOT - KNOTHOLE 9 (HARRY)
19 MAY 1953
——— mr/hr at H + 12 hrs
- - - - - - time of arrival (hours)


25
38
US 93
US 91
US 89
95
14
25
39
16
UPSHOT - KNOTHOLE 9 (HARRY)
19 MAY 1953
mr/hr at H+12 hrs.
time of arrival (hours)
GROUND MONITORED ROADS

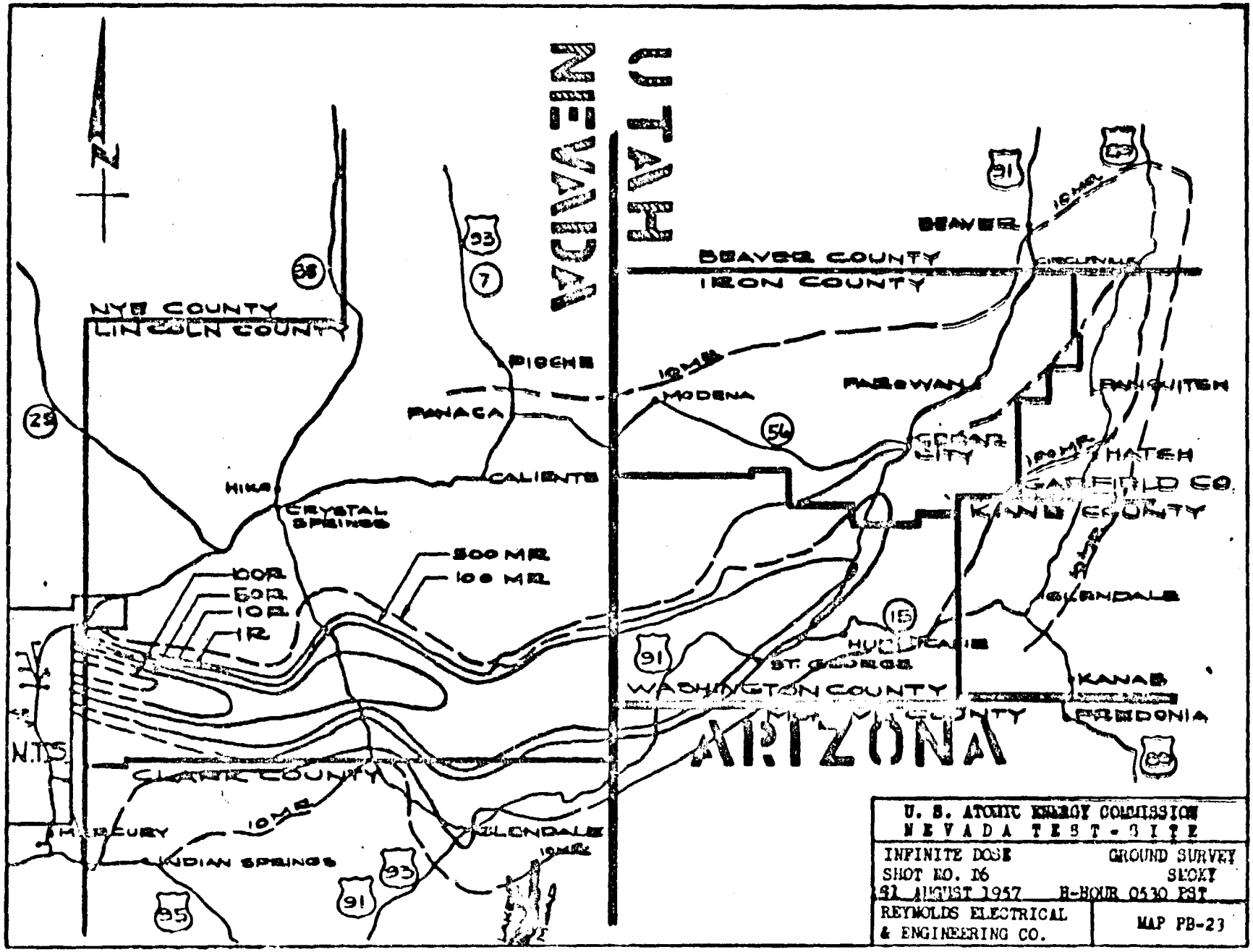

NEVADA
UTAH
ARIZONA
N
NYE COUNTY
LINCOLN COUNTY
CLARK COUNTY
BEAVER COUNTY
IRON COUNTY
WASHINGTON COUNTY
KANE COUNTY
GARFIELD CO.
PIOCHE
PANACA
CALIENTE
HIKO
CRYSTAL SPRINGS
MODENA
PAROWAN
CEDAR CITY
ENTERPRISE
HATCH
GLENDALE
HURRICANE
ST. GEORGE
KANAB
FREDONIA
MERCURY
INDIAN SPRINGS
N.T.S.
500 MR
100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

Figure 7 31

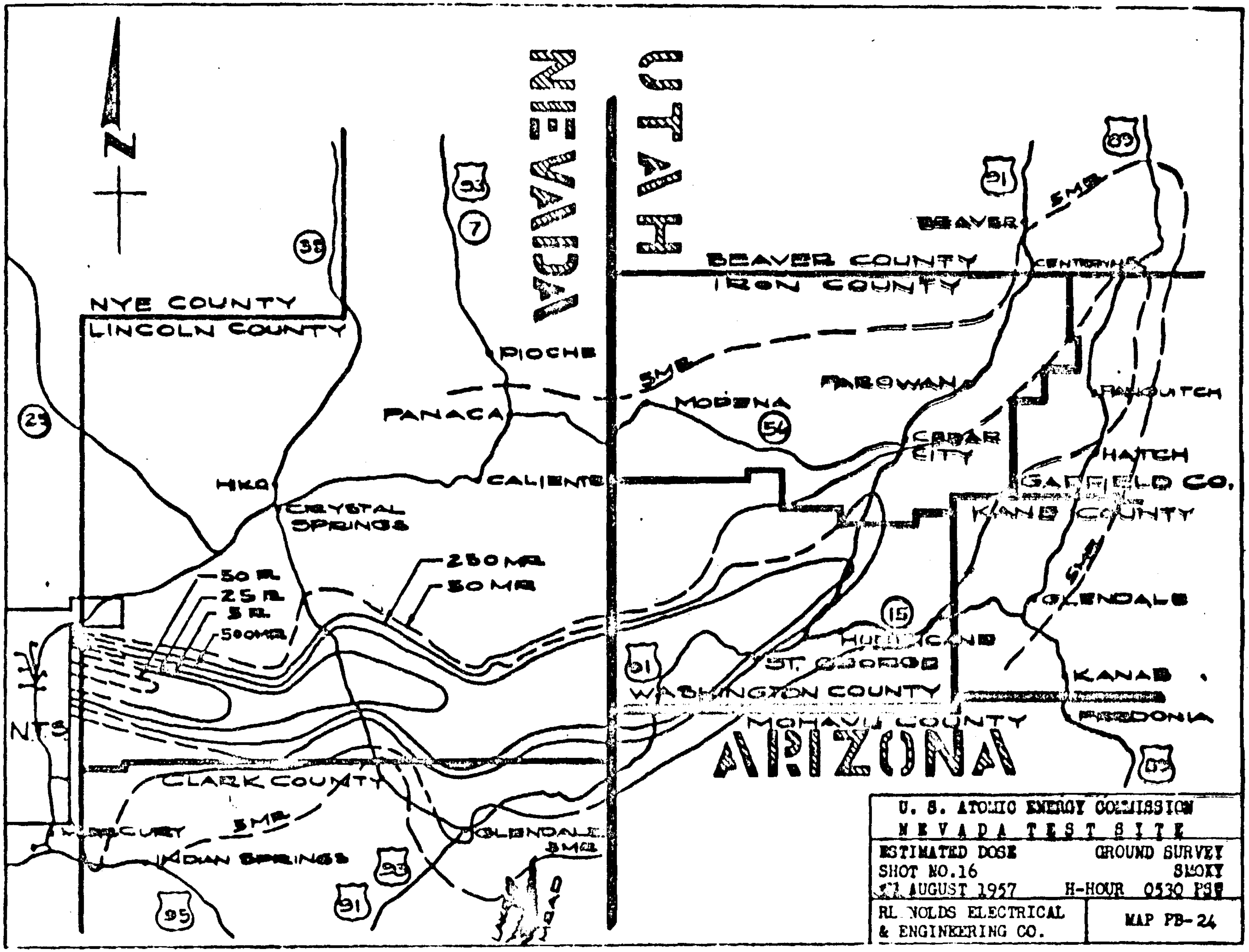

NEVADA
UTAH
ARIZONA
N
NYE COUNTY
LINCOLN COUNTY
BEAVER COUNTY
IRON COUNTY
GARFIELD CO.
KANE COUNTY
WASHINGTON COUNTY
MOHAVE COUNTY
CLARK COUNTY
PIOCHE
PANACA
CALIENTE
HIKO
CRYSTAL SPRINGS
MODENA
PAROWAN
CEDAR CITY
BEAVER
HATCH
GLENDALE
KANAB
FREDONIA
ST. GEORGE
MERCURY
INDIAN SPRINGS
NTS
5 MR
250 MR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

Figure 7 32

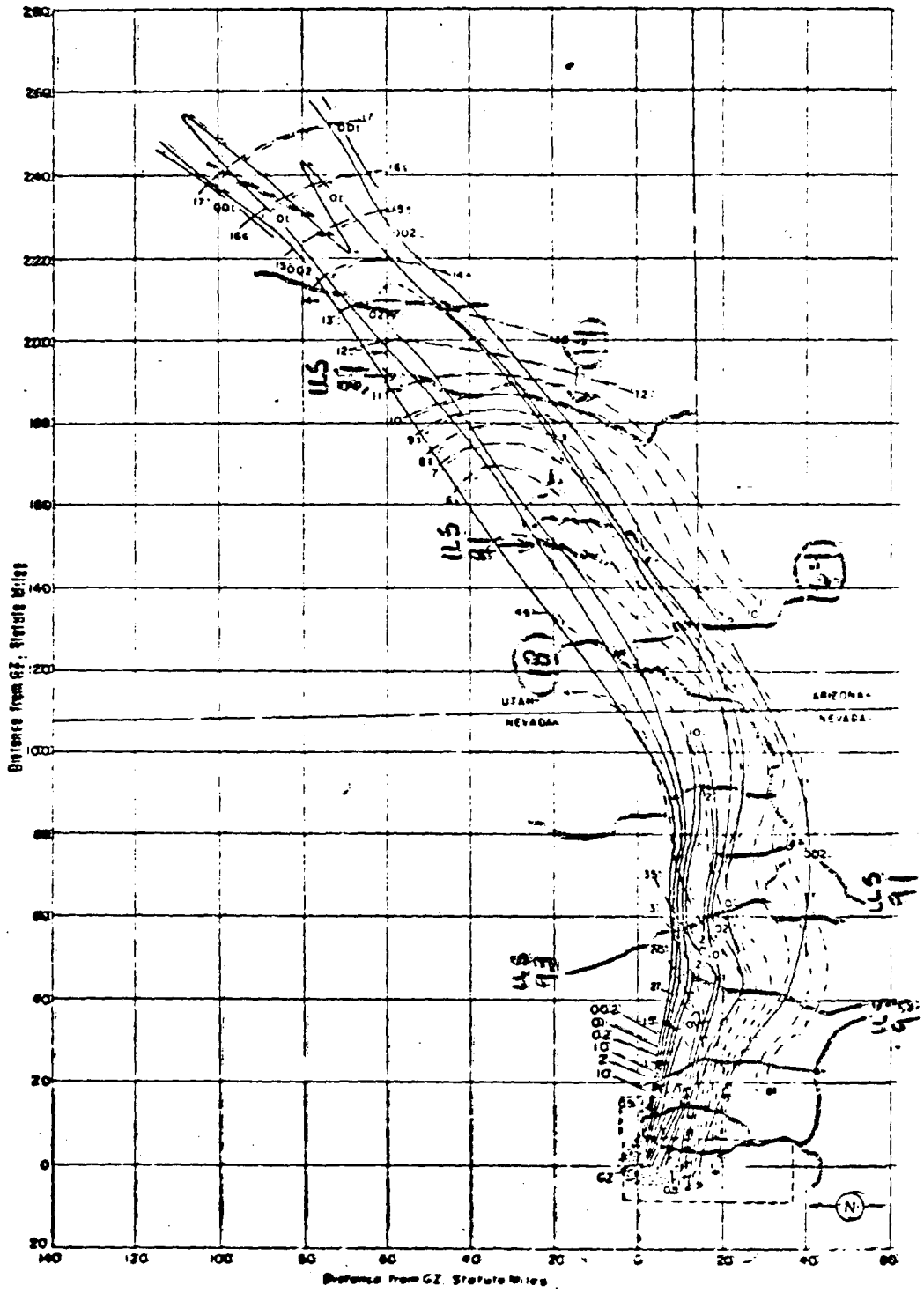
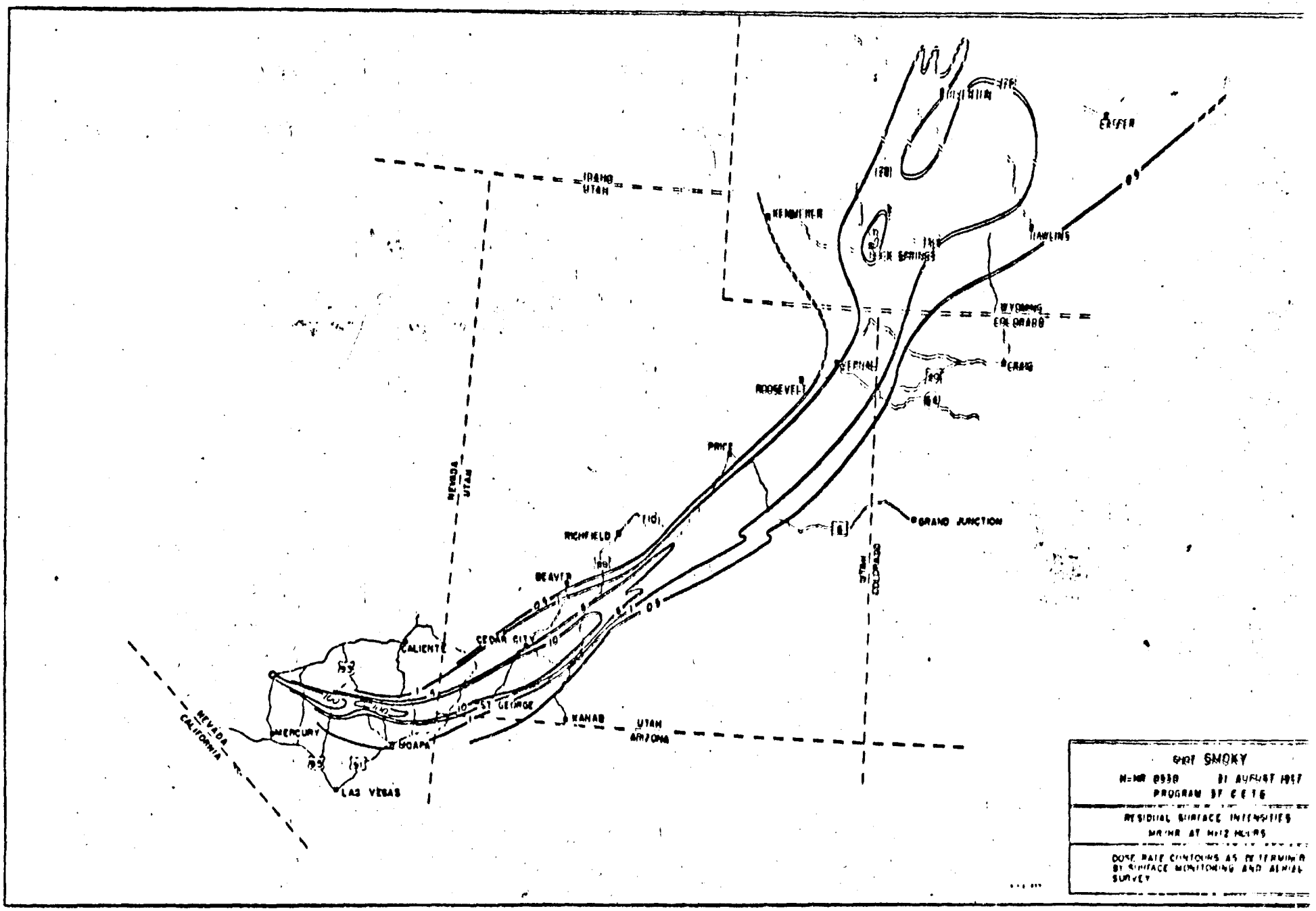
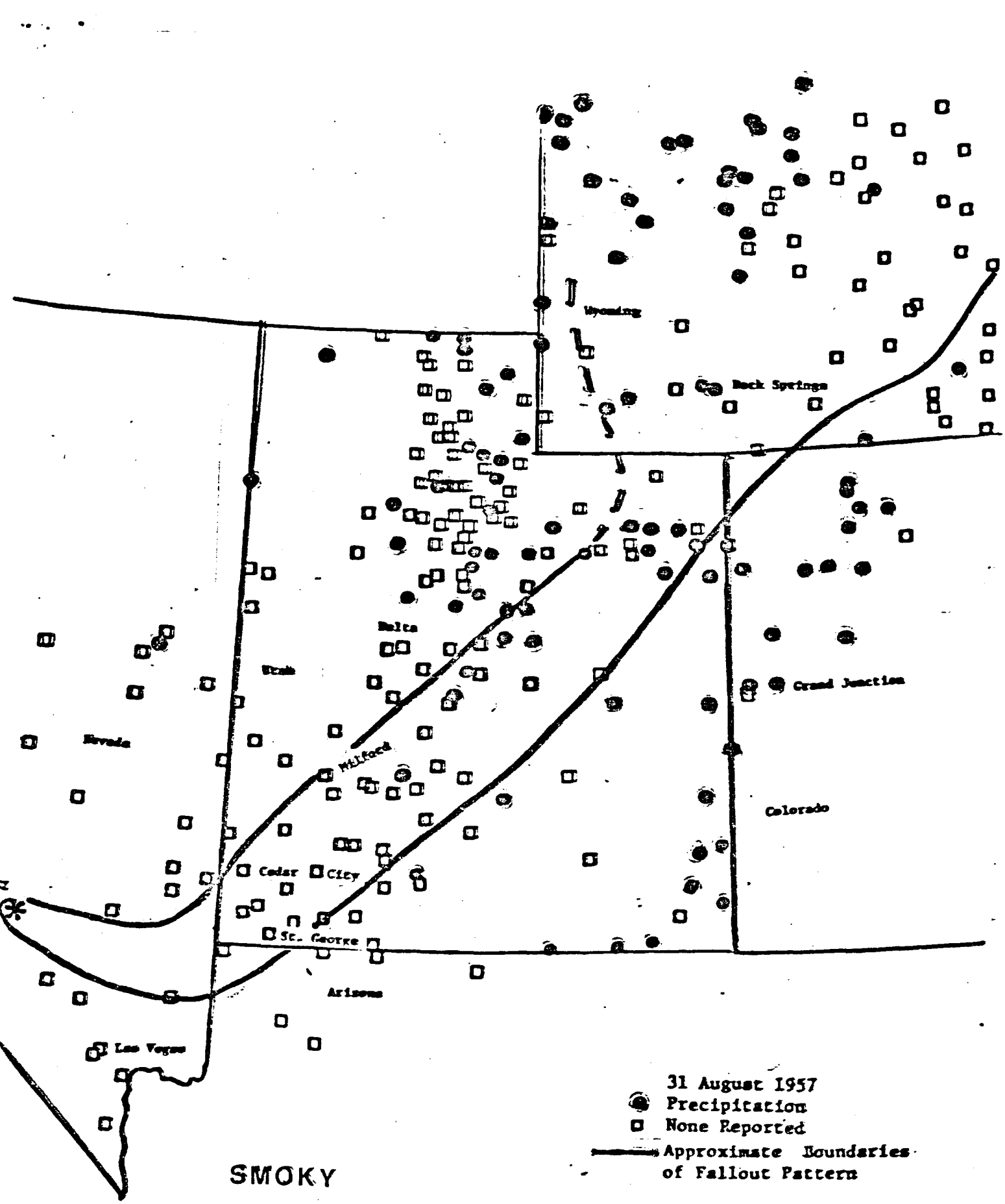
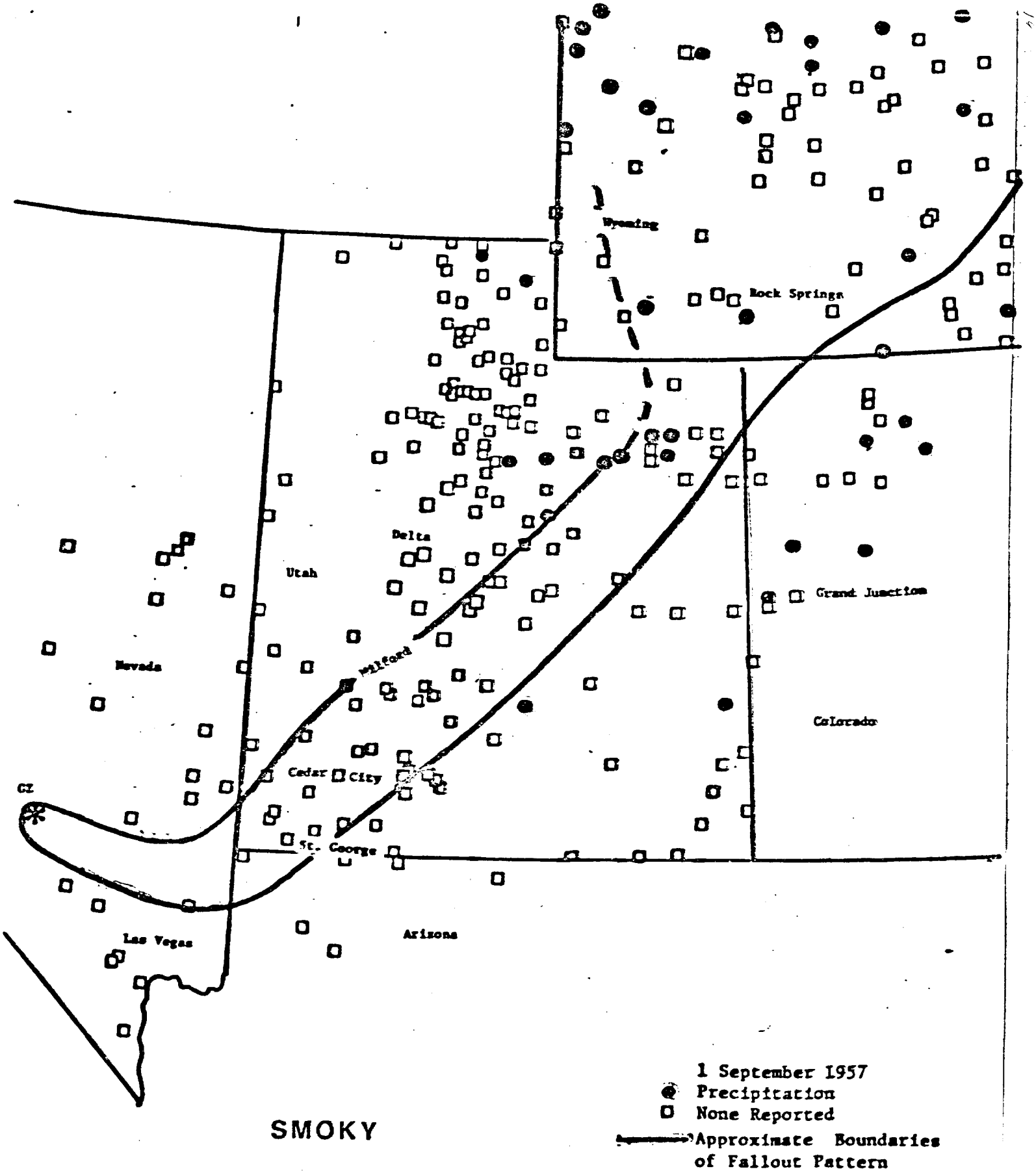


Figure 207. Operation PLUMBBOB - Smoky
Off-site dose rate contours in r/hr at H+1 hour.
GROUND MONITORED ROADS ——


IDAHO
UTAH
NEVADA
UTAH
WYOMING
COLORADO
UTAH
COLORADO
NEVADA
CALIFORNIA
UTAH
ARIZONA
KEMMERER
ERIFFER
HAWLINS
ROOSEVELT
PRICE
GRAND JUNCTION
RICHFIELD
BEAVER
CEDAR CITY
CALIENTE
ST GEORGE
KANAB
MERCURY
LAS VEGAS
SHOT SMOKY
PROGRAM 37 C E T G
RESIDUAL SURFACE INTENSITIES
MR/HR AT H+12 HOURS
DOSE RATE CONTOURS AS DETERMINED BY SURFACE MONITORING AND AERIAL SURVEY


Wyoming
Rock Springs
Utah
Nevada
Delta
Milford
Grand Junction
Colorado
Cedar City
St. George
Arizona
Las Vegas
SMOKY
31 August 1957
Precipitation
None Reported
Approximate Boundaries
of Fallout Pattern


Wyoming
Rock Springs
Utah
Delta
Nevada
Milford
Grand Junction
Colorado
GZ
Cedar City
St. George
Las Vegas
Arizona
SMOKY
1 September 1957
Precipitation
None Reported
Approximate Boundaries
of Fallout Pattern

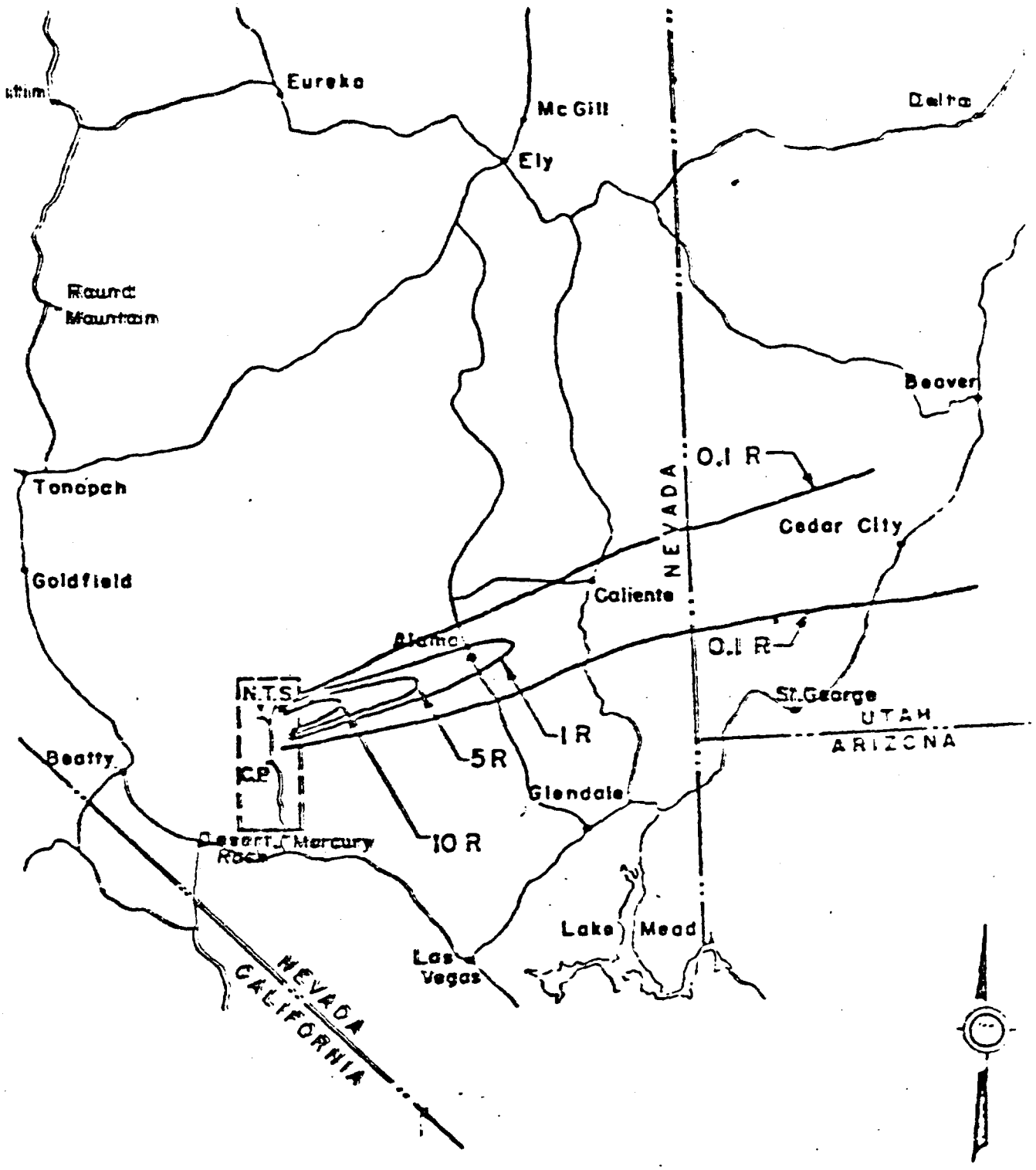


Figure 20. INFINITE DOSE FALLOUT PLOT FROM APPLE 1 SHOT, 29 MARCH 1955, 14.2 KT, 500-FOOT TOWER (Reference 30) (See Figure 21)

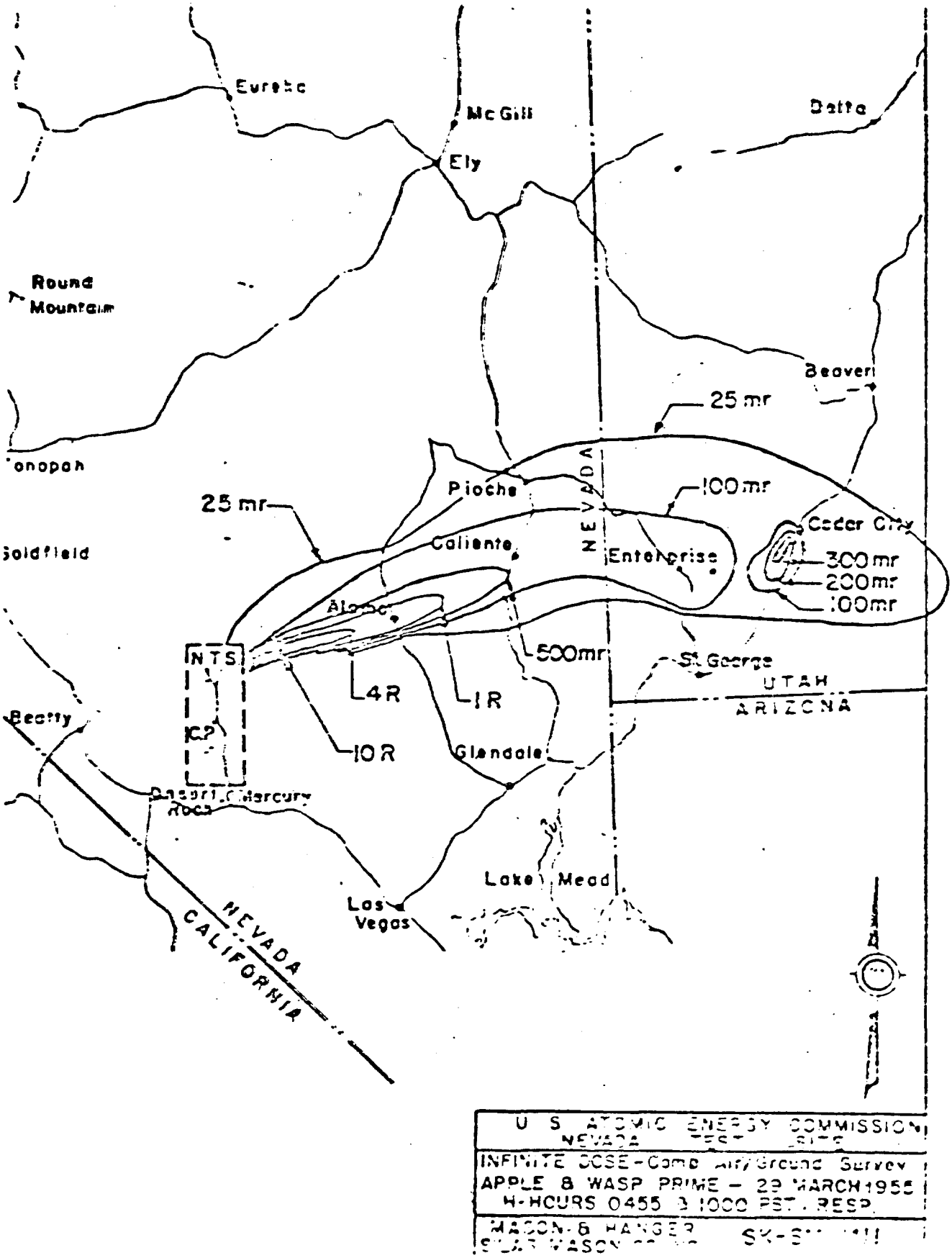
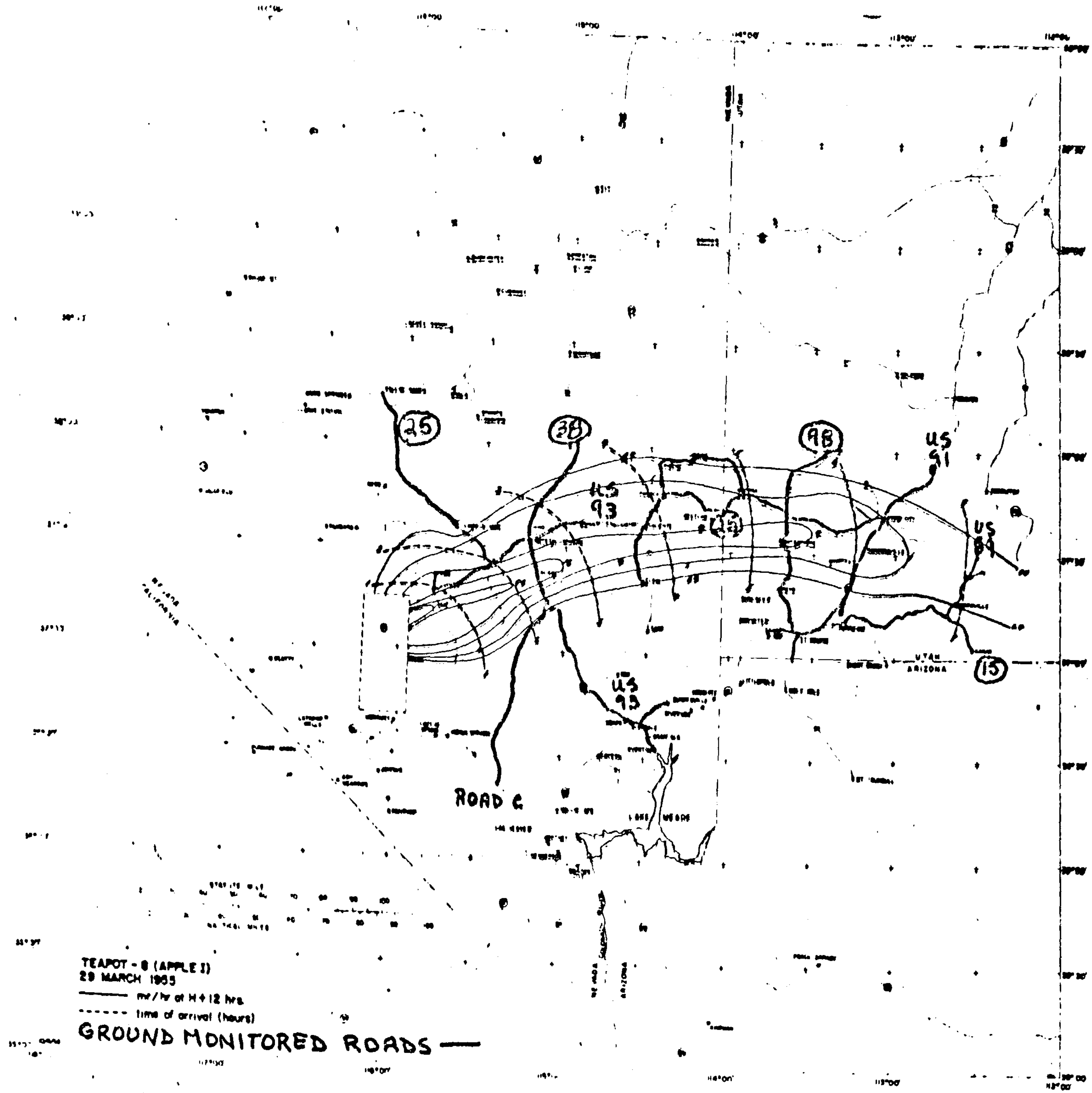


Figure 21. INFINITE DOSE FALLOUT PLAT FROM APPLE 1 SHOT, 29 MARCH 1955, 14.2 KT, 500-FOOT TOWER (Reference 30) (See Figure 20)


25
38
US 93
98
US 91
US 91
15
UTAH
ARIZONA
US 93
ROAD C
LAKE MEAD
TEAPOT - 8 (APPLE I)
29 MARCH 1955
mr/hr at H+12 hrs.
time of arrival (hours)
GROUND MONITORED ROADS

MONITORING LOG

Name St George Vehicle No. B18 Date 3-29-55 Shot No. VIII & IX

Time	Speedometer Reading	Location	Levels · mr/hr MX-5 Gross	MX-5 Bkgd	MX-5 Net	TI-B Gross	TI-B Bkgd	TI-B Net	Reported Time	Reported Via	Reported To	Instrument No. MX-5	Instrument No. TI-B
1130	11787	Jct 91 + 144	1.0	.03	3.97				1210	7	813	17510	
1135	11792	Kanarraville				10.0							927
1138	11794	2 mi N "				8.0							
1141	11796	4 mi N "				10.0							
1144	11798	6 mi N "				10.0							
1147	11799	Hamilton Fort	6.0			5.4							
1153	11804	Cedar City	3.0			3.0			↓				
1337	11812	" "				1.0			1525	9	813		
1343	11817	Hamilton Fort				3.2							
1350	11823	2 mi S "				4.6							
1355	11825	Kanarraville				3.6							
1400	11829	Jct 91 + 144				2.8	.03	2.77					
1408	11834	5 mi S. Jct 91+144				.60	.03	.57					
1410	11835	6 mi S " 91+144				.40	.03	.37					
1413	11840	Pintura	.07	.03	.04	1.10	.03	0.7					
1420	11845	Anderson Jct	.05	.03	.02								

Form 1 Page 1 of 3

Zone ST GEORGE 3-29-55 Shot No. VIII + T

Monitors Name and Sheet No	Time from H-hour	Location	Net Level mr/hr	Assumed Time of Fallout from H-Hour	Calculated Intensity at Time of Fallout mr/hr
CUSTOMS MACOMBER # 1					
SHEET 1 OF 3	+5.0	10 MI N PINTURA HWY 91 W END NEW HARMONY	4.97	H+5.0	
" 1 " 3	+5.5	W END NEW HARMONY	3.97	H+5.0	
" 1 " 3	+5.5	E END SIN " "	3.17	H+5.0	
" 1 " 3	+5.5	FP 455	2.98	H+5.0	
" 2 " 3	45.53	JCT HWY 91-144	3.97	H+5.0	
" 2 " 3	45.66	KANARRAVILLE	10.00	H+5.0	
" 2 " 3	45.69	2 MI N "	8.00	H+5.0	
" 2 " 3	45.70	4 MI N "	10.00	H+5.0	
" 2 " 3	45.83	6 MI N "	10.00	H+5.1	
" 2 " 3	+5.9	HAMILTON FORT	6.00	H+5.1	
" 2 " 3	+6.0	CEDAR CITY	3.00	H+5.2	
" 2 " 3	+7.66	CEDAR CITY	1.00	"	
" 2 " 3	7.69	HAMILTON FORT	3.20	H+5.1	
" 2 " 3	+7.83	6 MI S " "	4.60	"	
[illegible]	[illegible]	KANARRAVILLE	[illegible]	[illegible]	
" 2 " 3	8.08	JCT HWY 91+144	2.80	"	
" 2 " 3	+8.16	5 MI S JCT 91+144	.60	"	
" 2 " 3	+8.25	6 MI S JCT 91+144		"	

MONITORING LOG

COTTON + MACOMBER

Name: ST GEORGE Vehicle No. 1318 Date 5-24-55 Shot No. VIII + IX

Time	Speedometer Reading	Location	Levels mr/hr MX-5 Gross	MX-5 Bkgd	MX-5 Net	TI-B Gross	TI-B Bkgd	TI-B Net	Reported Time	Reported Via	Reported To	Instrument No. MX-5	Instrument No. TI-B
0935	11704	ST GEORGE JCT 91 + 18	.02	.03	0				1010	9	81	11510	
0945	11712	SANTA CLARA	.02	.03	0								
0949	1171	5 MI S SANTA CLARA	.02	.02	0								
0955	11720	10 MI S "	.02	.03	0								
1001	11731	ST GEORGE JCT 91 + 18	.02	.03	0								
1022	[illegible]	ST GEORGE CITY LIMITS	.03	.03	0								
1027	1171	WASHINGTON	.03	.03	0				1200	7	813		
1030	11735	JCT 91 + 15 HARRISBURG Jc	.02	.03	0								
1037	1175	LEEDS	.02	.03	0								
1043	11751	ANDERSON Jc	.01	.03	0								
1049	11751	PINTURA	.03	.03	0								
1053	11761	5 MI N PINTURA	30	.03	27								
1100	11777	10 MI N "	5.0	.03	4.97								
1120	11781	N END OF TOWN NEW HARMONY	4.0	.03	3.97	3.2	.03	3.17					927
1123	1178	" E END SCH "				3.2	.03	3.17					
1125	11785	FB AT 1105 1 MI E NEW HARMONY	3.0	.02	2.98	3.0	.02	2.98					

Form 1 Sheet 1 of 3

MONITORING LOG

Name St George Vehicle No. B18 Date 3-29-55 Shot No. VIII

Time	Speedometer Reading	Location	Levels - mr/hr MX-5 Gross	MX-5 Bkgd	MX-5 Net	TI-B Gross	TI-B Bkgd	TI-B Net	Reported Time	Reported Via	Reported To	Instrument MX-5
1437	11850	LEEDS	.04	.03	.01				1200	9	813	17510
1447	11857	ANDERSON VOT	.05	.03	.02				↓			
1454	11862	WASHINGTON	.05	.03	.02							
1515	11867	St George	.04	.03	.01							

Form 1 Sheet 3 of 3

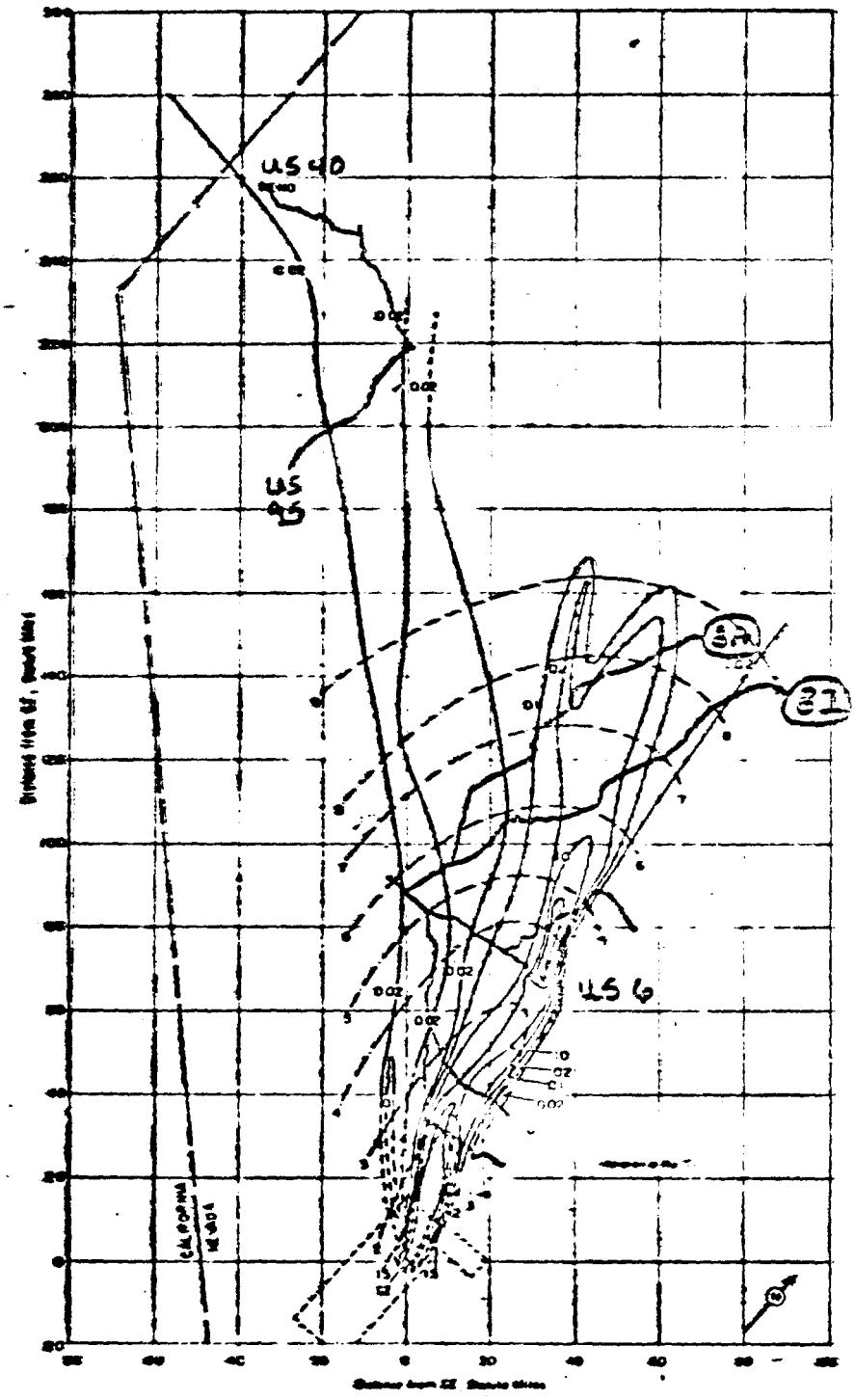
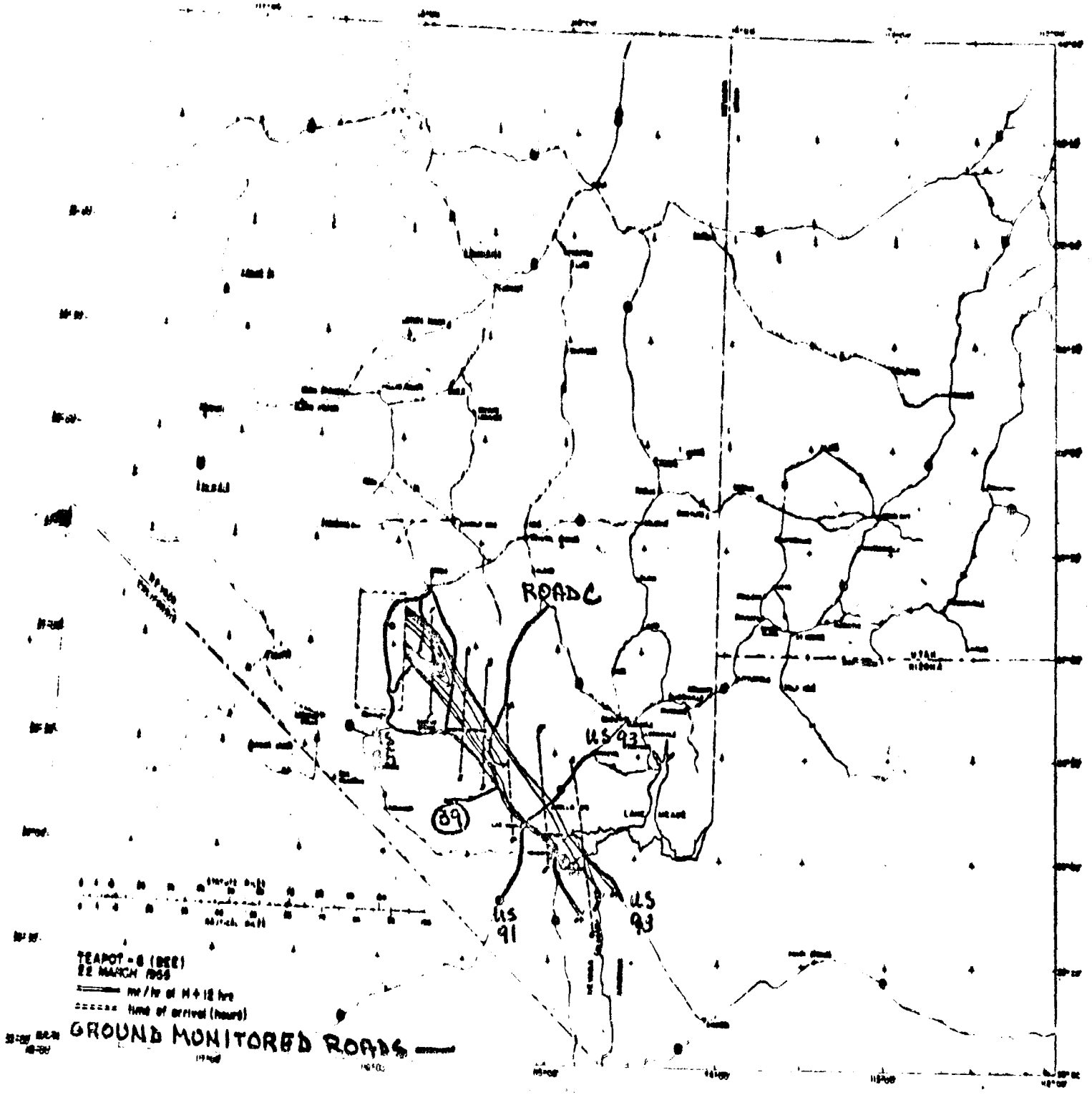
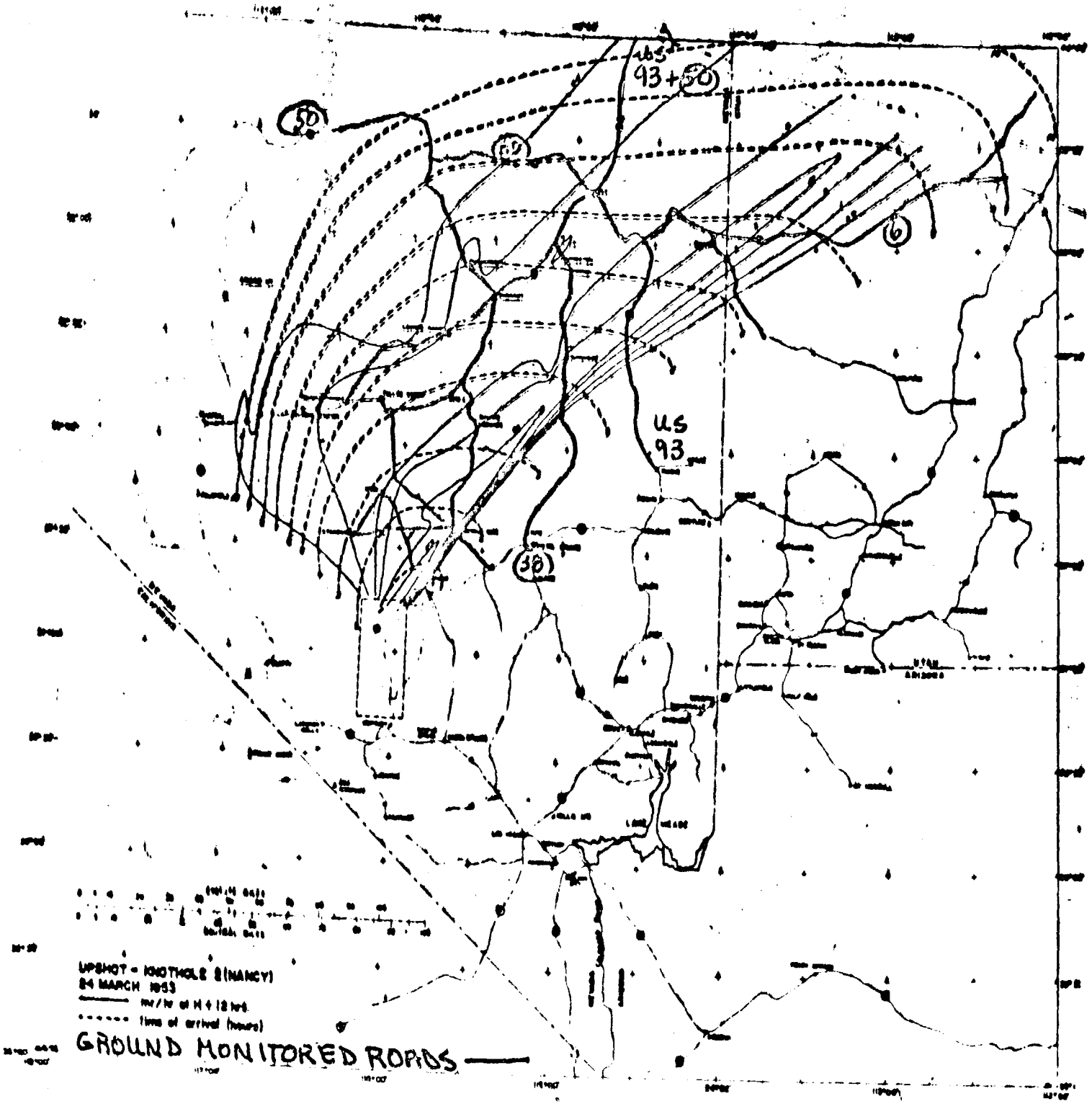


Figure 169. Operation PLUMBBOB - Boltzmann. Off-site dose rate contours in r/hr at H+1 hour.

GROUND MONITORED ROADS ——


ROAD C
US 93
89
US 91
US 93
TEAPOT - 6 (BEE)
22 MARCH 1966
mr/hr at H+12 hrs
time of arrival (hours)
GROUND MONITORED ROADS


US 93 + 50
50
6
US 93
30
UPSHOT - KNOTHOLE 8 (NANCY)
24 MARCH 1953
GROUND MONITORED ROADS

BACKGROUND READINGS - UINTA MOUNTAINS

1962 - 1968

September 1962

1. Upper Ottoson Cirque - 4 September 1963.

   a. Background reading on soil and plants from drainage area at base of large rock. 0.6 mR/hr.

   b. Sheep manure collected from meadow. 0.1 mR/hr.

   c. "Background sampling using an Eberline Model 1510 geiger counter showed up to 0.5 mR/hr in some plants at the bases of rock slides. Highest background was found in plant corpses near talus slopes 0.2 (taken with probe open). Background at 1 meter above surface was 0.05 mR/hr."

2. Cleveland Ridge - 6 September 1962

   "Top of ridge between Ottoson Basin and East Basin 11,600 feet. Background 0.05 mR/hr at three feet; 0.1 - .15 mR/hr at surface."

September 1963

1. Upper Ottoson Cirque - 2 September 1963.

   a. Background 1 meter above ground - beta shield closed.

      0.029±.007 mR/hr.

   b. Reading at ground level with beta shield open.

      0.430±.045 mR/hr.

   c. Readings at ground level with beta shield open. 10 meters from talus slope.

      0.270±.027 mR/hr.

   d. Readings at ground level with beta shield open. 20 meters from talus slope.

      0.118±.061 mR/hr.

e. Reading at ground level 30 meters from talus slope.

mean 0.143±.008 mR/hr.

f. Readings at ground level 40 meters from talus slope.

0.113±.021 mR/hr.

2. Readings of 0.6 mR/hr found at 11,900' – snow melt basin – Ottoson Cirque rim.

3. Cleveland Ridge – 1 September 1961

a. Top of ridge. Background 0.13 mR/hr.

b. West end of lake and bottom of rock slide.
Wet meadow between lake and rock slide. Background 0.15 mR/hr.

4. East side of Lake Fork from base of Mt. Lovenia to base of Mt. Wilson – 8 September 1963.

a. Reading with E-510 probe in contact with soil at base of large sloping rock – 0.6 mR/hr.

b. Lower area than (a) where heavy wash-off had occurred – 0.5 – 0.7 mR/hr.

c. Reading with E-510 probe in contact with soil, 100 yards higher on slope than (a) 0.6 – 0.9 mR/hr.

September 1964

1. Upper Ottoson Cirque – 3 September 1964.

a. Background reading – 1 meter above surface, beta shield closed.

0.030±.008 mR/hr.

b. Soil surface, base of sloping rock two meters square surface for runoff. Beta shield open, at contact of soil and rock.

0.495±.064 mR/hr.

c. Soil surface one decimeter from rock – same location.

0.355±.060 mR/hr.

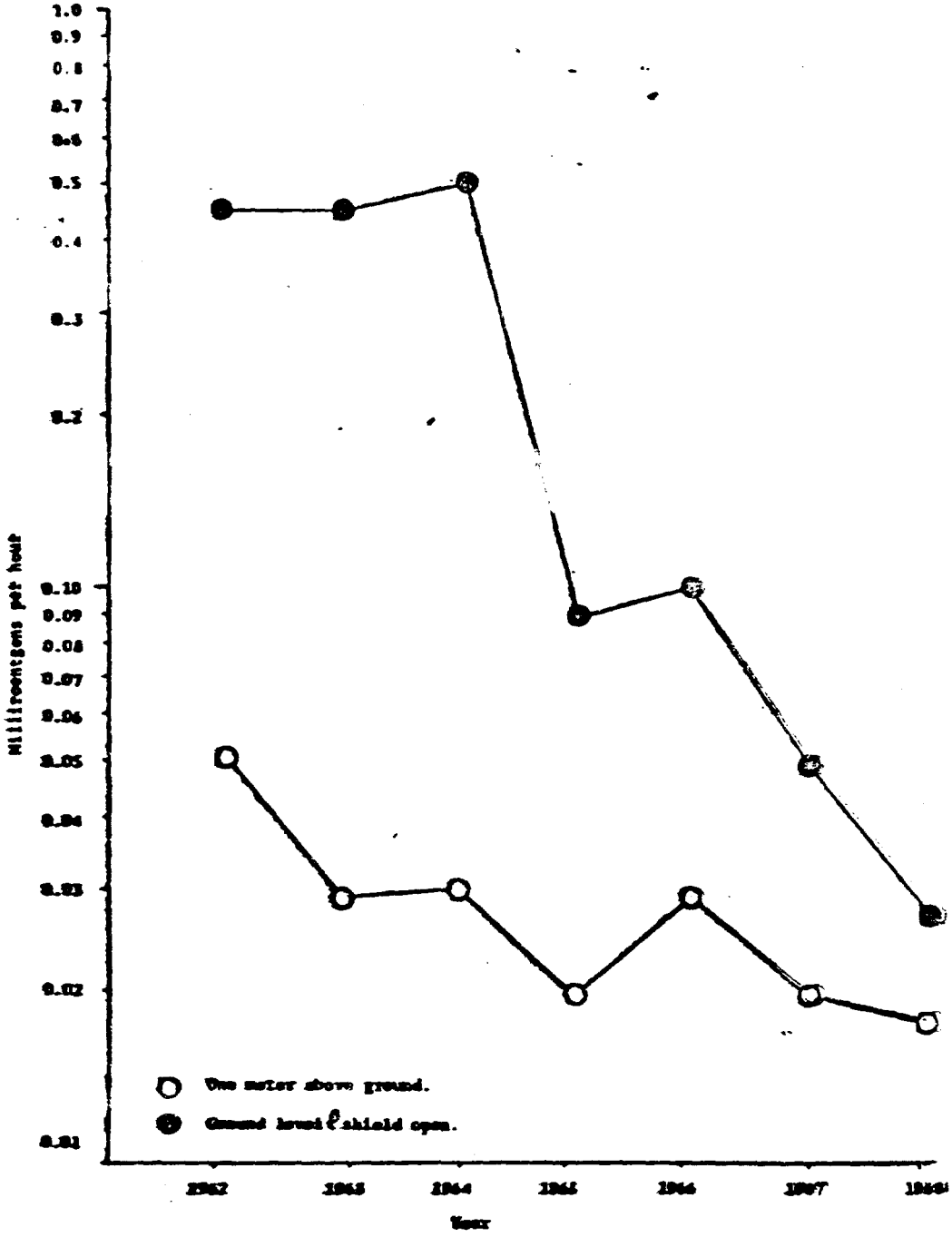
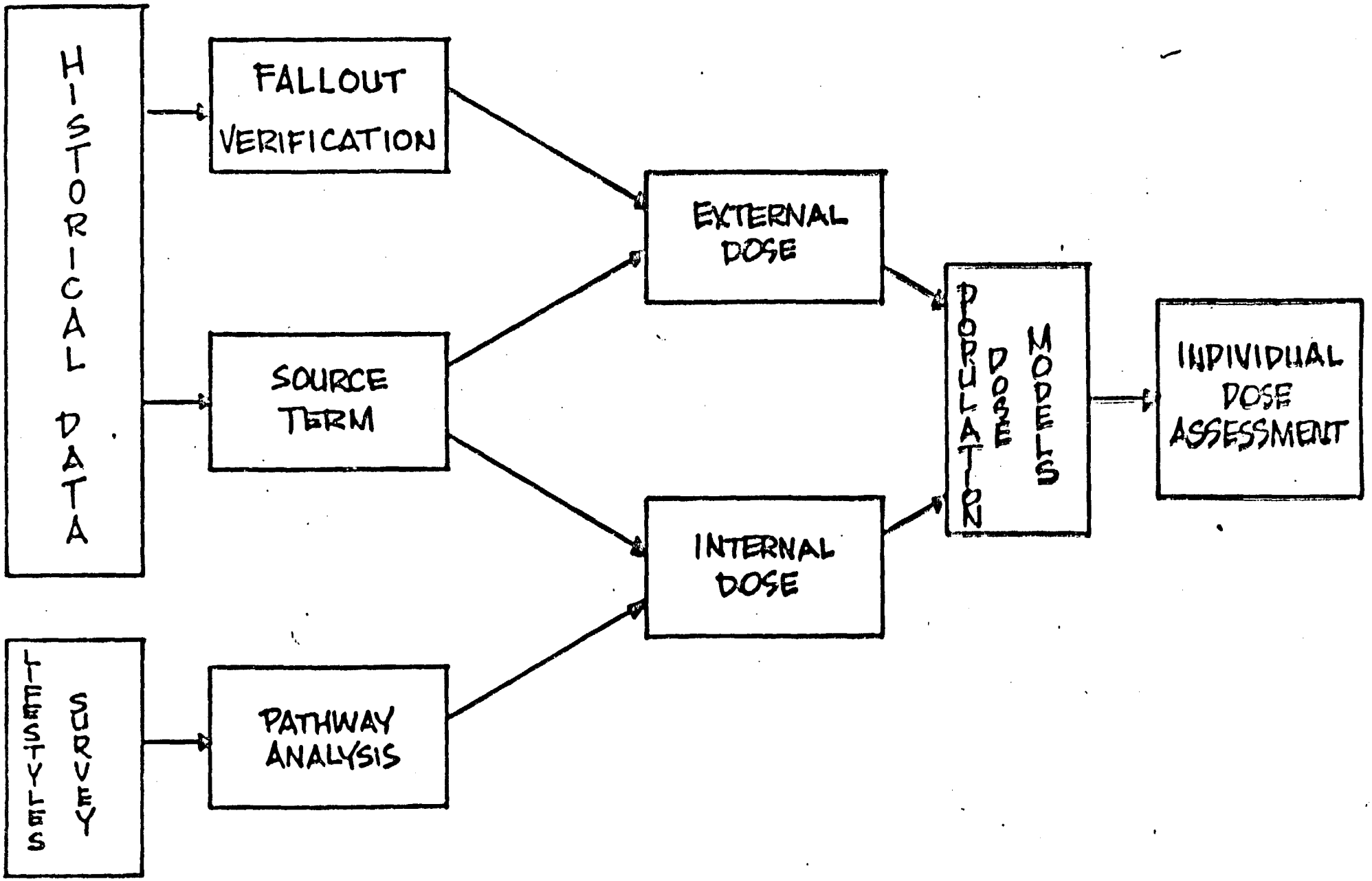


Fig. 36. Annual measurement of gross beta-gamma activity at the base of the talus slope in Ottoson Basin Cirque.

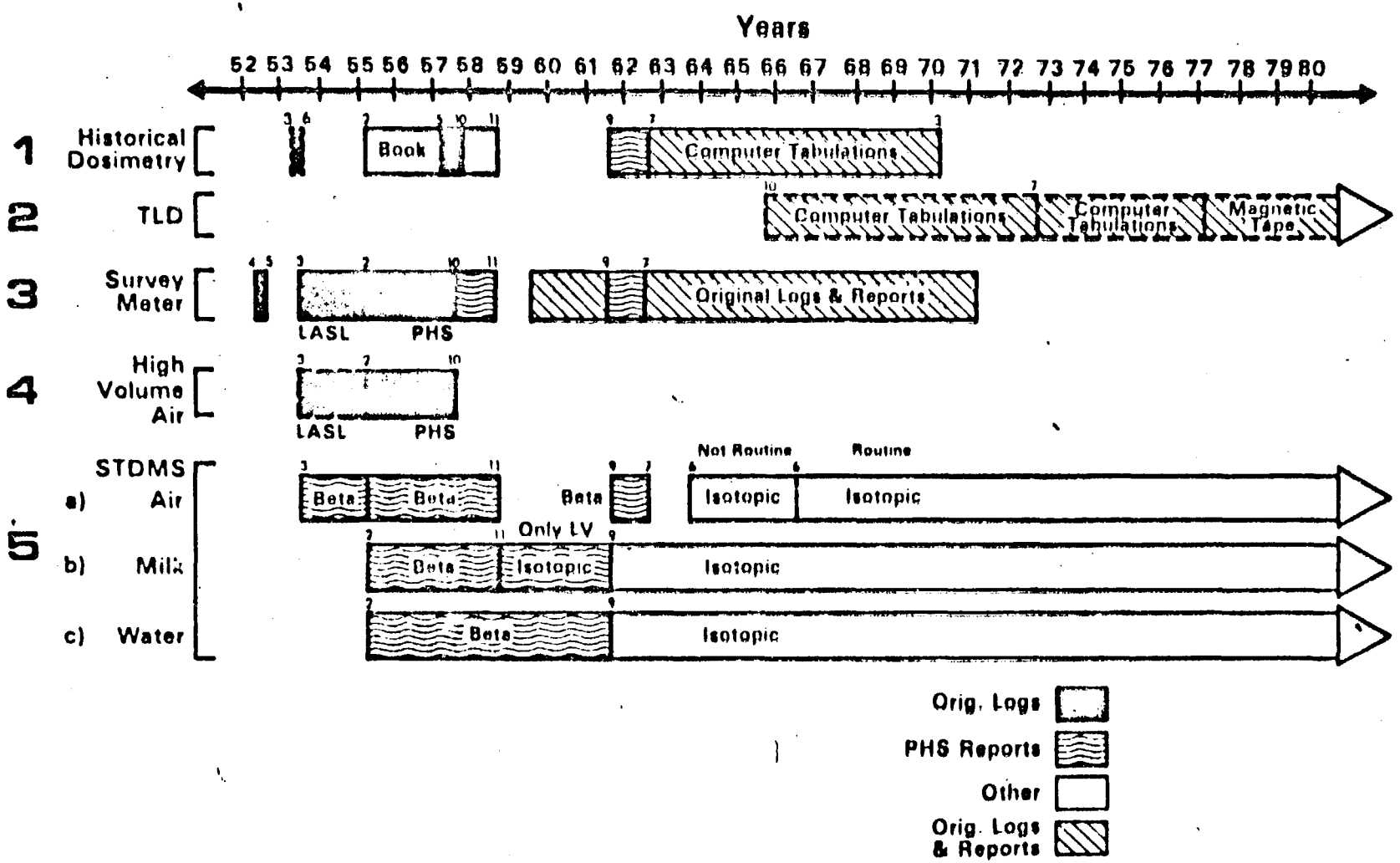
OFFSITE RADIATION EXPOSURE REVIEW PROJECT

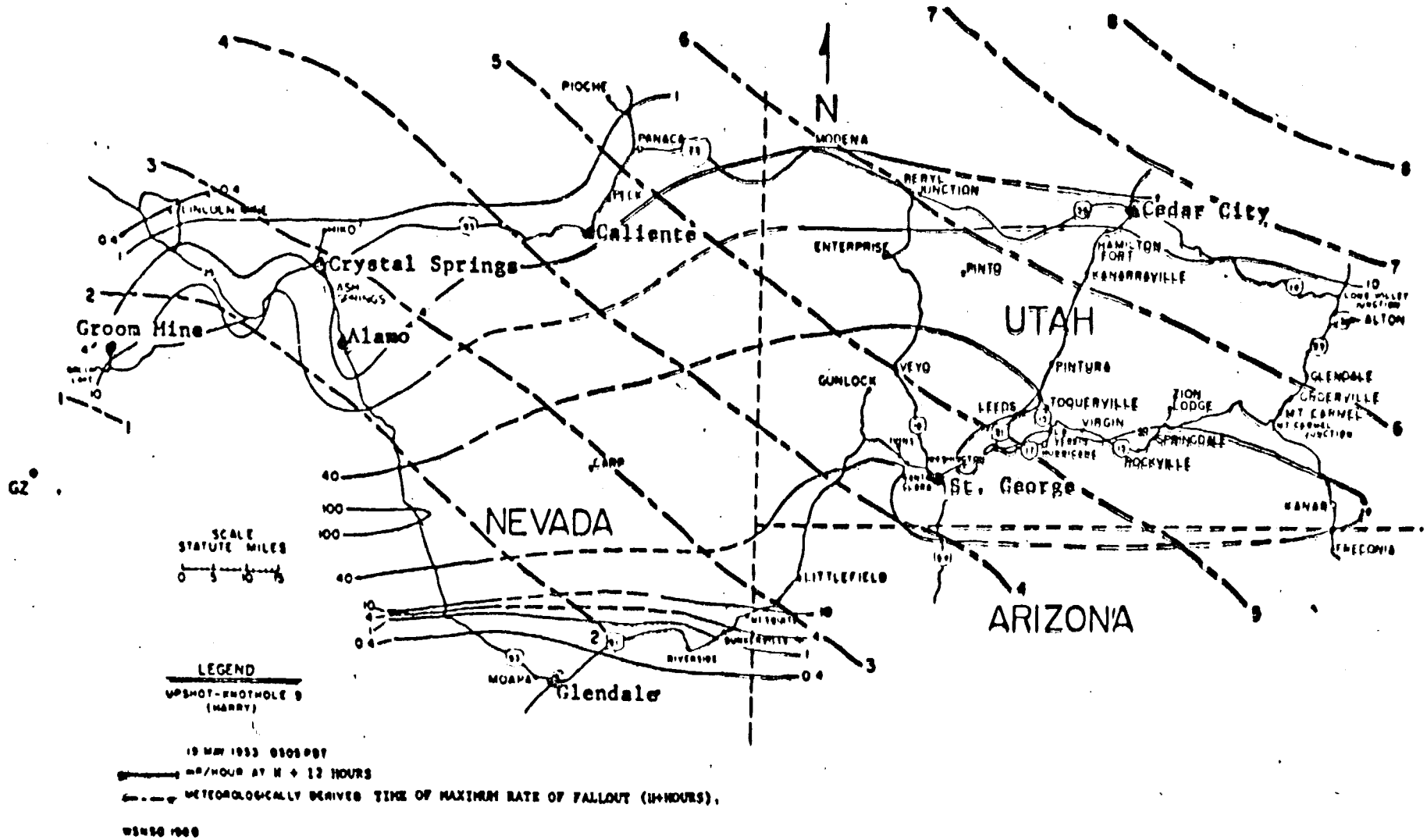
UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE • LAS VEGAS, NEVADA

OFF-SITE RADIATION EXPOSURE REVIEW PROJECT
OFF-SITE DOSE ASSESSMENT

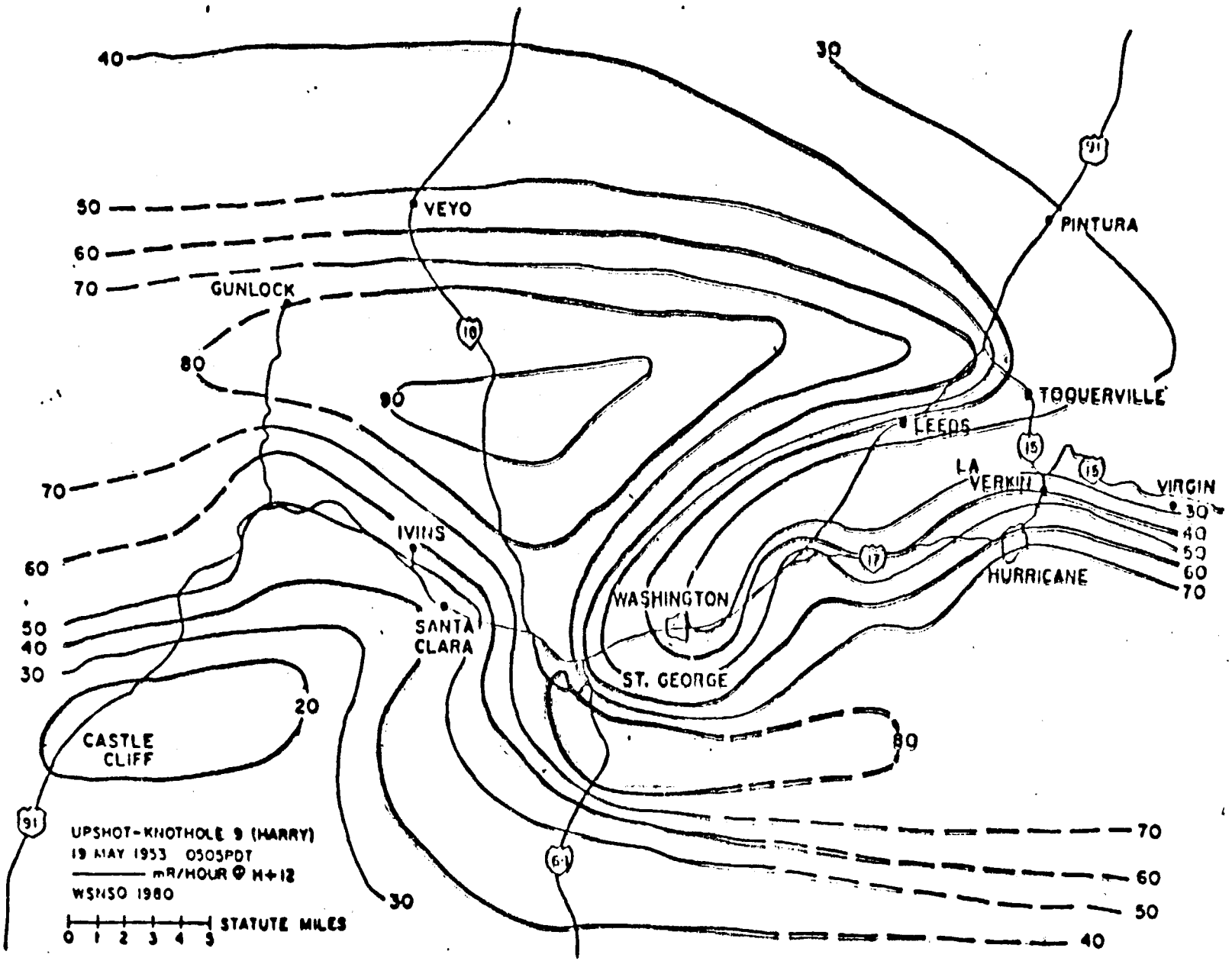


Data Bases Maintained on DOE CDC 6400 Computer by EPA

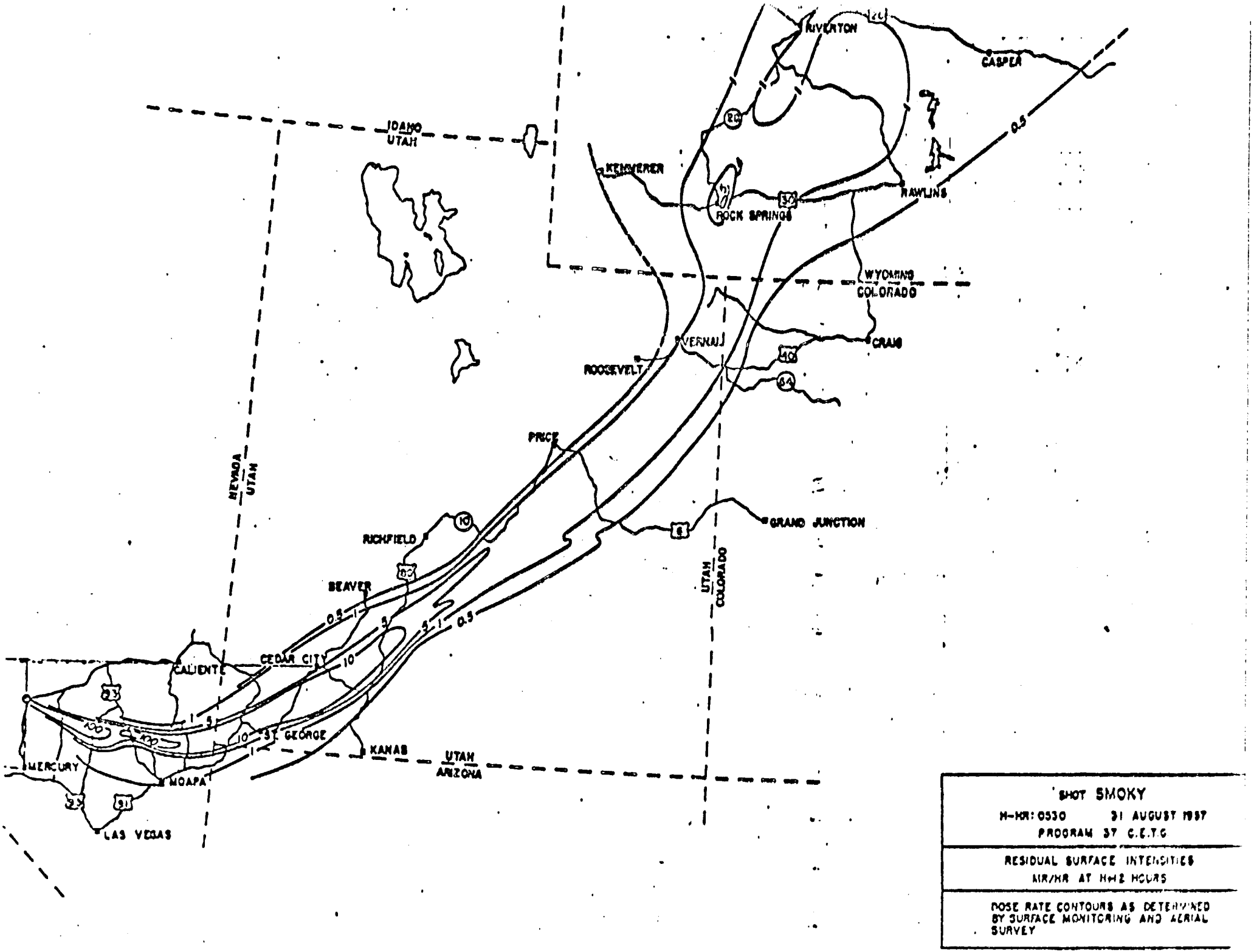


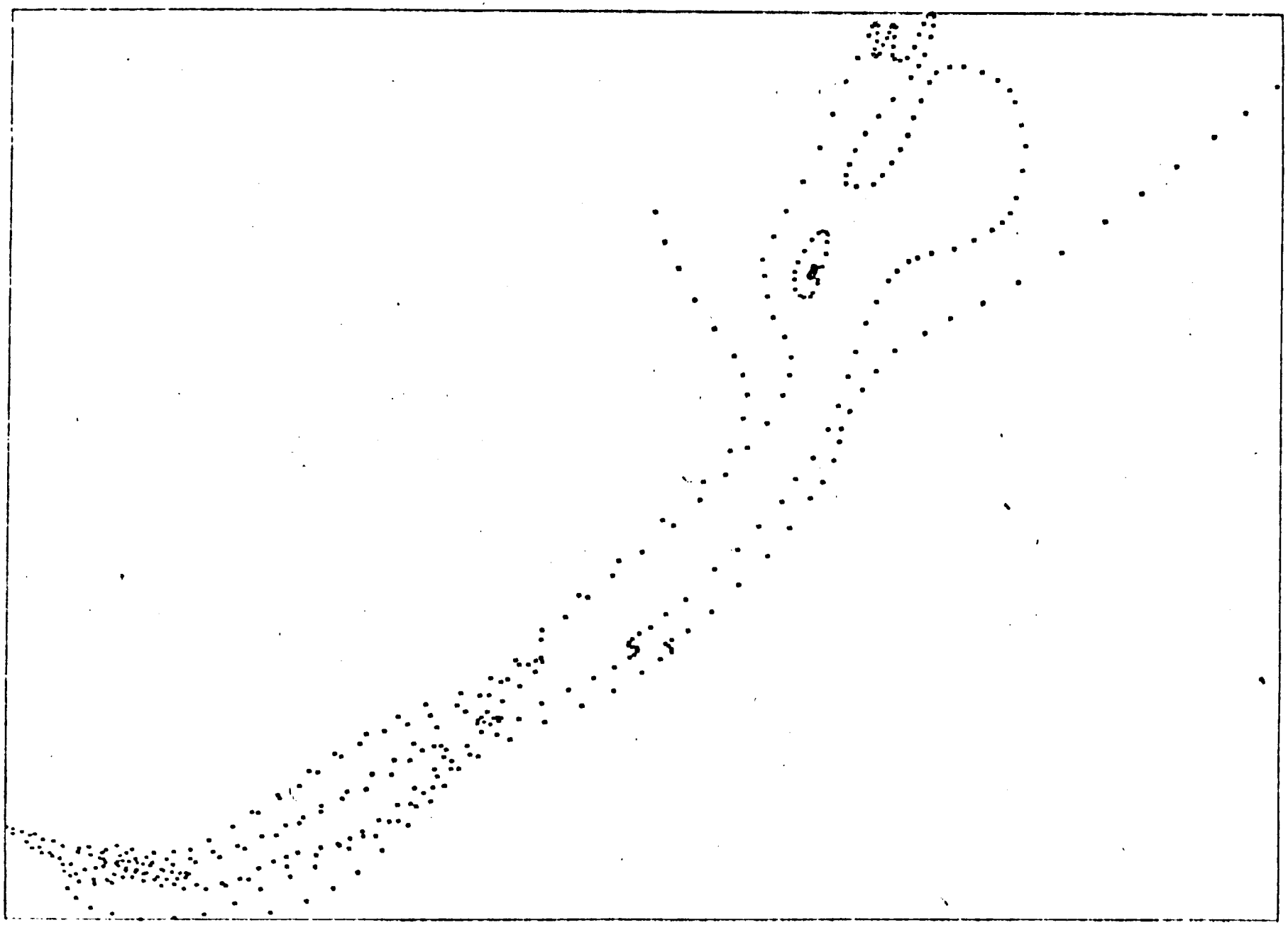


Extended range fallout pattern contours (mR/hr at H + 12 hours) and meteorologically derived time of maximum rate of fallout (H + HOURS).



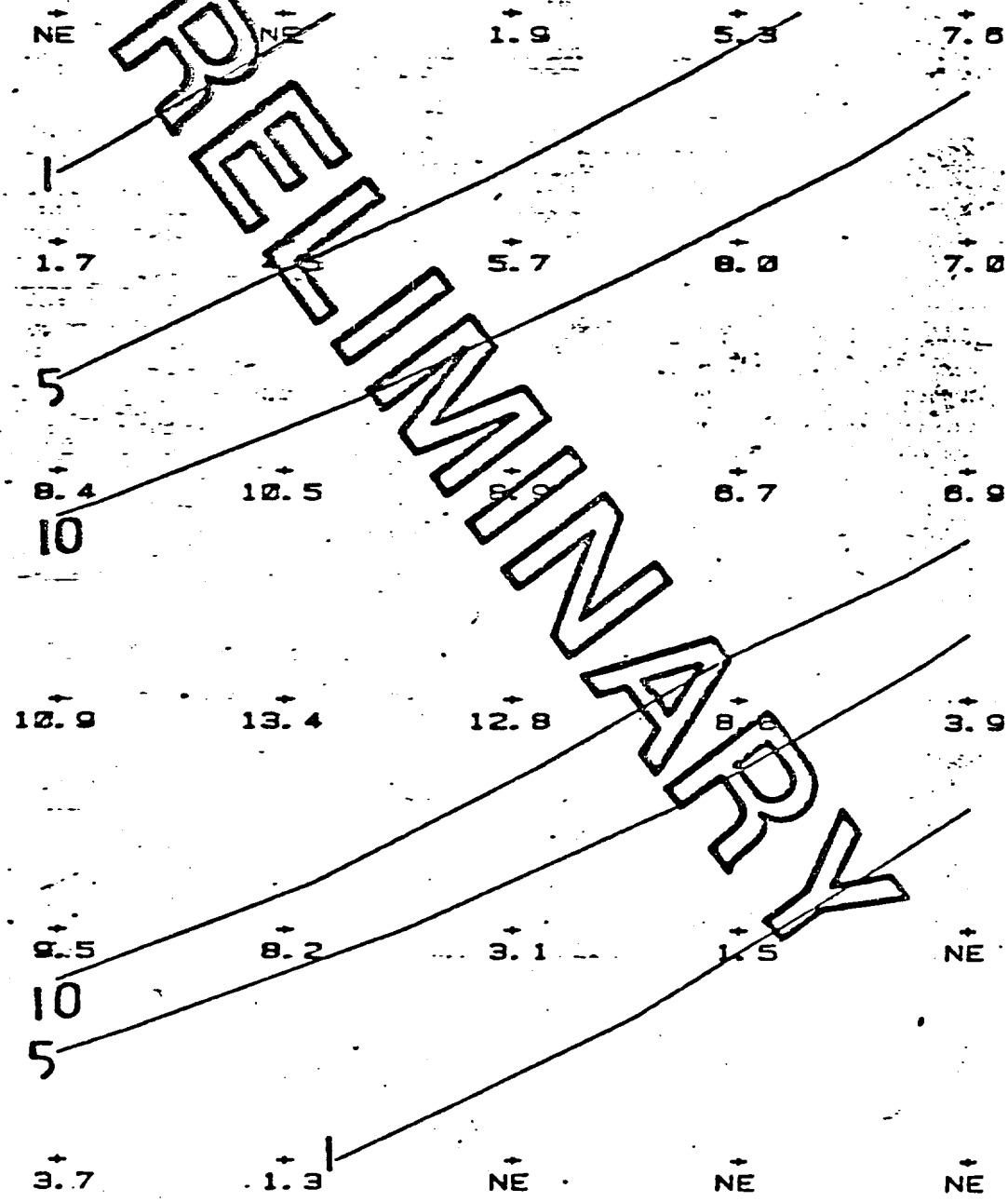
Detailed fallout pattern in the vicinity of St. George, Utah, mR/hour at H + 12 hours.


RIVERTON
CASPER
IDAHO
UTAH
KEMMERER
ROCK SPRINGS
RAWLINS
WYOMING
COLORADO
VERNAL
CRAIG
ROOSEVELT
PRICE
GRAND JUNCTION
NEVADA
UTAH
RICHFIELD
BEAVER
CEDAR CITY
CALIENTE
ST GEORGE
KANAB
UTAH
ARIZONA
MERCURY
MOAPA
LAS VEGAS
0.5
1
5
10
SHOT SMOKY
H-HR: 0530 31 AUGUST 1957
PROGRAM 37 C.E.T.G
RESIDUAL SURFACE INTENSITIES
MR/HR AT H+8 HOURS
DOSE RATE CONTOURS AS DETERMINED BY SURFACE MONITORING AND AERIAL SURVEY



The digitized H+12 hour exposure rate contours for shot SMOKY

Enlarged area from shot Smoky contours showing 10 km grid estimates of H+12 hour exposure rate. All values shown are in mR/h. NE means no estimate was made. Historical contours are shown for comparison.



PRELIMINARY

SHOT: HARRY

COUNTY: Washington

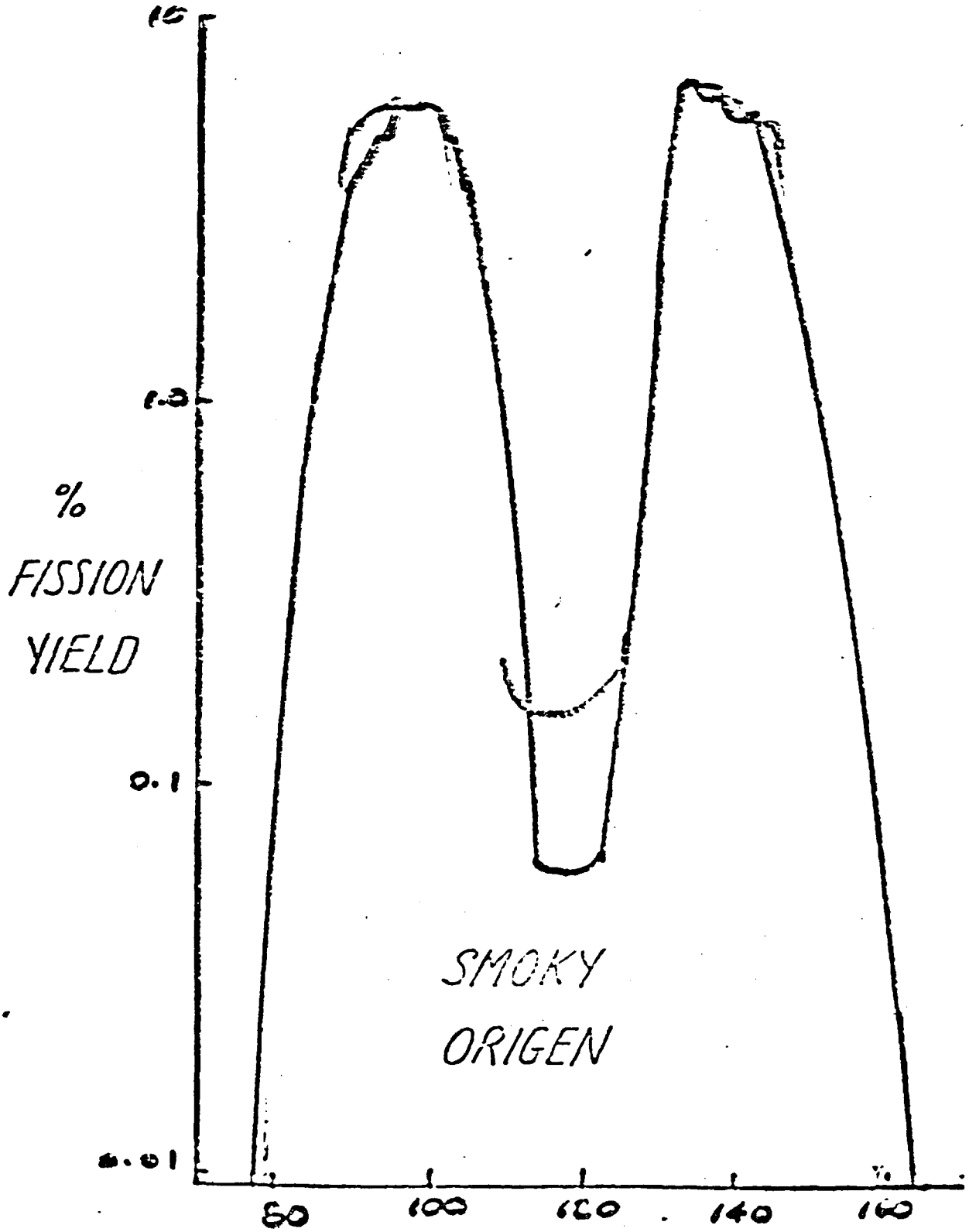
Location	Est. H+12 Exp. (mR/h)	Error Est. H + 12	Time of Arrival	Error on Time Est.	Population Estimate
Anderson Jct.	36.2	2.0	5.2		17
Central	47.1	1.2	5.1		41
Enterprise	13.0	0.8	5.6		811
Gunlock	65.1	2.1	4.8		100
Hurricane	47.0	5.3	5.0		1265
Ivins	66.4	2.4	4.5		30
La Verkin	43.5	4.4	5.0		380
Leeds	38.0	4.1	5.0		145
New Harmony	18.9	1.6	6.0		120
Pine Valley	47.2	3.2	5.2		25
Pintura	30.5	0.8	5.5		50
Rockville	38.3	3.2	5.1		300
St. George	73.5	3.4	4.3		4732
Santa Clara	62.8	2.1	4.4		311
Shivwits	53.1	2.7	4.3		95
Springdale	37.6	8.4	5.3		196
Toquerville	36.4	2.3	5.1		142
Veyo	63.6	1.2	5.0		84
Virgin	41.5	5.1	5.1		140
Washington	65.1	3.0	4.7		438
Zion Lodge	37.7	8.2	5.3		15

PRELIMINARY

SOURCE TERM CALCULATIONS

HARRY G. HICKS
LLNL

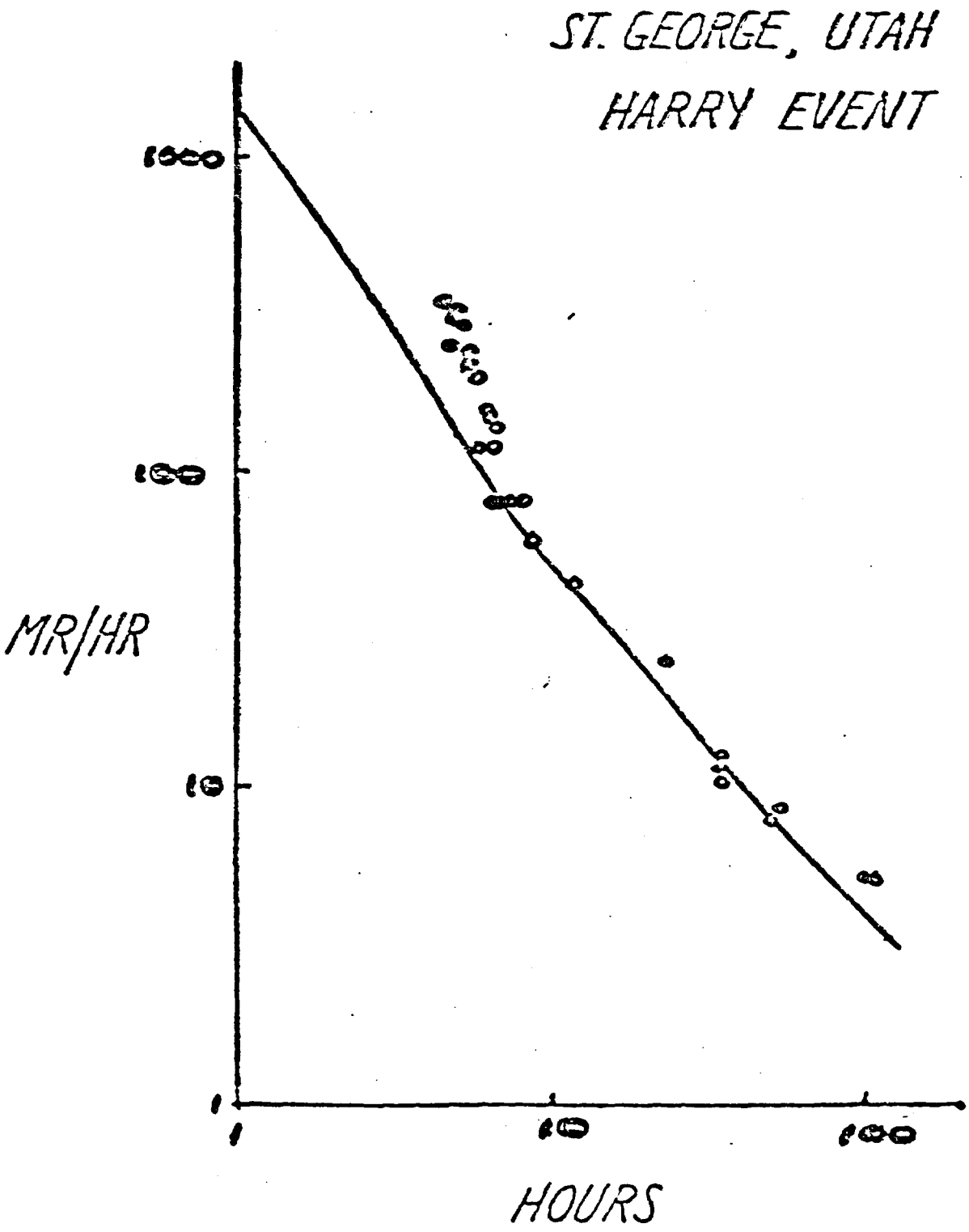
FISSION PRODUCT DISTRIBUTION IS UNIQUE



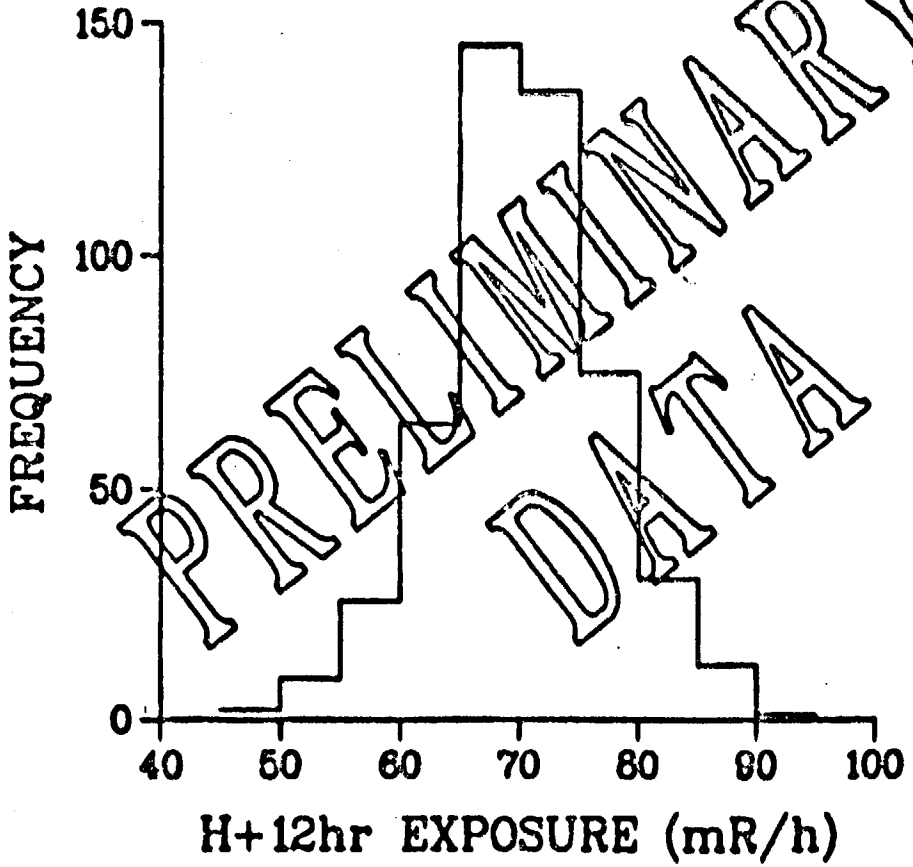
HARRY MICROCURIES/SQ METER
MR/HR AT H+12 HOURS = 1.000
FRACTION OF REFRACTORIES PRESENT = 0.500
RELAXATION LENGTH = 0.16 GM/SQCM
BOMB FRACTION PER SQ. METER = 1.798E-13

DEBRIS DECAY FROM 1 TO 50 YEARS

	ZERO TIME	1.00E+00	1.50E+00	2.00E+00	3.50E+00	5.00E+00	7.00E+00	1.00E+01	2.00E+01	3.50E+01	5.00E+01
BE 7	1.90E-06	1.64E-08	1.52E-09	1.42E-10	1.14E-13	9.12E-17	6.82E-21	4.37E-27	0.	0.	0.
MN 54	9.10E-06	3.92E-06	2.59E-06	1.70E-06	4.86E-07	1.39E-07	2.61E-08	2.13E-09	5.01E-13	1.81E-18	6.56E-24
FE 59	2.10E-05	7.60E-08	4.56E-09	2.74E-10	5.95E-14	1.28E-17	1.67E-22	7.85E-30	0.	0.	0.
CO 57	4.27E-05	1.68E-05	1.05E-05	6.61E-06	1.69E-06	4.02E-07	6.20E-09	3.77E-09	3.29E-13	2.70E-19	0.
CO 58	1.35E-04	3.88E-06	6.59E-07	1.12E-07	5.44E-10	2.65E-12	2.18E-15	5.18E-20	1.90E-35	0.	0.
CO 60	1.99E-05	1.75E-05	1.63E-05	1.52E-05	1.25E-05	1.03E-05	7.89E-06	5.32E-06	1.40E-06	1.98E-07	2.74E-08
W 181	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W 185	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W 188	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
U234	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
U237	8.22E-02	2.05E-10	2.00E-10	1.94E-10	1.82E-10	1.69E-10	1.54E-10	1.33E-10	8.29E-11	4.07E-11	2.00E-11
* AM241	3.35E-09	3.35E-09	3.35E-09	3.35E-09	3.37E-09	3.39E-09	3.39E-09	3.40E+09	3.42E-09	3.39E-09	3.34E-09
* CM242	2.29E-07	4.82E-08	2.22E-08	1.02E-08	9.94E-10	9.68E-11	4.34E-12	4.10E-14	1.19E-18	1.10E-18	1.03E-18
KR 85	4.62E-06	1.15E-04	1.11E-04	1.08E-04	9.82E-05	8.87E-05	7.79E-05	6.43E-05	3.40E-05	1.30E-05	4.96E-06
SR 89	3.95E-08	9.27E-04	8.11E-05	7.13E-06	4.80E-09	3.24E-12	1.91E-16	8.69E-23	6.32E-44	0.	0.
SR 90	7.98E-08	7.98E-04	7.90E-04	7.83E-04	7.54E-04	7.25E-04	6.90E-04	6.41E-04	5.01E-04	3.46E-04	2.39E-04
Y 90	1.18E-11	7.98E-04	7.90E-04	7.83E-04	7.54E-04	7.25E-04	6.90E-04	6.41E-04	5.01E-04	3.46E-04	2.39E-04
Y 91	2.58E-08	1.75E-03	2.03E-04	2.36E-05	3.70E-08	5.81E-11	1.06E-14	2.61E-20	6.27E-39	0.	0.
ZR 95	6.49E-04	1.67E-03	2.38E-04	3.39E-05	9.88E-08	2.80E-10	1.19E-13	1.01E-18	1.23E-35	0.	0.
NB 95M	1.38E-11	3.53E-05	5.04E-06	7.21E-07	2.09E-09	6.09E-12	2.52E-15	2.13E-20	2.61E-37	0.	0.
NB 95	7.23E-11	3.59E-03	5.15E-04	7.35E-05	2.13E-07	6.18E-10	2.56E-13	2.18E-18	2.67E-35	0.	0.
RU103	7.95E-05	3.09E-04	1.26E-05	5.20E-07	3.55E-11	2.43E-15	6.83E-21	3.21E-29	0.	0.	0.
RH103M	5.30E-09	3.09E-04	1.26E-05	5.20E-07	3.55E-11	2.44E-15	6.83E-21	3.22E-29	0.	0.	0.
RU106	4.68E-04	4.45E-03	3.15E-03	2.23E-03	7.93E-04	2.82E-04	7.09E-05	8.97E-06	9.05E-09	2.91E-13	9.36E-18
RH106	5.06E-06	4.45E-03	3.15E-03	2.23E-03	7.93E-04	2.82E-04	7.09E-05	8.97E-06	9.05E-09	2.91E-13	9.36E-18
SN123	3.98E-06	5.51E-05	2.00E-05	7.27E-06	3.49E-07	1.67E-08	2.91E-10	6.72E-13	1.04E-21	6.94E-35	4.46E-48
SB125	6.76E-05	1.36E-04	1.20E-04	1.05E-04	7.18E-05	4.88E-05	2.92E-05	1.35E-05	1.04E-06	2.21E-08	4.71E-10
TE125M	1.82E-12	5.56E-05	4.94E-05	4.35E-05	2.97E-05	2.02E-05	1.21E-05	5.59E-06	4.29E-07	9.16E-09	1.95E-10
TE127M	2.95E-10	1.41E-04	4.42E-05	1.38E-05	4.25E-07	1.31E-08	1.26E-10	1.18E-13	9.72E-24	7.26E-39	5.41E-54
TE127	2.06E-02	1.40E-04	4.37E-05	1.37E-05	4.20E-07	1.29E-08	1.24E-10	1.17E-13	9.62E-24	7.16E-39	5.36E-54
CS137	9.20E-05	9.70E-04	9.59E-04	9.48E-04	9.14E-04	8.81E-04	8.43E-04	7.88E-04	6.22E-04	4.42E-04	3.12E-04
BA137M	1.94E-07	9.09E-04	8.98E-04	8.87E-04	8.54E-04	8.26E-04	7.88E-04	7.38E-04	5.84E-04	4.13E-04	2.93E-04
CE141	1.89E-07	8.17E-05	1.64E-06	3.30E-08	2.69E-13	2.19E-18	3.59E-25	2.38E-35	0.	0.	0.
CE144	2.01E-03	5.92E-03	3.81E-03	2.43E-03	6.37E-04	1.68E-04	2.82E-05	1.94E-06	2.62E-10	4.11E-16	6.40E-22
PR144	5.53E-07	5.92E-03	3.81E-03	2.43E-03	6.37E-04	1.68E-04	2.82E-05	1.94E-06	2.62E-10	4.11E-16	6.40E-22
PM147	2.70E-14	1.57E-03	1.37E-03	1.20E-03	8.08E-04	5.43E-04	3.19E-04	1.45E-04	1.04E-05	1.95E-07	3.68E-09
EU155	4.40E-06	1.29E-04	1.20E-04	1.11E-04	8.95E-05	7.19E-05	5.37E-05	3.47E-05	8.10E-06	9.11E-07	1.03E-07
TOTAL	1.06E-01	3.53E-02	2.03E-02	1.45E-02	7.25E-03	4.84E-03	3.71E-03	3.10E-03	2.26E-03	1.56E-03	1.09E-03

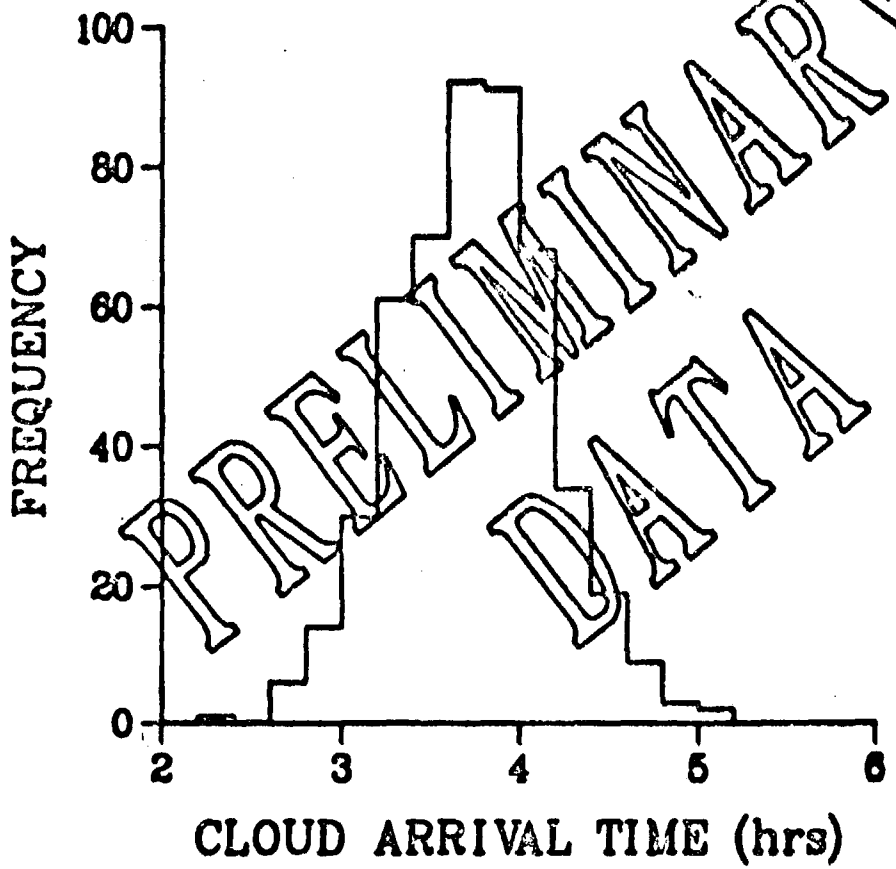

ST. GEORGE, UTAH
HARRY EVENT
1000
100
10
1
MR/HR
1
10
100
HOURS

DISTRIBUTION OF EXPOSURE RATES (H+12hr) ED 12/3/81 #9
SHOT HARRY AT ST. GEORGE ASSUMED NORMAL

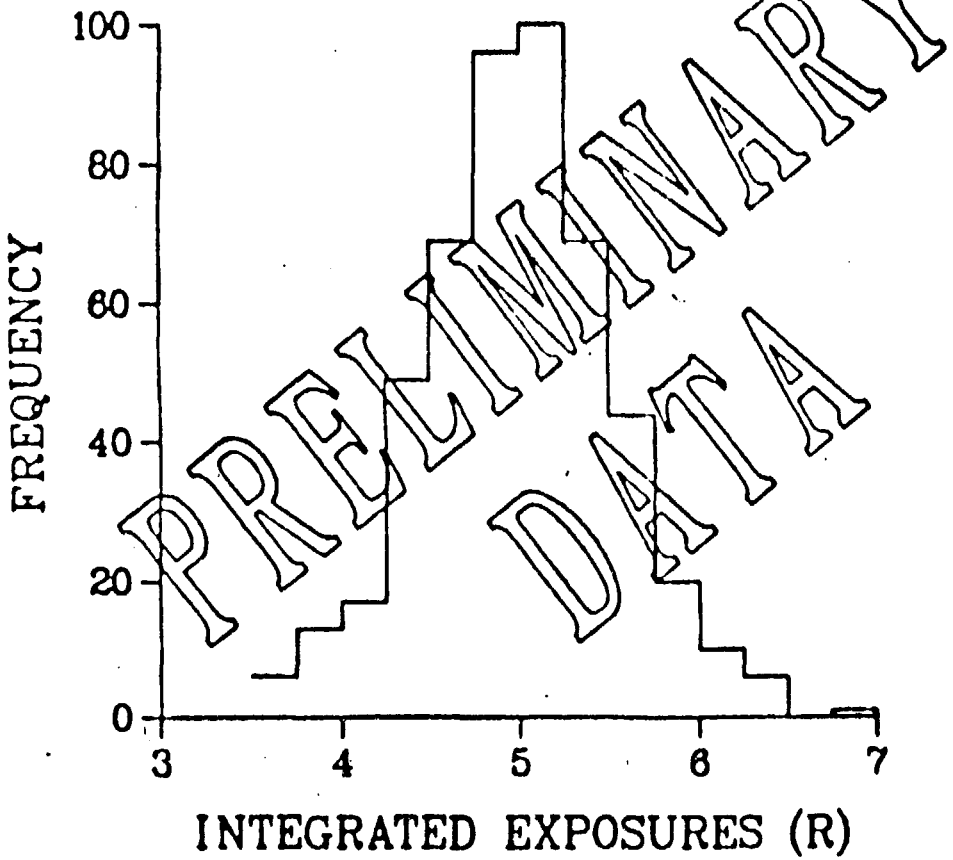


PRELIMINARY DATA

DISTRIBUTION OF CLOUD ARRIVAL TIMES FOR ST. GEORGE ED 12/3/81 #8
ASSUMED LOG-NORMAL DISTRIBUTION



INTEGRATED EXPOSURES ST. GEORGE SHOT HARRY ED 12/3/81 #10
LOG-NORMAL TIME NORMAL H+12hr EXPOSURE RATES



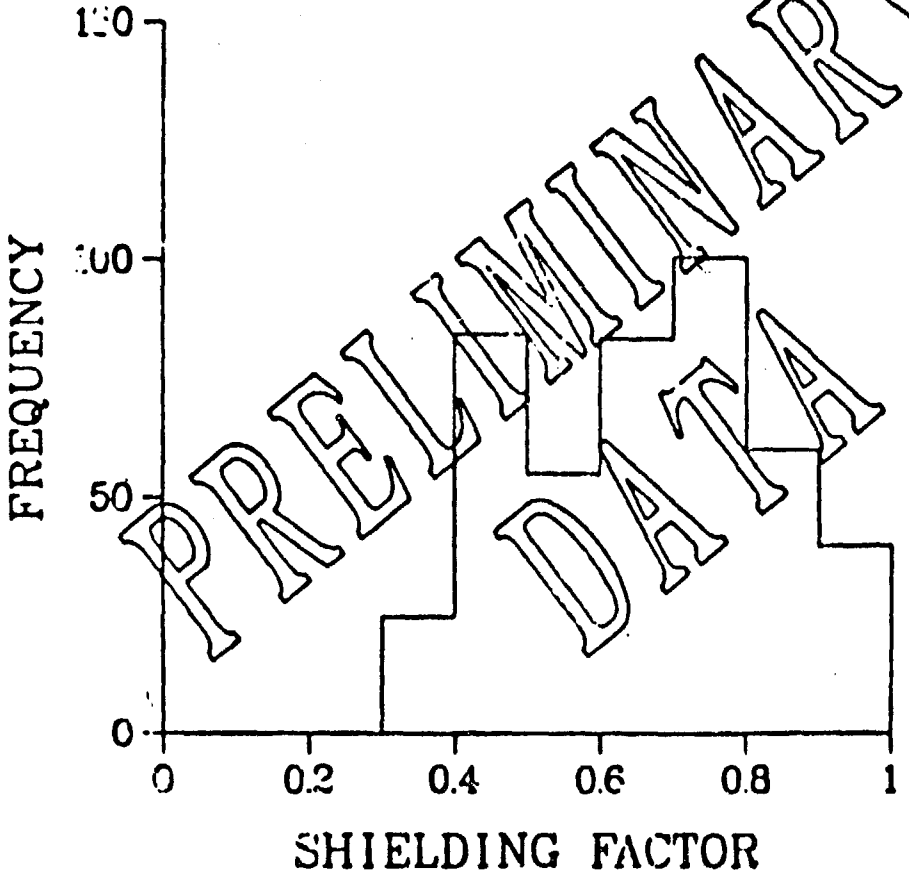
SHIELDING ADJUSTMENT FACTORS

LIVING STRUCTURE	OUTDOOR OCCUPATION	INDOOR OCCUPATION
HOUSE TRAILER	0.96	0.92
FRAME HOUSE	0.91	0.85
STUCCO	0.75	0.50
BRICK VENEER	0.75	0.50
BRICK	0.70	0.40
STONE	0.65	0.30
ADOBE	0.60	0.20

PRELIMINARY DATA

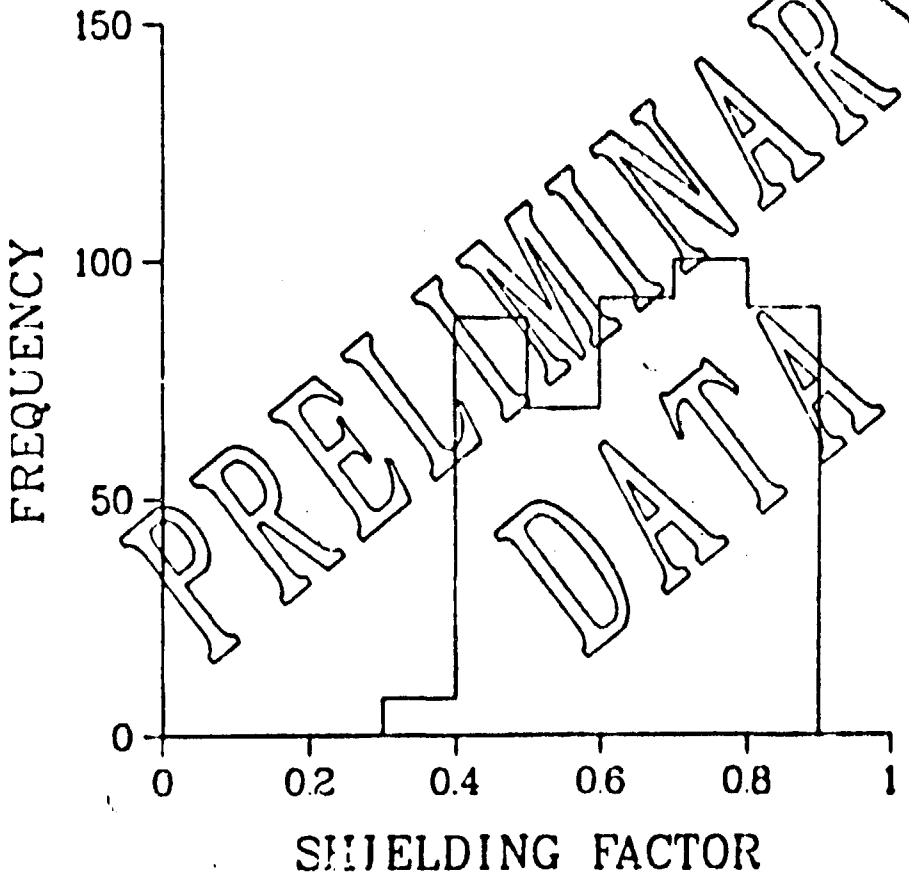
SHIELDING FACTORS FOR SHOT HARRY ED 12/3/81 #4

FOR 447 HOUSES LS= 1



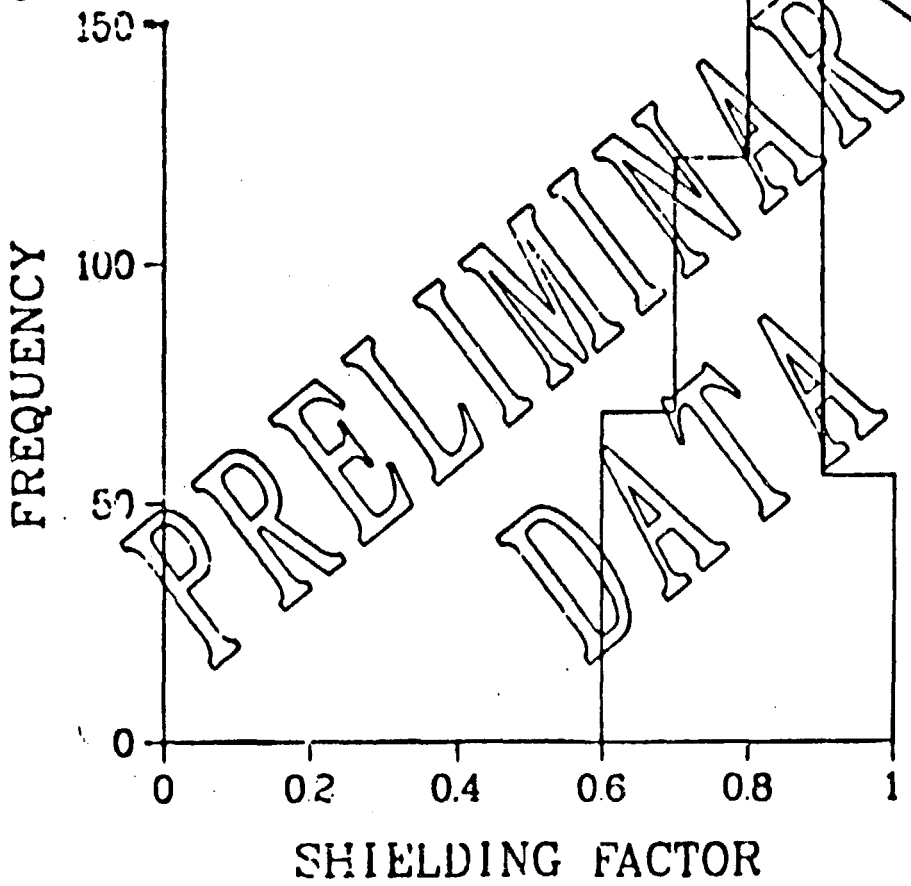
PRELIMINARY DATA

SHIELDING FACTORS FOR SHOT HARRY ED 12/3/81 #5
FOR 447 HOUSES LS= 5

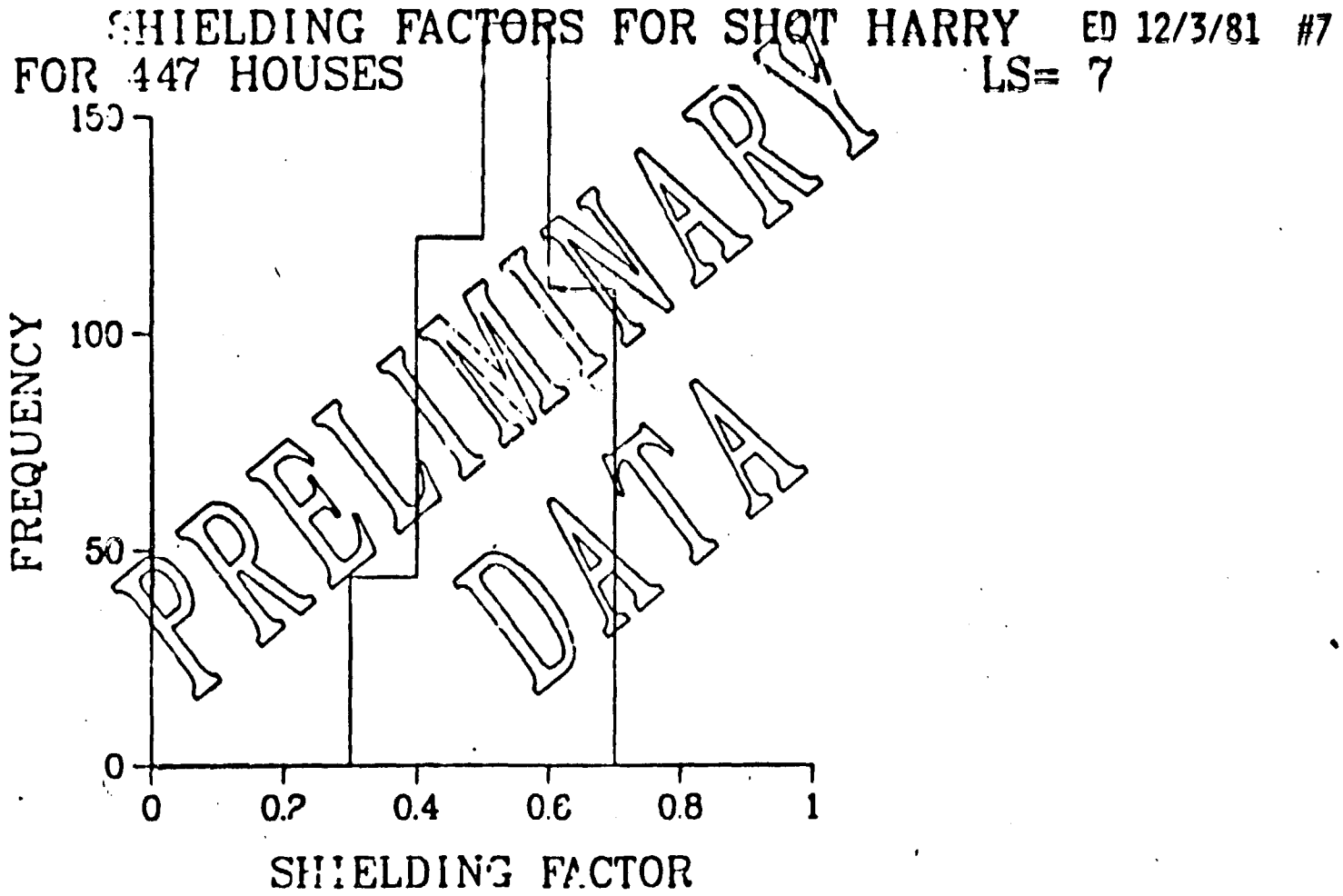


PRELIMINARY DATA

SHIELDING FACTORS FOR SHOT HARRY ED 12/3/81 #6
FOR 447 HOUSES LS= 6



PRELIMINARY DATA

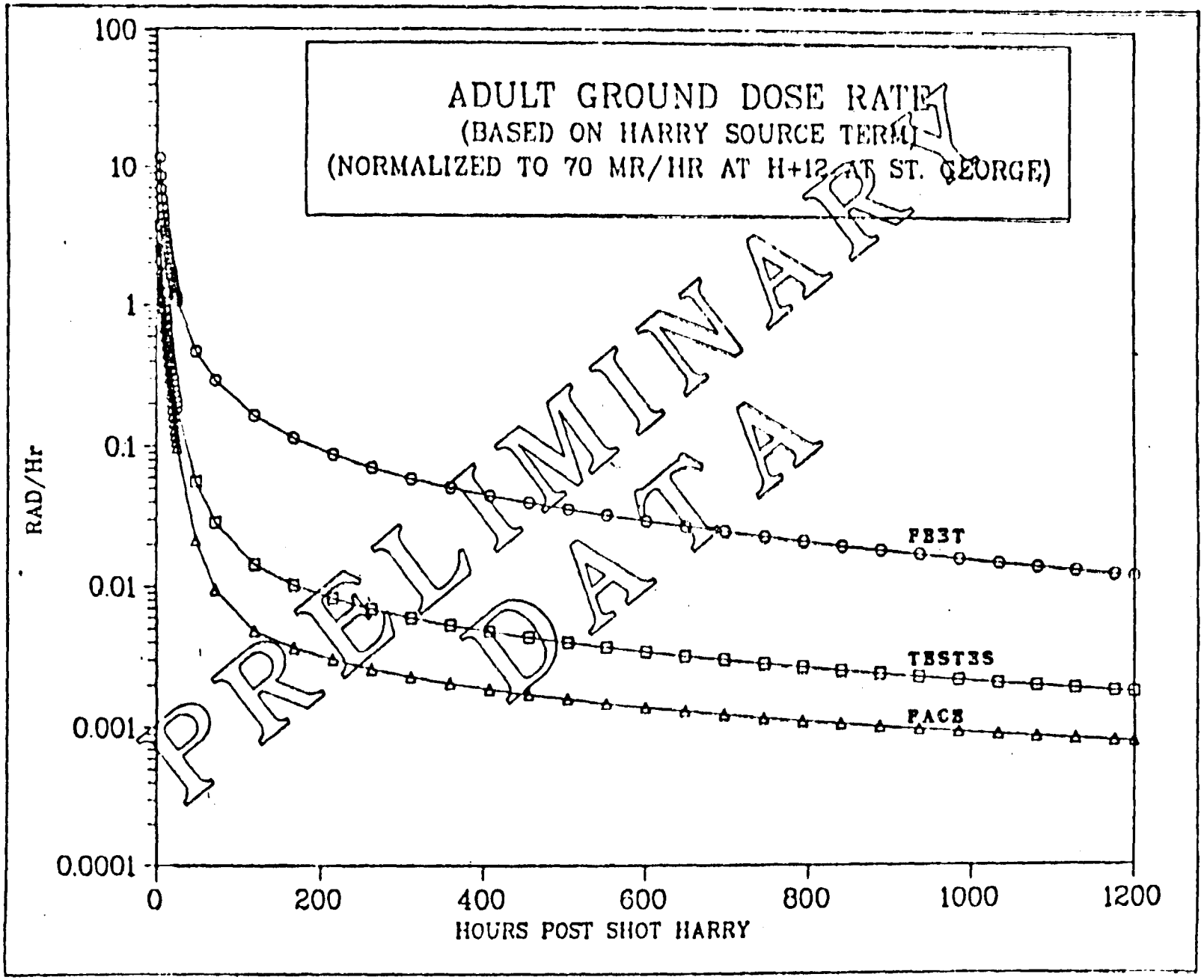

SHIELDING FACTORS FOR SHOT HARRY ED 12/3/81 #7
FOR 447 HOUSES LS= 7
PRELIMINARY DATA
FREQUENCY
150
100
50
0
0
0.2
0.4
0.6
0.8
1
SHIELDING FACTOR

BETA DOSES IN RADS

	CLOUD	GROUND	SKIN
CHILD1	0.01	5.	28.
CHILD2	0.0	4.	0.
FATHER	0.02	8.	52.

PRELIMINARY DATA

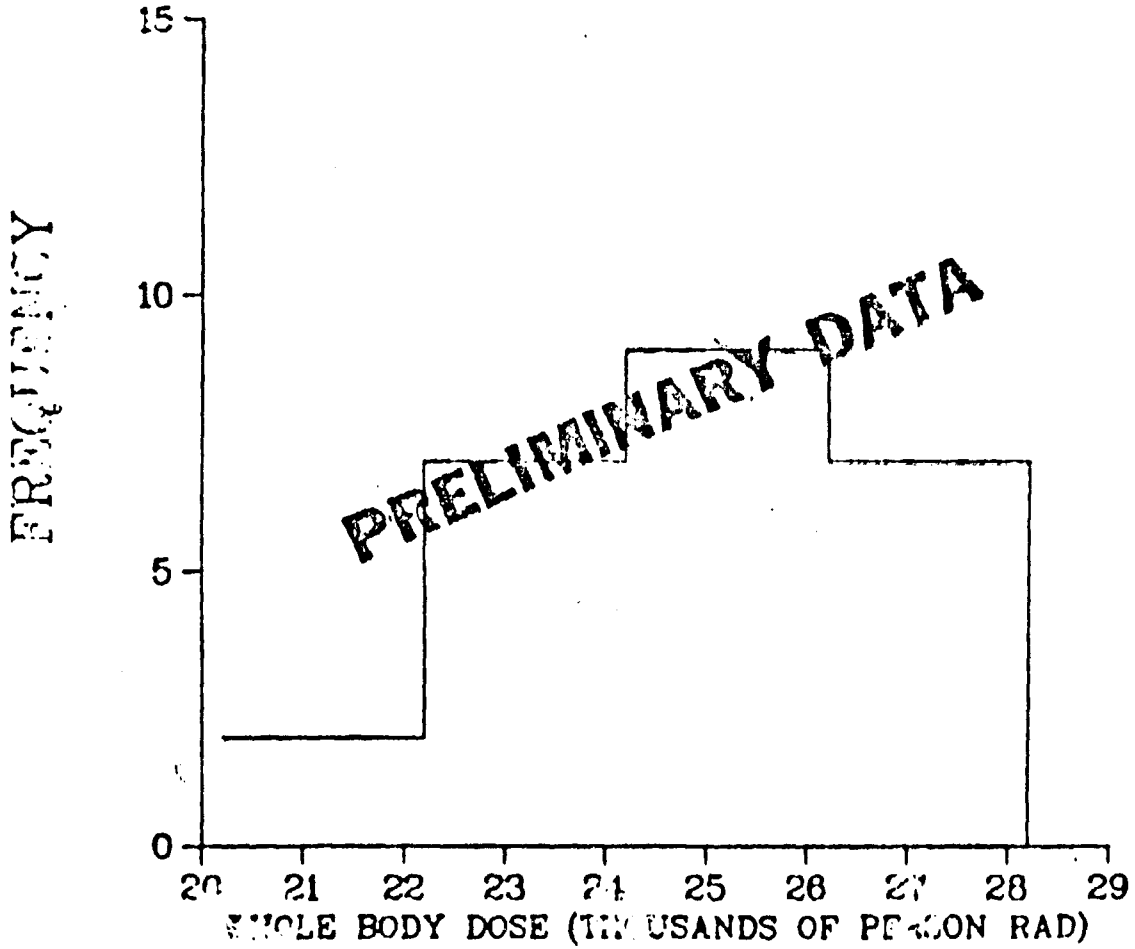
TEST CASE-PEOPLE LIVING IN ST.GEORGE
CHILD OUTSIDE FOR PARTIAL CLOUD PASSAGE-SHOT HARRY
•ASSUME THAT SKIN DEPOSITION EQUALS GROUND DEPOSITION.


ADULT GROUND DOSE RATE
(BASED ON HARRY SOURCE TERM)
(NORMALIZED TO 70 MR/HR AT H+12 AT ST. GEORGE)
PRELIMINARY DATA
RAD/Hr
100
10
1
0.1
0.01
0.001
0.0001
0
200
400
600
800
1000
1200
HOURS POST SHOT HARRY
FB3T
TEST3S
FACE

ST. GEORGE
ANNIE HARRY SMOKY

	WHOLE BODY GAMMA (RAD)	TOTAL SKIN DOSE (RAD)
NEWBORN	3.1	43
INFANT	3.1	140
PRESCHOOL	3.3	140
STUDENT	2.8	53
HOMEMAKER	3.1	53
EMPLOYED OUT	3.7	230
EMPLOYED IN	2.6	24

HARRY SMOKY AND ANNIE FOR WASHINGTON IRON AND LINCOLN COUNTIES
WHOLE BODY GAMMA DOSES IN THOUSANDS OF PERSON RAD



COMPARISON OF POPULATION DOSE ESTIMATES
EXTERNAL, TOTAL BODY
ST. GEORGE, UTAH

PRELIMINARY

ORERP - LANL	14,000 per-rads
TMC: 18,500 × 0.7	13,000
Shleien: 35,000 × 0.7	18,000

LRA- 3

FIG. 1

PATHWAY VI STRUCTURE

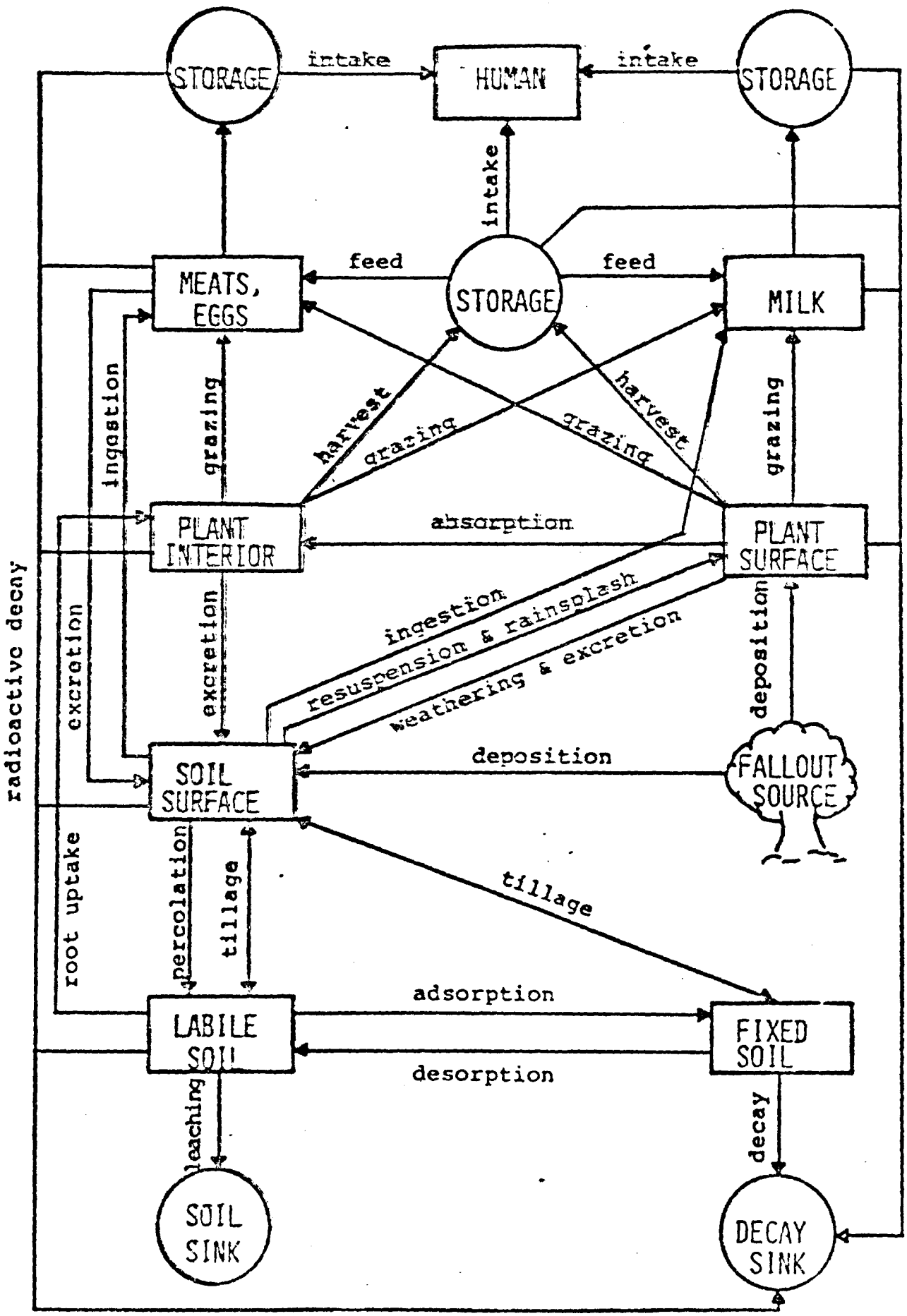
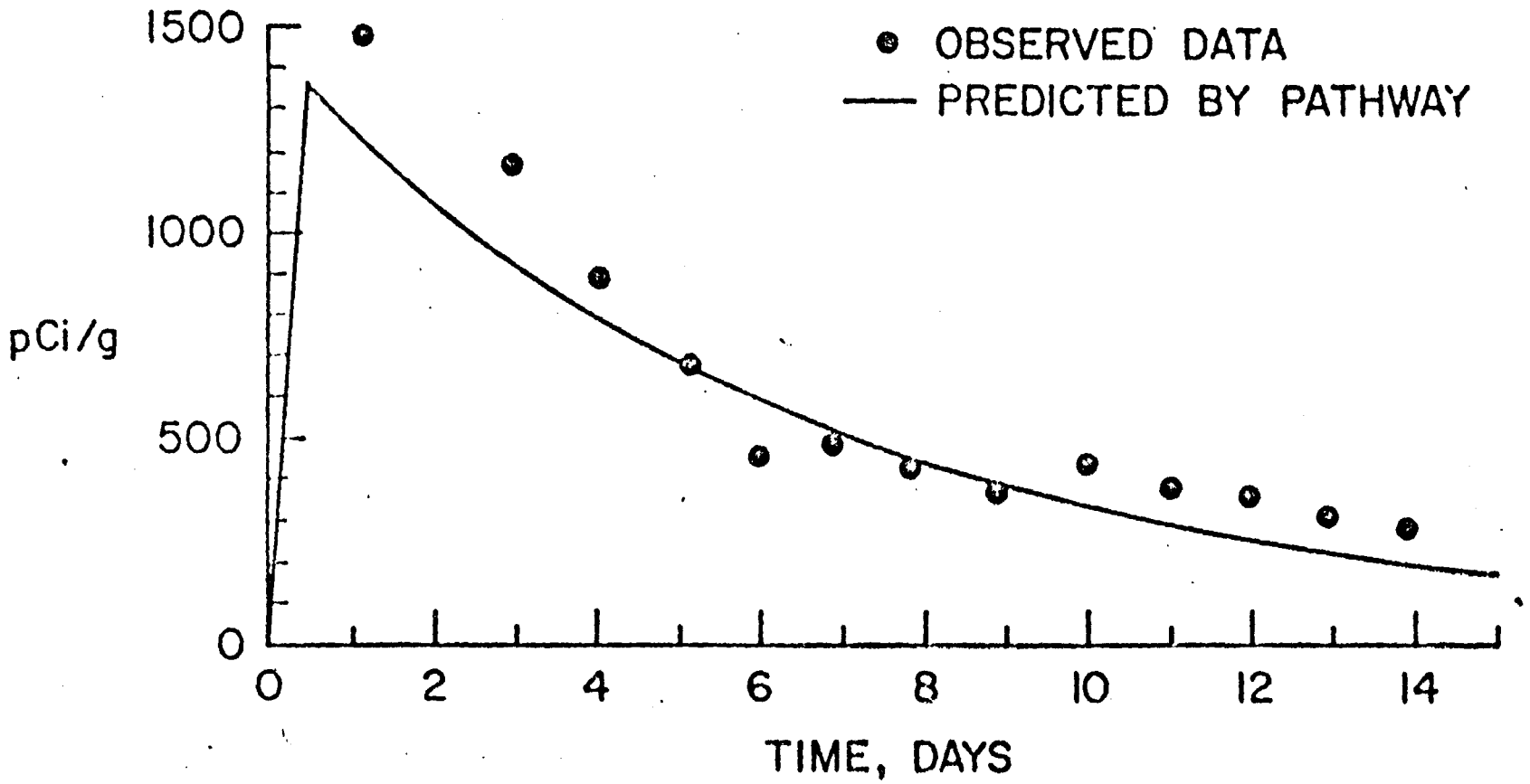
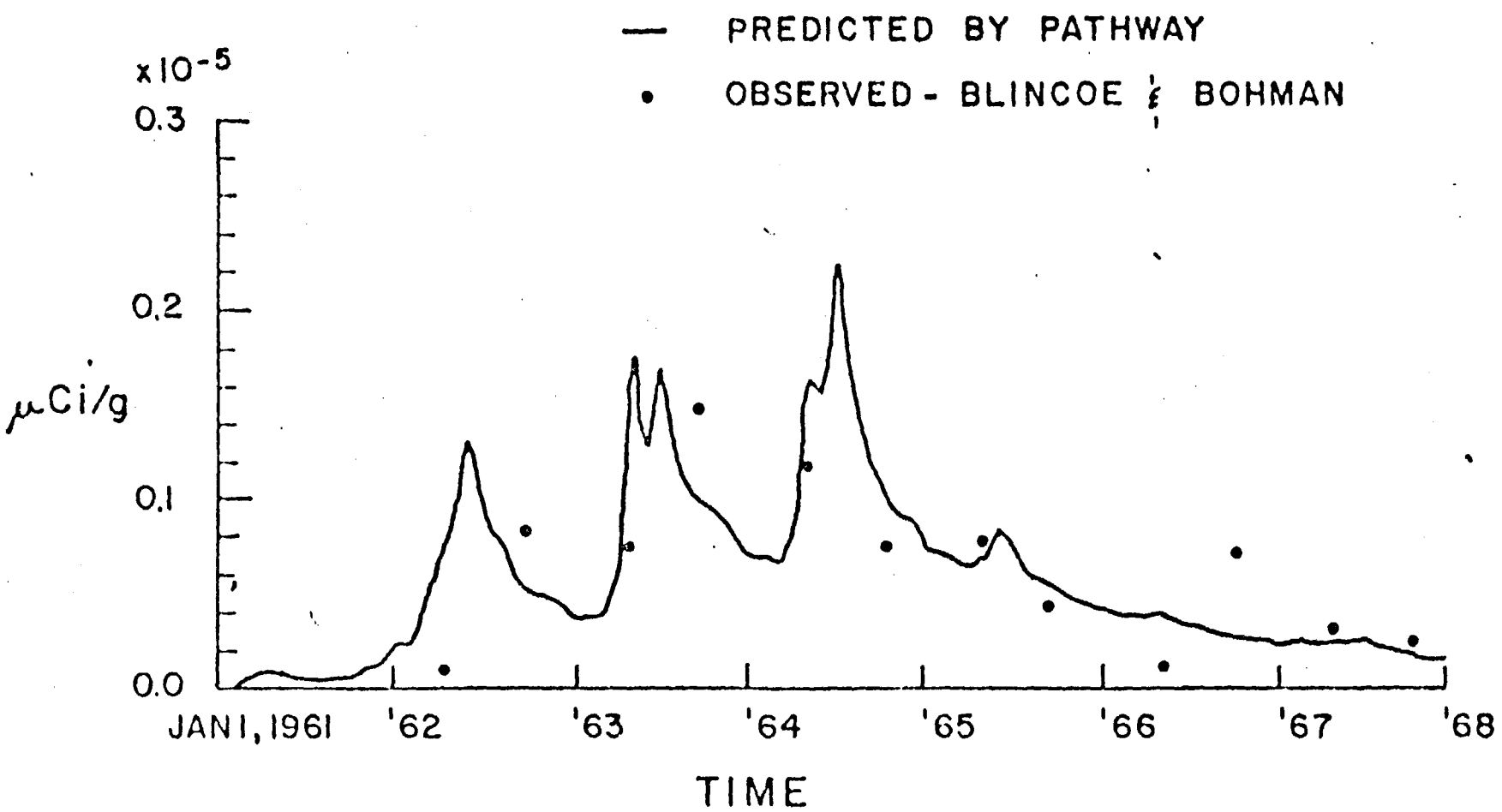


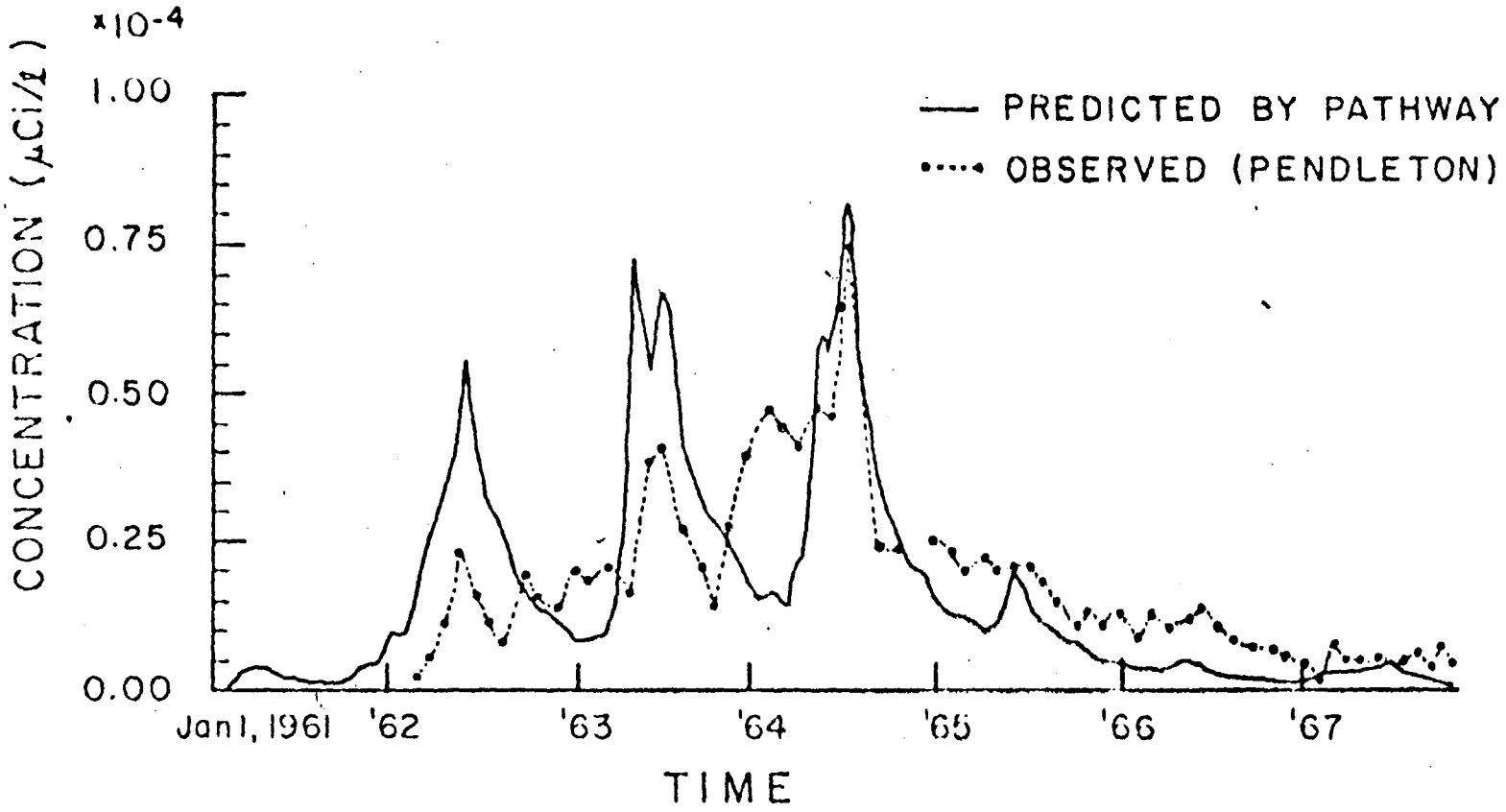
FIG. 5. ^{131}I LEVELS IN GRASS FOLLOWING EXPERIMENTAL RELEASE IN IDAHO PASTURE. -*SASSER*



CONCENTRATION OF Cs-137 IN RANGE CATTLE - KNOLL CREEK, NEVADA



Sr-90 Concentrations in milk, near Salt Lake City, Utah.



PRIVACY ACT MATERIAL REMOVED

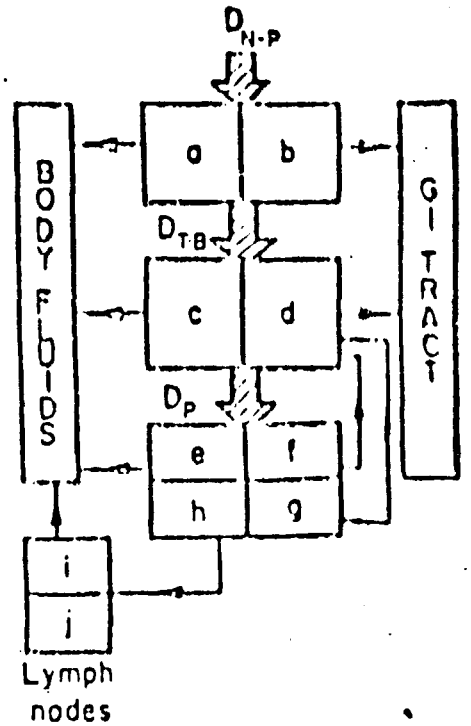
Table 2. Integrated intakes per unit deposition estimated for selected litigants. Preliminary run, July 1981.

Radionuclide	Integrated intake, all sources (μCi)/unit deposition (μCi/m^2)					
^{137}Cs	4.34E+0	3.45E+0	5.83E+0	5.69E+0	5.27E+0	3.61E+0
^{90}Sr	7.41E-1	6.07E-1	4.05E-1	9.73E-1	8.63E-1	5.91E-1
^{239}Pu	2.10E-1	2.10E-1	2.10E-1	2.10E-1	2.10E-1	2.10E-1
^{136}Cs	7.96E-1	5.28E-1	1.20E+0	1.28E+0	1.02E+0	4.61E-1
^{131}I	4.81E-1	3.19E-1	1.22E-1	7.74E-1	6.18E-1	2.79E-1
^{89}Sr	3.63E-1	2.82E-1	1.84E-1	5.09E-1	4.32E-1	2.62E-1
^{103}Ru	1.39E-1	1.39E-1	1.39E-1	1.39E-1	1.39E-1	1.39E-1
^{106}Ru	1.90E-1	1.90E-1	1.90E-1	1.90E-1	1.90E-1	1.90E-1
^{140}Ba	1.09E-1	1.01E-1	1.21E-1	1.23E-1	1.16E-1	9.89E-2
^{147}Nd	8.15E-2	8.10E-2	8.24E-2	8.26E-2	8.20E-2	8.08E-2
^{133}I	2.34E-2	1.64E-2	3.42E-2	3.64E-2	2.94E-2	1.46E-2
^{97}Zr	3.97E-3	3.96E-3	3.98E-3	3.99E-3	3.98E-3	3.96E-3
^{99}Mo	2.89E-2	2.34E-2	3.76E-2	3.93E-2	3.37E-2	2.19E-2
^{132}Te	1.87E-2	1.78E-2	2.01E-2	2.04E-2	1.95E-2	1.76E-2
^{105}Rh	6.71E-2	4.52E-2	1.01E-1	1.08E-1	8.61E-2	3.92E-2
^{143}Ce	7.74E-3	7.70E-3	7.80E-3	7.81E-3	7.77E-3	7.69E-3
^{135}I	7.90E-4	6.03E-4	1.08E-3	5.15E-3	9.53E-4	5.50E-4

- PRELIMINARY DATA -

PRIVACY ACT MATERIAL REMOVED

Region	Compartment	Class D T day	D F	W T day	W F	Y T day	Y F
N-P	a	0.01	0.5	0.01	0.1	0.01	0.01
(D_{N-P} = 0.30)	b	0.01	0.5	0.40	0.9	0.40	0.99
T-B	c	0.01	0.95	0.01	0.5	0.01	0.01
(D_{T-B} = 0.08)	d	0.2	0.05	0.2	0.5	0.2	0.99
	e	0.5	0.8	50	0.15	500	0.05
P	f	n.a.	n.a.	1.0	0.4	1.0	0.4
(D_P = 0.25)	g	n.a.	n.a.	50	0.4	500	0.4
	h	0.5	0.2	50	0.05	500	0.15
L	i	0.5	1.0	50	1.0	1 000	0.9
	j	n.a.	n.n.	n.a.	n.a.	∞	0.1



Source: ICRP 30 (1979)

PRIVACY ACT MATERIAL REMOVED

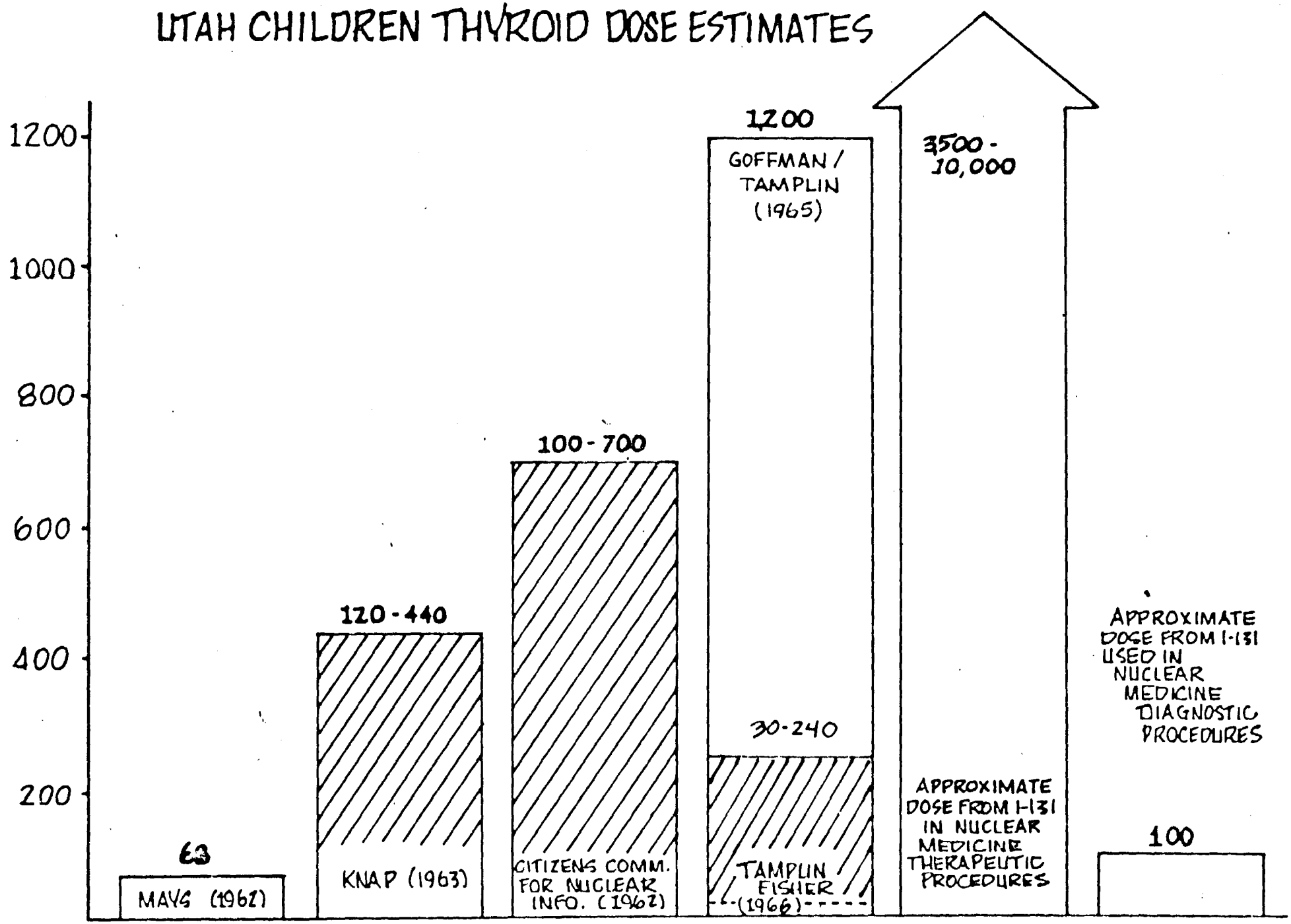
SUMMARY OF ESTIMATES OF DOSE COMMITMENT

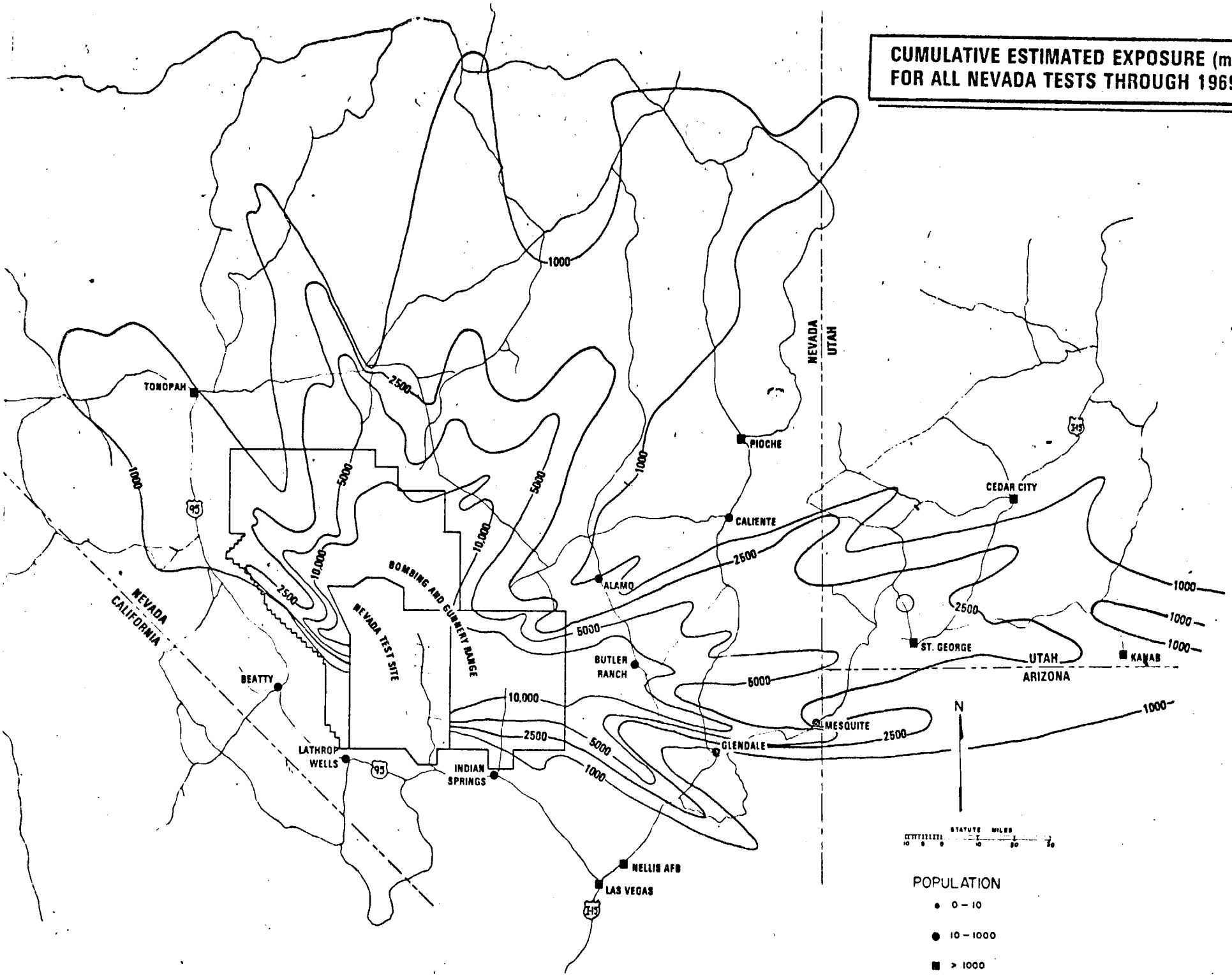
Subject / Ruth		Thyroid	Bone	Bone Marrow	Total Body	Lung	Bare Skin
:	External	1.6	1.4	1.4	1.6	1.6	110.
	Internal	340.	0.84	0.41	0.29	0.022[a]	
:	External	0.21	0.14	0.14	0.21	0.21	5.9
	Internal	4.1.	0.14	0.075	0.035	0.0019[a]	
:	External	1.1	1.0	1.0	1.1	1.1	13.
	Internal	160.	0.44	0.19	0.084	0.019[a]	
:	External	2.6	2.4	2.4	2.6	2.6	70.
	Internal	62.	0.20	0.12	0.096	0.0095[a]	

[a] Inhalation only.

PRIVACY ACT MATERIAL REMOVED

UTAH CHILDREN THYROID DOSE ESTIMATES




CUMULATIVE ESTIMATED EXPOSURE (mR)
FOR ALL NEVADA TESTS THROUGH 1969
NEVADA
UTAH
ARIZONA
CALIFORNIA
TONOPAH
PIOCHE
CEDAR CITY
CALIENTE
ALAMO
BOMBING AND GUNNERY RANGE
NEVADA TEST SITE
BUTLER RANCH
BEATTY
ST. GEORGE
KANAB
MESQUITE
GLENDALE
LATHROP WELLS
INDIAN SPRINGS
NELLIS AFB
LAS VEGAS
1000
2500
5000
10,000
N
STATUTE MILES
POPULATION
0 – 10
10 – 1000
> 1000

FUTURE REQUIREMENTS

1. _ COMPLETE STOCHASTIC MODEL DEVELOPMENT
2. _ OTHER EVENTS
3. _ OTHER LOCATIONS
4. _ INDIVIDUAL DOSE ASSESSMENT MODEL
5. _ EXTENDED REGION

NEVADA
OPERATIONS
OFFICE

CLAIM SOURCES

- MEMBERS OF CONGRESS/CONSTITUENTS BEHALF
- PRESIDENTIAL STAFF INQUIRIES/GENERAL PUBLIC
- FEDERAL, STATE & LOCAL REFERENCES
- FORMAL REQUESTS FROM MEMBERS OF THE PUBLIC
- WALK-INS

NEVADA OPERATIONS OFFICE

MEDICAL LIASON OFFICER NETWORK (MLON)

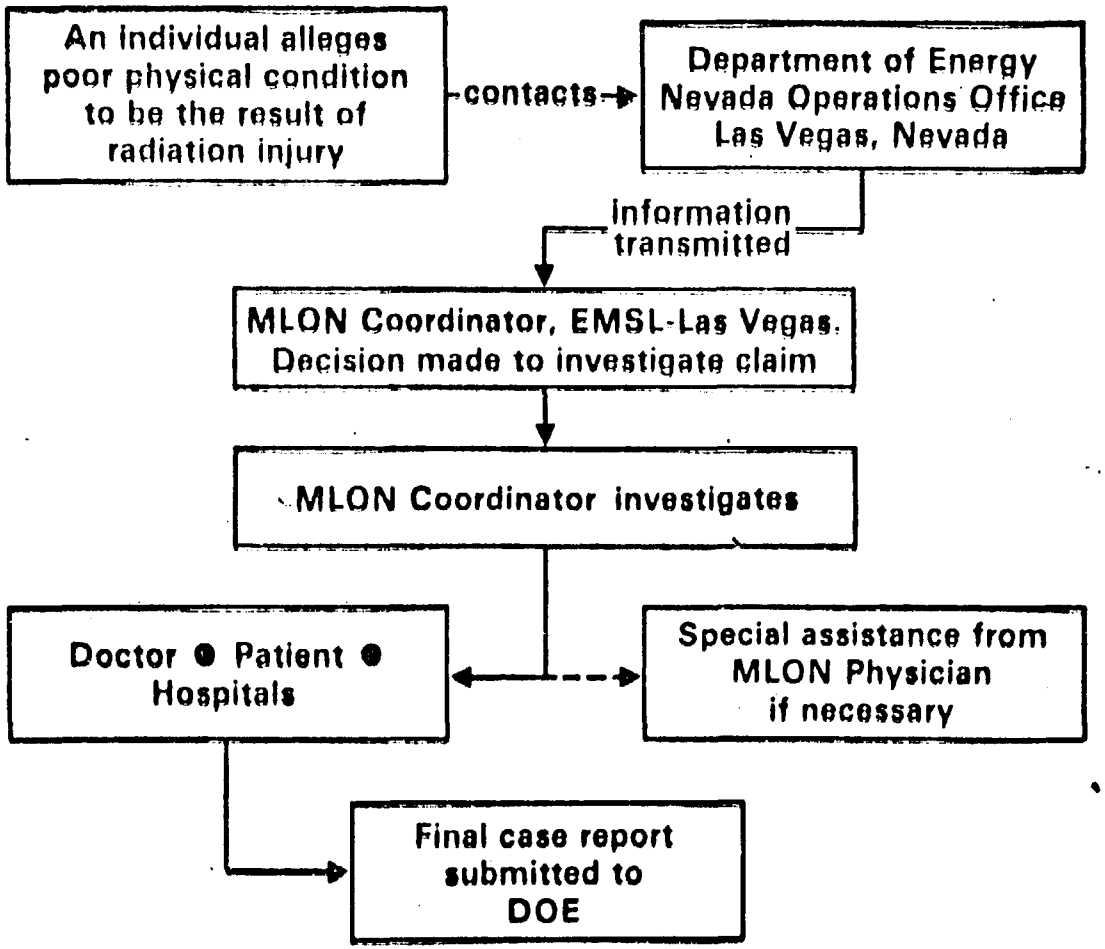
- AEC RECOGNIZED NEED FOR MEDICAL INVESTIGATIONS OF OFF SITE RADIATION EXPOSURE CLAIMANTS—1954—INITIATED MOU
- HUMAN & ANIMAL EXPOSURE FROM FALLOUT FROM ATMOSPHERIC TESTING
- USPHS PROVIDED RADIOLOGICAL SUPPORT ON & OFF SITE SUPPORT UNTIL 1962
- FORMALIZED MLON NETWORK IN 1958
- UTILIZED PHYSICIANS IN STATES & U.S. TERRITORIES
- FULL TIME MLON COORDINATOR—1968—RADIATION TRAINED PHYSICIANS IN ALL STATES & TERRITORIES
- FALLOUT FAMILY SURVEILANCE

NEVADA
OPERATIONS
OFFICE

MLON INVESTIGATIVE TECHNIQUE

- CONTACT CLAIMANT/HISTORICAL BACKGROUND
- OBTAINS VIA MEDICAL RELEASES CLAIMANT'S COMPLETE MEDICAL HISTORY
- PERSONAL CONTACT WITH CLAIMANT'S PHYSICIANS
- MEDICAL EXAMINATION IF WARRANTED
- FALLOUT RADIATION DOSE ASSESSMENT BASED ON TIME OF RESIDENCE & LOCATION
- STATISTICAL PROBABILITY OF INJURY OCCURRENCE
- MEDICAL OPINION TO DOE

MLON Case Investigation Procedure



OFF-SITE RADIATION EXPOSURE TORT CLAIMS RECEIVED BY OGC/HQ AND/OR NV

Attorney Filing Claims	Office Receiving Claims	Number of Personal Injury (PI) Claims	Number of Wrongful Death (WD) Claims	(Number of Deaths Represented by WD Claims)	Total Number of Claims	Total Amount of Claims (in millions)
Udall*	OGC/HQ	243	826	(324)	1,069	$ 2,485
Haralson**	NV	---	16	(1)	16	28
Other	NV	24	21	(12)	45	57.3
		267	863	(337)	1,130	$ 2,570.3***

* * * * * * * *

OTHER DATA

Nature of Injury/ Cause of Death	
Leukemia	92
Hodgkins Disease	17
Other cancer	480
Thyroid tumor	1
Lymphoma tumor	1
Other illnesses	13

Locations of Alleged Exposures	
Utah	470
Nevada	98
Arizona	11
Colorado	1
Utah/Nevada	18
Utah/Arizona	4
Nev/Ariz/NM	1
Not indicated	1

Age Data			
Age Group	Decedents	Living Claimants	Totals
Not given	13	3	16
18 and under	44	2	46
19 - 30	13	22	35
31 - 40	14	38	52
41 - 50	44	52	96
51 - 60	62	71	133
61 - 70	78	52	130
71 - 80	52	20	72
81 and over	17	7	24

*The Udall totals now encompass all known claims submitted by Udall to OGC to date, including the 202 initial claims listed in OGC's 4/25/79 summary which NV has not received copies of, and also including 18 claims which NV has received copies of but which are not listed as received by OGC in their 4/25/79 summary.

**Claims submitted to NV by Dale Haralson which to date have not been amended and/or refiled with OGC/HQ by Udall.

***Exact amount: $2,570,271,444.04

NOTE: These figures include claimants who have filed suit in Allen (869 Claimants), Timothy (7), Mower (8), and Church (1), all in U.S.D.C. Utah, and Rickenbach (1), U.S.D.C., Central Dist., Calif. (totaling 886 of above claimants). Several of these plaintiffs have not filed tort claims.

OCC/NV
11/30/81

CALCULATION OF INFINITE "DOSE" (EXPOSURE)

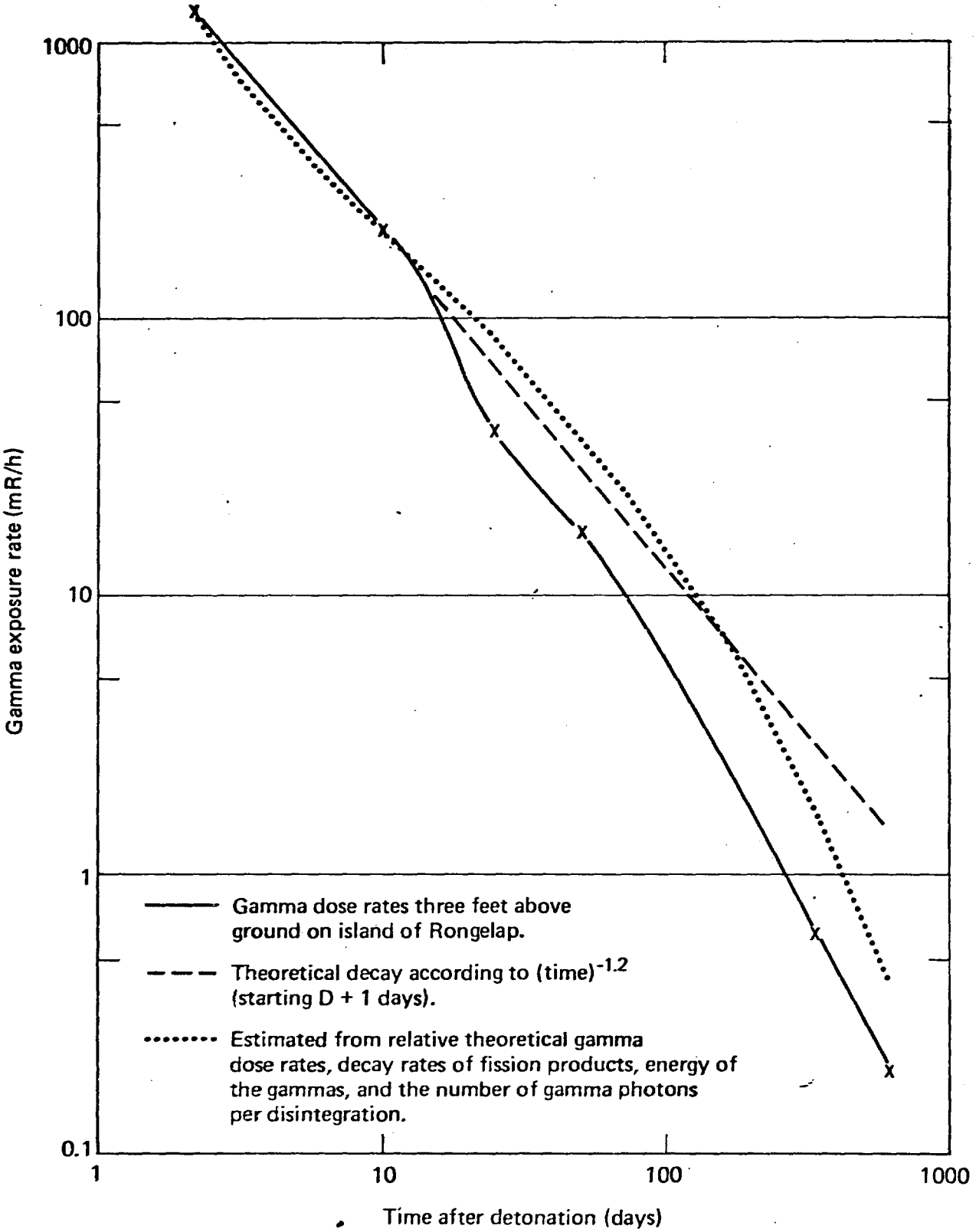
$$\text{INFEX} = R(1) \int_a^{\infty} t^{-1.2}\, dt$$

$$= 5\, R(1)\, a^{-0.2}$$

where a = time of arrival, hrs

R(1) = exposure rate at 1 hour

LRA-4


1000
100
10
1
0.1
Gamma exposure rate (mR/h)
1
10
100
1000
Time after detonation (days)
Gamma dose rates three feet above ground on island of Rongelap.
Theoretical decay according to (time)-1.2 (starting D + 1 days).
Estimated from relative theoretical gamma dose rates, decay rates of fission products, energy of the gammas, and the number of gamma photons per disintegration.

LRA-5

CALCULATION OF ESTIMATED "DOSE" (EXPOSURE)

$$ED = S \int_a^{8760} R \, dt$$

$$R = \begin{cases} R(1)\, t^{-1.2} & \text{for} \quad t < 168 \text{ hr} \\ bR(1)\, t^{-1.3} & \text{for} \quad 168 < t < 336 \text{ hr} \\ cR(1)\, t^{-1.4} & \text{for} \quad 336 < t < 8760 \text{ hr} \end{cases}$$

S = shielding factor = 0.75

b and c are constants required for the continuity of R

$b = 168^{0.1}$

$c = 336^{0.2}$

LRA-6

RELATION BETWEEN INFINITE "DOSE" EXPOSURE AND ESTIMATED "DOSE" (EXPOSURE)

- Depends upon time of arrival, a
- Factors that lower infinite "dose":

	Shielding	Weathering	Time	Product
For a = 1 hr:	0.75	0.84	0.95	0.60
a = 4 hr:	0.75	0.79	0.93	0.55
a = 8 hr:	0.75	0.76	0.92	0.52

LRA-8

COMPARISON OF HISTORICAL POPULATION EXPOSURE ESTIMATES, person-R

Series	Shleien	TMC
Buster-Jangle	470	600
Tumbler-Snapper	5,100	4,700
Upshot-Knothole	59,000	40,000
Teapot	30,000	19,000
Plumbbob	24,000	19,000
Hardtack II	370	1,500
Other	423	na
Total	120,000	84,000

From: A.V. Shelton, Ch., TMC Report (1959)
Shleien, Health Phys. 41, 243 (1981)

LRA-14

NTS OFF-SITE POPULATION EXPOSURE THROUGH HARDTACK II, SUMMED FOR THE TEN EVENTS OF HIGHEST POPULATION EXPOSURE

Event	Series	Person-R	Percent
Harry	U-K	30,000	35
Bee	Teapot	11,000	13
Smoky	Plumbbob	7,400	8.8
Annie	U-K	3,700	4.4
Easy	T-S	2,700	3.2
Diable	Plumbbob	2,700	3.2
Shasta	Plumbbob	2,600	3.1
Simon	U-K	2,200	2.6
Badger	U-K	2,100	2.5
Zucchini	Teapot	2,000	2.4
Partial total		66,000	78

LRA-17

NTS OFF-SITE POPULATION EXPOSURE THROUGH HARDTACK II, SUMMED FOR THE TEN LOCATIONS OF HIGHEST POPULATION EXPOSURE

Location	R	Per.-R	%
St. George, UT	3.7	18,000	22
Las Vegas, NV	0.21	9,900	12
Hurricane, UT	4.4	4,800	5.7
Ely, NV	1.2	4,300	5.1
Cedar City, UT	0.64	3,900	4.6
Kanab, UT	1.6	3,100	3.6
Lincoln Mine, NV	6.0	3,000	3.5
North Las Vegas, NV	0.20	2,600	3.1
McGill, NV	0.77	1,800	2.1
Tonopah, NV	1.1	1,500	1.8
Partial total		53,000	63

LRA-18

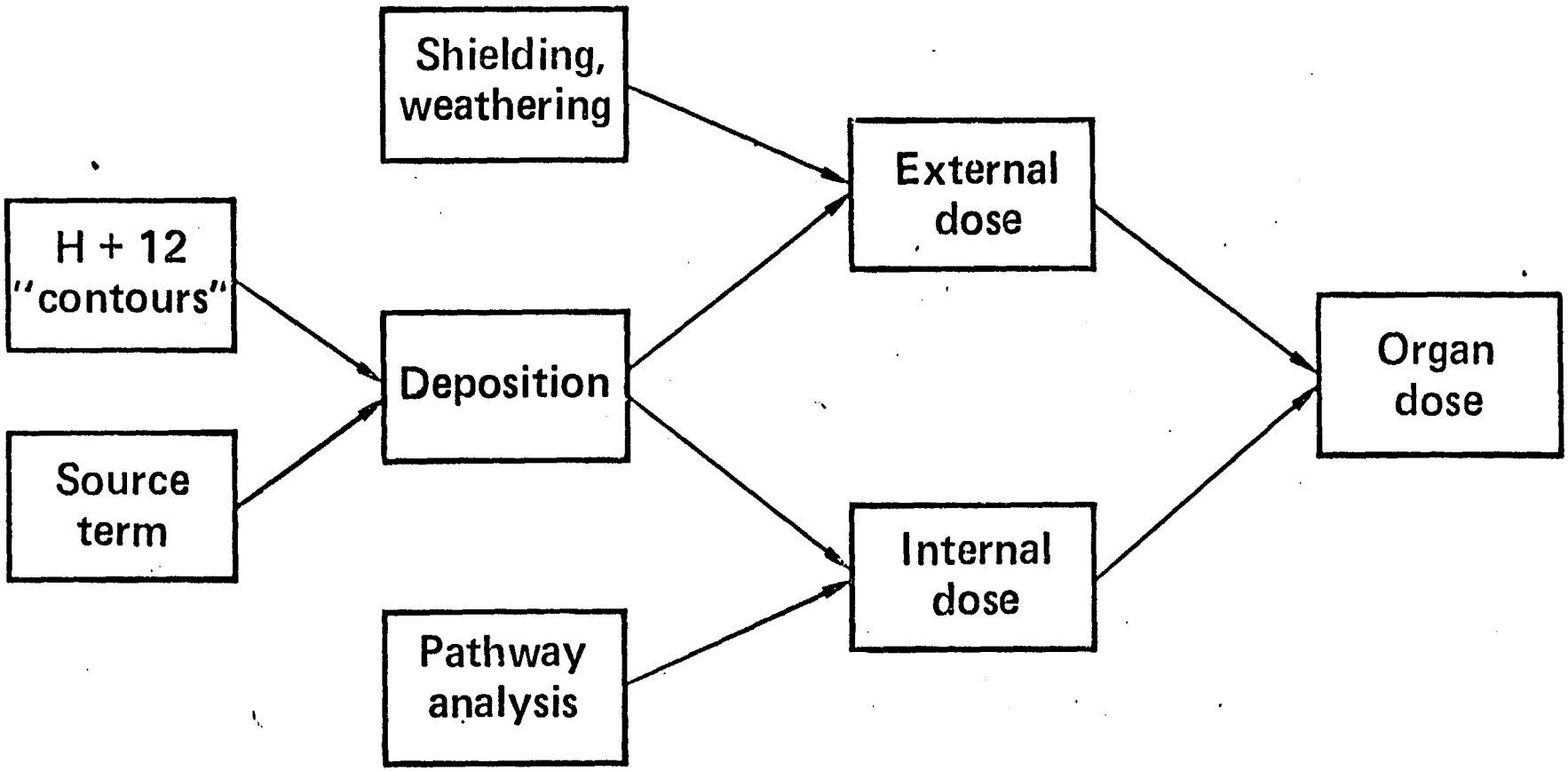
DOSE IS DELIVERED VIA FIVE MECHANISMS

1. Deposition of radioactivity on the ground
2. Deposition of radioactivity on skin
3. Immersion during cloud passage
4. Inhalation of radioactivity
5. Ingestion of radioactivity

$$\frac{\text{Activity}}{\text{Gram}} \times \frac{\text{Gram}}{\text{Day}} = \text{Daily intake}$$

Vegetables, meat, milk, water

SIMPLIFIED DIAGRAM OF THE DOSE RECONSTRUCTION EFFORT



LRA-28

PRIVACY ACT MATERIAL REMOVED

DOSE ASSESSMENT TEST CASES

NAME	SEX	AGE IN 1953	RESIDENCE	MAJOR CONTAMINATION EVENTS	OCCUPATION OR STATUS	ILLNESS
	F	7	ST. GEORGE PINE VALLEY	HARRY ANNIE PRISCILLA	STUDENT	THYROID CANCER
	M	8	CEDAR CITY	HARRY SMOKY ZUCCHINI	CHILD	HODGKIN'S DISEASE
	F	12	ST. GEORGE	HARRY ANNIE TELSA	STUDENT	MYELOGENOUS LEUKEMIA
	M	42	VEYO	HARRY SMOKY PRISCILLA	RANCHER	MALIGNANT MELANOMA

PRIVACY ACT MATERIAL REMOVED

PRIVACY ACT MATERIAL REMOVED

SUMMARY OF ESTIMATES OF DOSE COMMITMENT, rads

Subject / Path	Thyroid	Bone	Bone Marrow	Lung	Bare Skin
: External	1.6	[illegible]	1.6	1.6	110.
Internal	340	[illegible]	0.29	0.022[a]	
: External	[illegible]	0.14	0.14	0.21	0.21	5.9
Internal	[illegible]	0.14	0.075	0.035	0.0019[a]	
: External	1.1	1.0	1.0	1.1	1.1	13.
Internal	160.	0.44	0.19	0.084	0.019[a]	
[illegible]	2.6	2.4	2.4	2.6	2.6	70.
[illegible]ternal	62.	0.20	0.12	0.096	0.0095[a]	

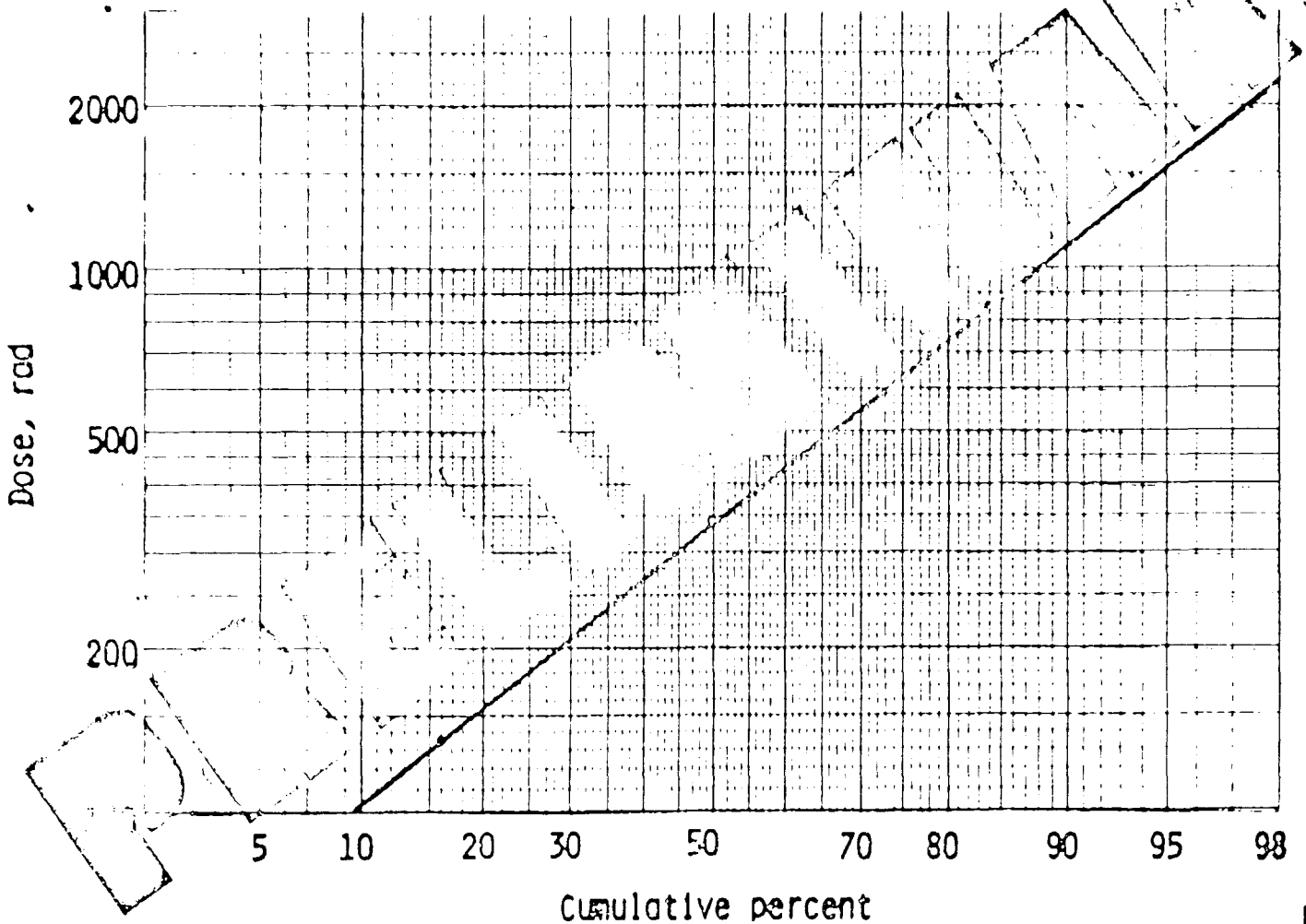
[a] Inhalation only.

PRELIMINARY

PRIVACY ACT MATERIAL REMOVED

PRIVACY ACT MATERIAL REMOVED

UNCERTAINTY IN THYROID DOSE



LRA-27

PRIVACY ACT MATERIAL REMOVED

COMPARISON OF POPULATION DOSE ESTIMATES
EXTERNAL, TOTAL BODY
ST. GEORGE, UTAH

PRELIMINARY

ORERP-LANL	14,000 per-rads
TMC: 18,500 × 0.7	13,000
Shleien: 35,000×0.75×0.7	18,000

LRA- 3

SIXTY EIGHT LOCATIONS IN THE THREE COUNTIES WERE CONSIDERED

COUNTY	STATE	ESTIMATED 1955 POPULATION• <1yr	1–11yr	12–17yr	>18yr	Total
Washington	UT	271	2872	1327	5581	10051
21 communities		(2.7)	(29)	(13)	(56)	
Lincoln	NV	83	794	369	1892	3158
33 communities		(2.6)	(25)	(12)	(60)	
Iron	UT	274	2833	1160	5853	10120
14 communities		(2.7)	(28)	(12)	(58)	
Total		628	6499	2856	13326	23309
		(2.7)	(28)	(12)	(57)	

•The percent of total is listed in parentheses

COLLECTIVE DOSES SUMMED OVER AGE GROUPS AND LOCATIONS SUMMARIZES VARIATION BY EVENT

1000 person-rads

ORGANS	ANNIE	HARRY	SMOKY	TOTAL
Bon surf	0.044	2.1	0.38	2.6
Breast	0.007	0.37	0.10	0.48
LLI wall	0.16	41	19	60
Kidneys	0.017	0.96	0.30	1.3
Liver	0.017	0.96	0.29	1.3
Lungs	0.013	0.57	0.13	0.71
Ovaries	0.008	0.86	0.36	1.2
R marrow	0.035	1.8	0.39	2.3
Testes	0.007	0.27	0.065	0.34
Thyroid	3.9	630	220	850
Total body	0.022	1.5	0.43	1.9
Uterus	0.007	0.51	0.18	0.70

PRELIMINARY

COLLECTIVE DOSES SUMMED OVER EVENTS AND LOCATIONS SUMMARIZES VARIATION BY AGE GROUP

1000 person-rads

ORGANS	INFANT	CHILD	TEEN	ADULT
Bon surf	0.36	1.0	0.37	0.80
Breast	0.04	0.23	0.07	0.14
LLI wall	3.7	28	8.8	19
Kidneys	0.09	0.57	0.17	0.45
Liver	0.11	0.57	0.17	0.43
Lungs	0.07	0.33	0.10	0.22
Ovaries	0.08	0.58	0.18	0.39
R marrow	0.28	0.95	0.33	0.69
Testes	0.02	0.15	0.05	0.13
Thyroid	120	530	110	95
Total body	0.18	0.93	0.27	0.52
Uterus	0.04	0.31	0.10	0.24

PRELIMINARY

NG-13

TOTAL POPULATION DOSE FOR WASHINGTON, LINCOLN, AND IRON COUNTIES FROM ANNIE, HARRY, AND SMOKY

PRELIMINARY

Organ	Person-rem		
	External	Internal	Total
Kidneys	21,000	1,300	22,000
LLI wall	19,000	60,000	79,000
Liver	20,000	1,300	21,000
Lungs	21,000	800	22,000
Ovaries	4,800	1,200	6,000
Red Marrow	21,000	2,200	23,000
Skin	610,000	-	
Testes	7,200	340	21,000
Thyroid	26,000	850,000	880,000
Total Body	22,000	1,900	24,000
Uterus	4,400	700	5,100

THE PRESENT METHOD IS LIMITED

- Applicable only where external exposure rates were measured (or interpolated)
- These locations undoubtedly were the areas where the highest individual doses occurred
- There may be significant population doses in other areas, e.g. Salt Lake City

EXTENSION OF CALCULATIONS

- We can measure Pu-239, Pu-240, and Cs-137 in soils at the present time.
- EML has separated the Cs-137 contributions from global and NTS fallout, based upon these kinds of measurements and has reported values for much of Utah.
- Knowing the present levels in soil of Cs-137 derived from explosions at NTS, we can then calculate the original deposition of all radionuclides and the doses.
- We need additional measurements in Nevada, northern Arizona, and Utah.

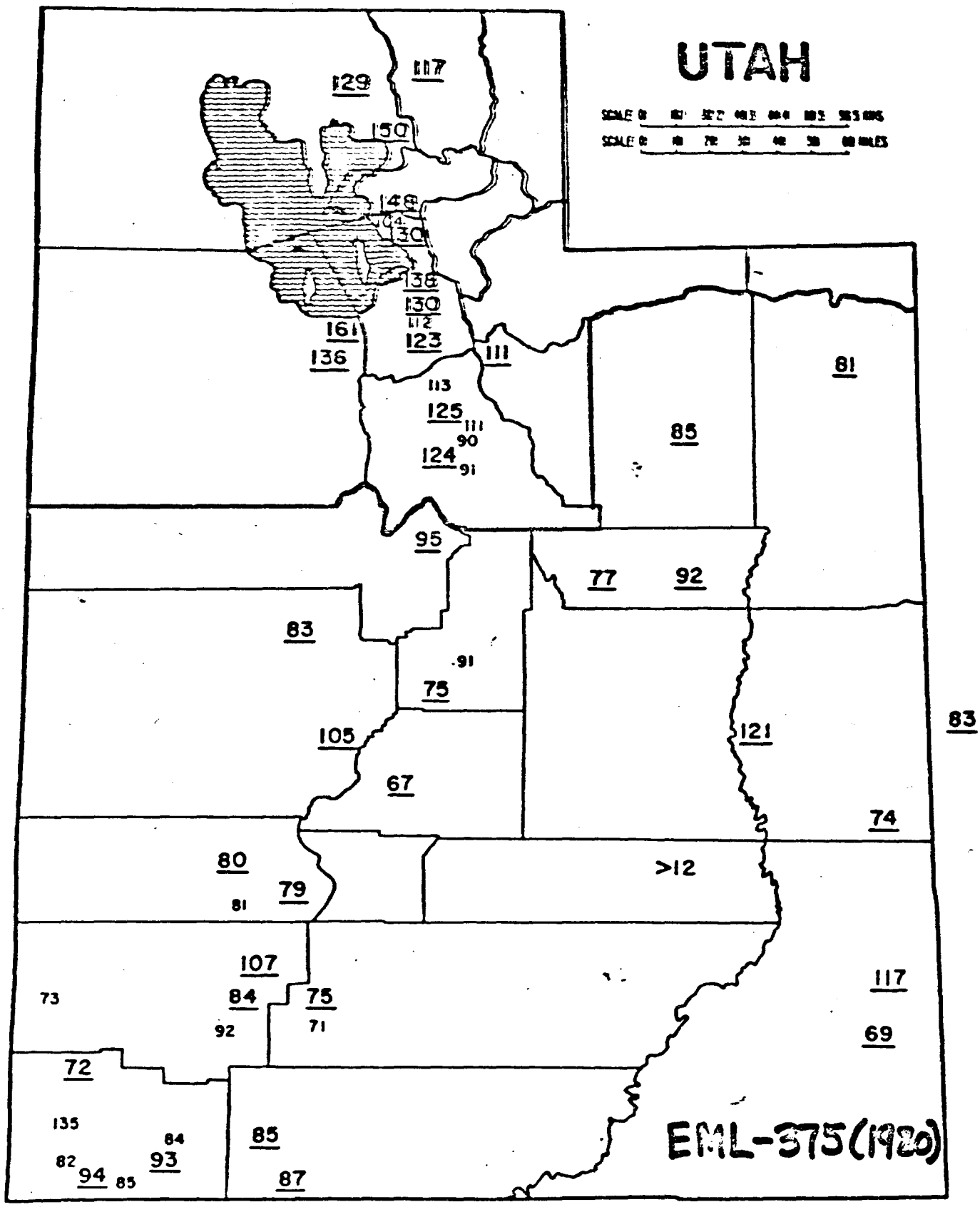


Figure 6. Best estimates of total ^{137}Cs inventories in Utah Soils as of June 1979. Underlined values are more precise than non-underlined values (see Table 4).

THE ATOM RATIO OF $^{240}Pu/^{239}Pu$ IS DIFFERENT FOR GLOBAL AND NTS FALLOUT

^{239}Pu is made in reactors:

$$^{238}U + n \rightarrow {}^{239}U \rightarrow {}^{239}Np \rightarrow {}^{239}Pu$$

^{240}Pu is a contaminant:

$$^{239}Pu + n \rightarrow {}^{240}Pu$$

$$^{238}U + 2n \rightarrow {}^{240}U \rightarrow {}^{240m}Np \rightarrow {}^{240}Pu$$

Thermonuclear explosions produce a high neutron flux and also make ^{240}Pu from ^{239}Pu and ^{238}U, and thereby alter the ratio of ^{240}Pu to ^{239}Pu.

(Pu) FROM A MIXTURE OF TWO SOURCES CAN BE RESOLVED BY SAMPLE ANALYSIS

$$\frac{(Pu)_N}{(Pu)_Q} = Y = \frac{(R_Q - R_S)(1 + 3.73 R_N)}{(R_S - R_N)(1 + 3.73 R_Q)}$$

(Pu) = Pu activity per unit area

R = $^{240}Pu / ^{239}Pu$ atom ratio

$R_N = 0.0321 \pm 0.003$

$R_Q = 0.180 \pm 0.006$

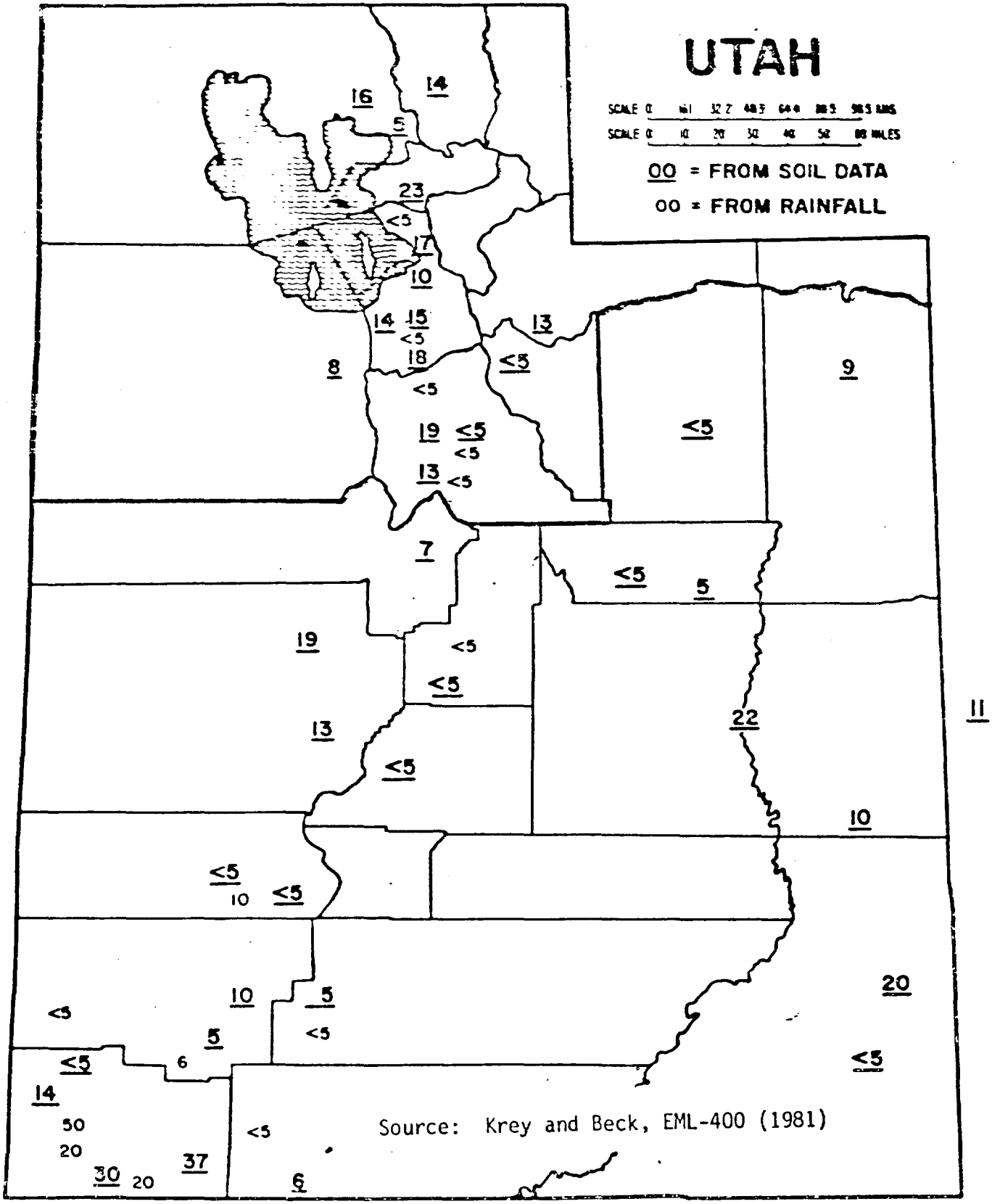
THIS ALLOWS THE CALCULATION OF $(^{137}Cs)_N$

$$(Pu)_q + (Pu)_N = (Pu)_s$$

$$(Pu)_q = \frac{1}{1+Y} (Pu)_s$$

$$(^{137}Cs)_N = (^{137}Cs)_s - (^{137}Cs/Pu)_q (Pu)_q$$

$$(^{137}Cs/Pu)_q = 53 \pm 1\%$$


UTAH
00 = FROM SOIL DATA
00 = FROM RAINFALL
16
14
5
23
<5
17
10
14
15
<5
18
<5
8
13
<5
9
19
<5
<5
13
<5
<5
7
<5
5
19
<5
<5
13
<5
22
11
10
<5
10
<5
10
5
<5
<5
5
6
<5
20
<5
14
50
20
37
30
20
<5
6
Source: Krey and Beck, EML-400 (1981)

Estimated Mean Bone Dose (mRem) to Utah Population from External Radiation Exposure

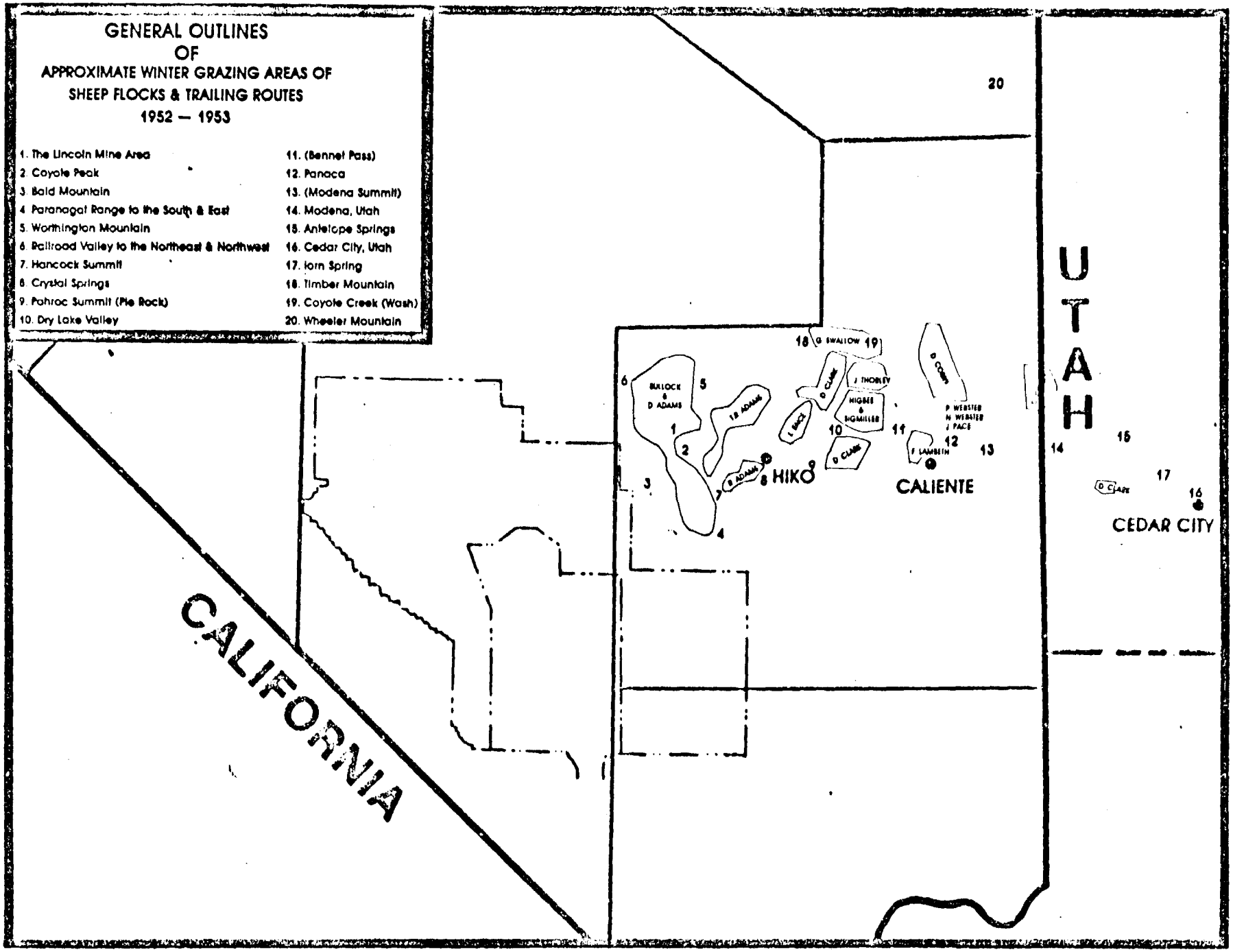
	NTS Fallout	GLOBAL Fallout	Natural background
N. Utah	415	100	69
S, Utah	280	50-75	76
Washington Co.	1120	50	65
Beaver Co.	250	60	100
Utah-mean	400	95	70
U. S. -mean	-	100	56

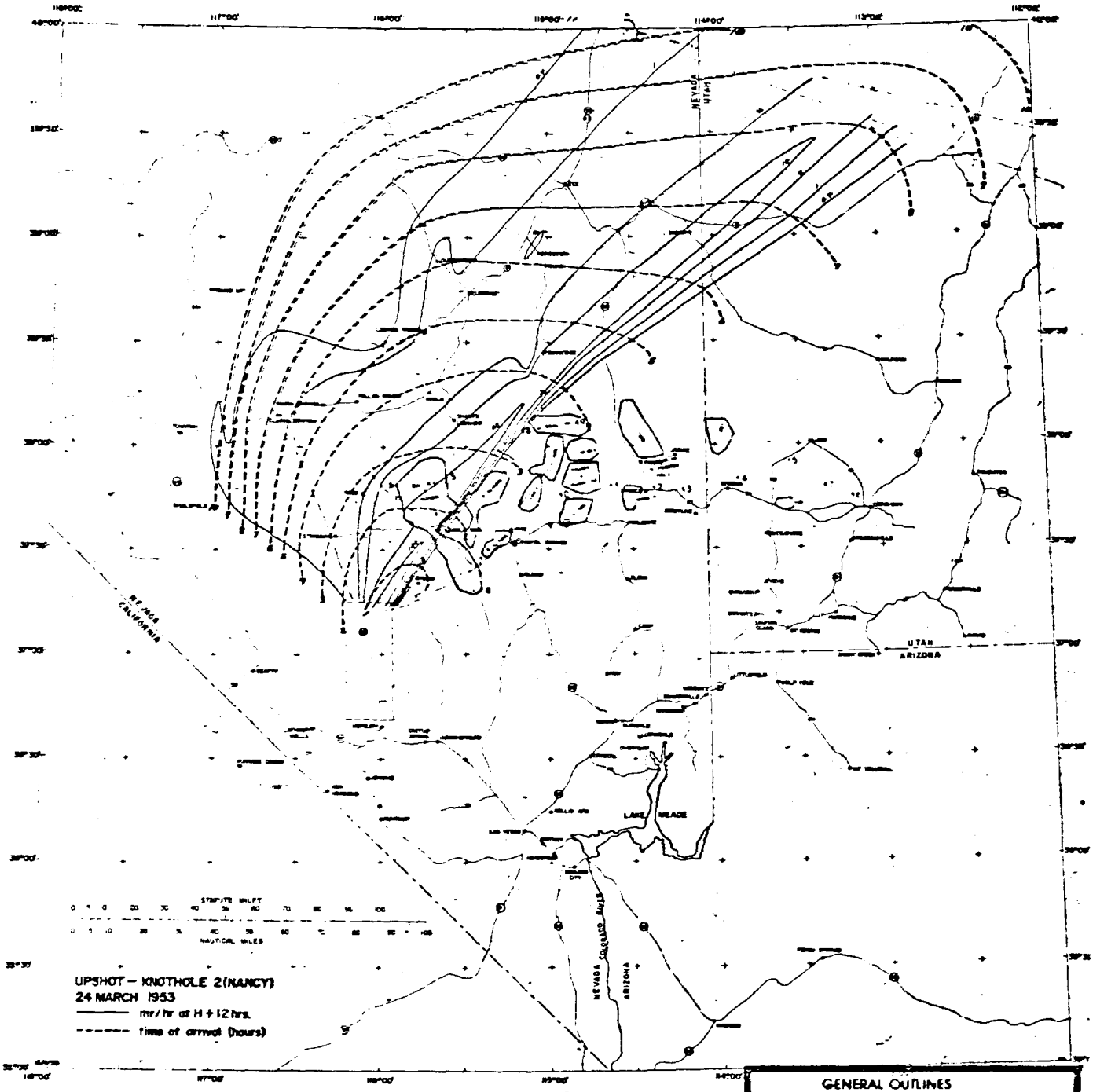
From Beck, EML (1981)

COMPARISON OF POPULATION DOSE ESTIMATES
EXTERNAL, RED MARROW
WASHINGTON COUNTY

ORERP-LANL	17,000 person-rads
Beck and Krey	10,000

PRELIMINARY


GENERAL OUTLINES
OF
APPROXIMATE WINTER GRAZING AREAS OF
SHEEP FLOCKS & TRAILING ROUTES
1952 — 1953
1. The Lincoln Mine Area
2. Coyote Peak
3. Bald Mountain
4. Paranagat Range to the South & East
5. Worthington Mountain
6. Railroad Valley to the Northeast & Northwest
7. Hancock Summit
8. Crystal Springs
9. Pahroc Summit (Pie Rock)
10. Dry Lake Valley
11. (Bennet Pass)
12. Panaca
13. (Modena Summit)
14. Modena, Utah
15. Antelope Springs
16. Cedar City, Utah
17. Iorn Spring
18. Timber Mountain
19. Coyote Creek (Wash)
20. Wheeler Mountain
CALIFORNIA
UTAH
HIKO
CALIENTE
CEDAR CITY



GENERAL OUTLINES OF APPROXIMATE WINTER GRAZING AREAS OF SHEEP FLOCKS & TRAILING ROUTES 1952 – 1953

DAVE C. BULLOCK & SONS

1951-1952

DATE	LOCATION	REF. CODE
	WINTER GRAZING:	
(Oct-Nov, 1951)	Sheep ranch in Lincoln County, NV Tickaboo Valley	1;3
	TRAILING:	
March 20, 1952	Left Ranch Tickaboo Valley	1
UNK	(Hancock Summit)	
UNK	(Crystal Springs)	
UNK	(PAHROS Summit)	
March 26, 1952	Dry Lake (Valley)	1
UNK	(Bennet Pass)	
April 1, 1952	Panaca	1
UNK	(Modena Summit)	
April 5, 1952	Modena, Utah	1
April 10, 1952	Cedar City, Utah	1
	SHEARING & LAMBING:	
UNK	Farm in Cedar City, Utah	1
	SUMMER GRAZING:	
UNK	Ranch on Cedar Mountain	1
	WINTER GRAZING:	
(Mid Oct., 1952) to April 5, 1953	Sheep ranch in Lincoln County, NV Tickaboo Valley	1 Pg 691; 3 Pg 6

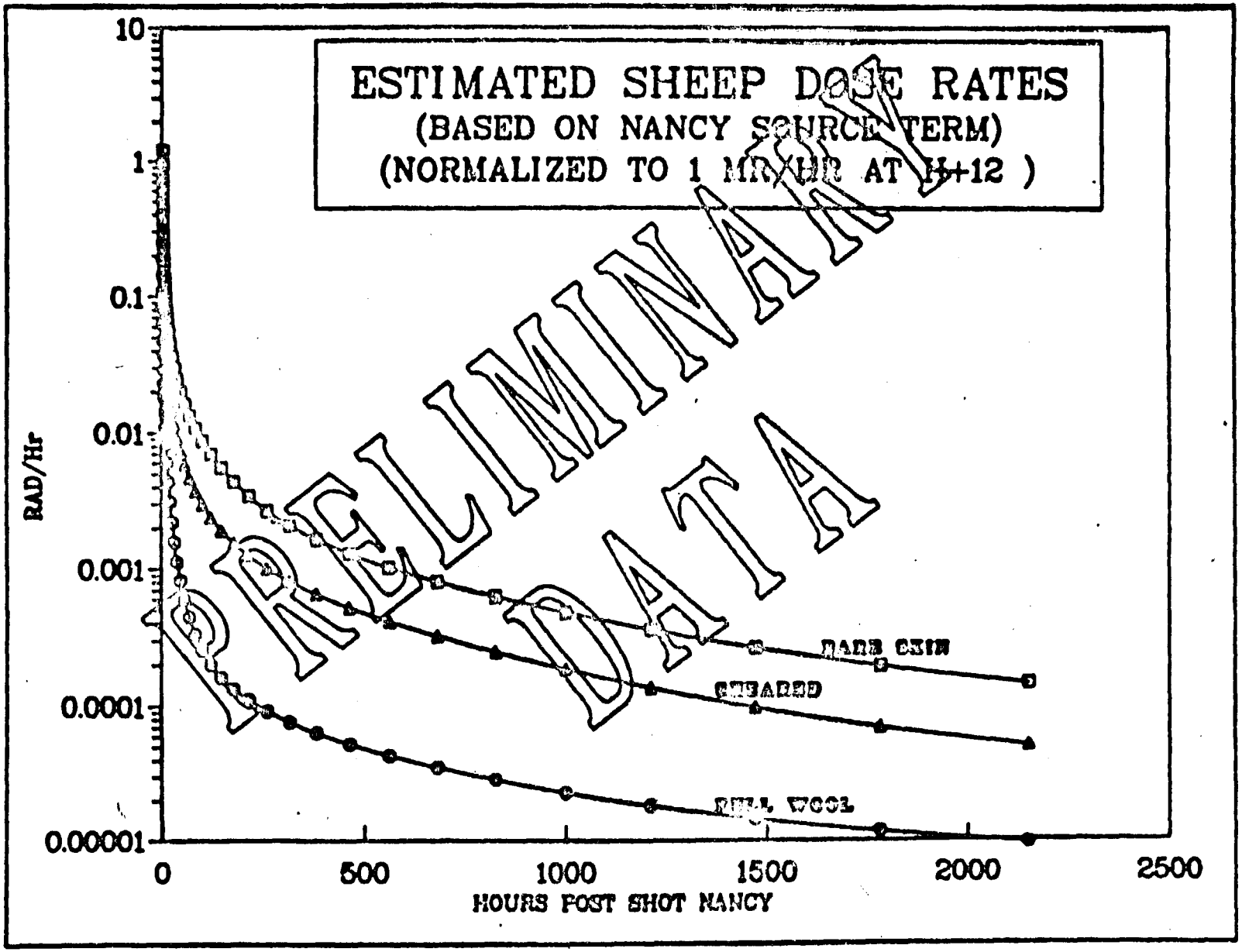
PRELIMINARY

DAVE C. BULLOCK & SONS

1952-1953

DATE	LOCATION	REF. CODE
	TRAILING:	
April 6, 1953	Tickaboo Valley (Desert Valley)	1 Pg 691, 692; 5 Pg 12
April 9, 1953	Hancock Summit	1
April 11, 1953	Crystal Springs	1
April 13, 1953	Pie Rock (PAHCOC Summit Pass)	1
April 15, 1953	Dry Lake (Valley)	1
UNK	(Bennet Pass)	
April 20, 1953	Panaca	1
UNK	(Modena Summit)	
April 25, 1953	Modena, Utah	1
UNK	(Antelope Spring)	
May 2, 1953	Cedar City, Utah	1
	SHEARING:	
May 4-5, 1953	Farm in Cedar City	1;5;6
	LAMBING:	
May 9, 1953	Farm in Cedar City	1;5;6
	SUMMER GRAZING:	
(Oct-Nov, 1953)	Ranch on Cedar Mountain	1
UNK	(TRAILING):	UNK

PRELIMINARY


ESTIMATED SHEEP DOSE RATES
(BASED ON NANCY SOURCE TERM)
(NORMALIZED TO 1 MR/HR AT H+12)
PRELIMINARY DATA
RAD/Hr
10
1
0.1
0.01
0.001
0.0001
0.00001
0
500
1000
1500
2000
2500
HOURS POST SHOT NANCY

INTEGRATED BETA DOSE TO SKIN OF SHEEP FROM NANCY, TOA = 2 HR, E = 100 mR/HR AT 11+12

Bare skin: 630 rad

Full wool: 50 rad

(External gamma dose = 5 rads)

PRELIMINARY

CALCULATION OF INTAKE, I

$$I' = E \cdot DN(t_a) \cdot (p/w) \cdot F \, e^{-\lambda t}$$

where E = mR/hr at H+12

$DN(t_a)$ = Normaliged deposition, $\mu Ci/m^2$ per mR/hr

t_a = Time of arrival

p = Fraction of surface deposit on veget.

w = Biomass (dry), kg/m^2

F = Food intake (dry), kg/d

λ = Effective decay of radionuclide from vegetation, d^{-1}

t = Time since t_a, day

CALCULATION OF INTAKE, I (concluded)

$$I = \int_0^7 I' \, dt$$

THE KEY PARAMETER IS P/W

P and W are not independent parameters

Knapp: $p/w = 0.4/0.028 = 14.3\ m^2/kg$

Chamberlain:

$$1 - p = e^{-\mu w}$$

If $\mu w < 1$, then

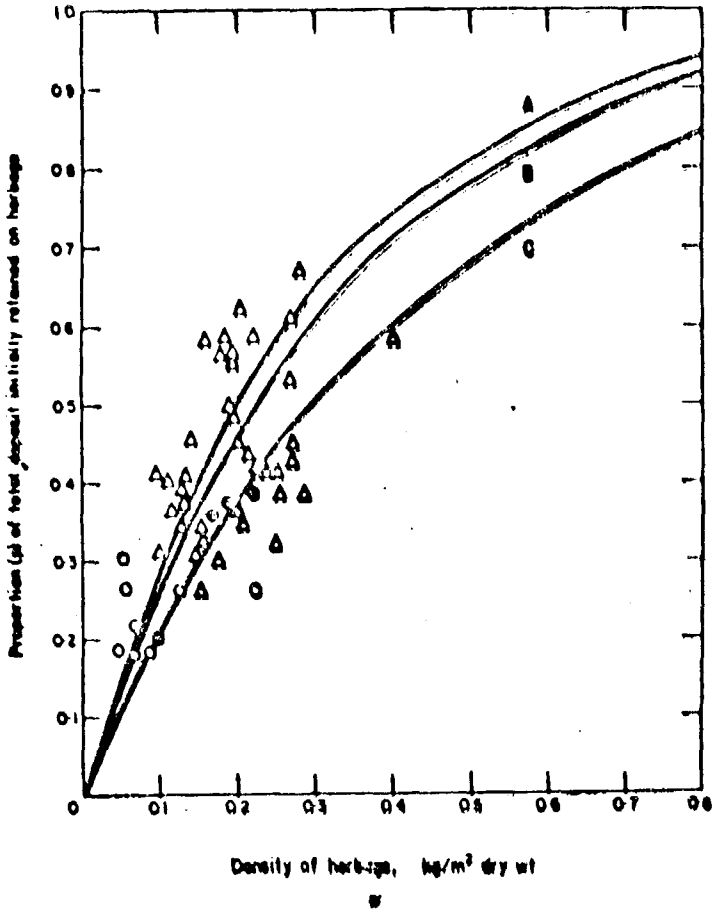
$$1 - p = 1 - \mu w \ ; \quad p/w = \mu$$

Total activity on vegetation is

$$cw = pd \ ; \quad p/w = c/d$$

c = Concentration in vegetation, $\mu Ci/kg$

d = Surface soil deposition, $\mu Ci/m^2$



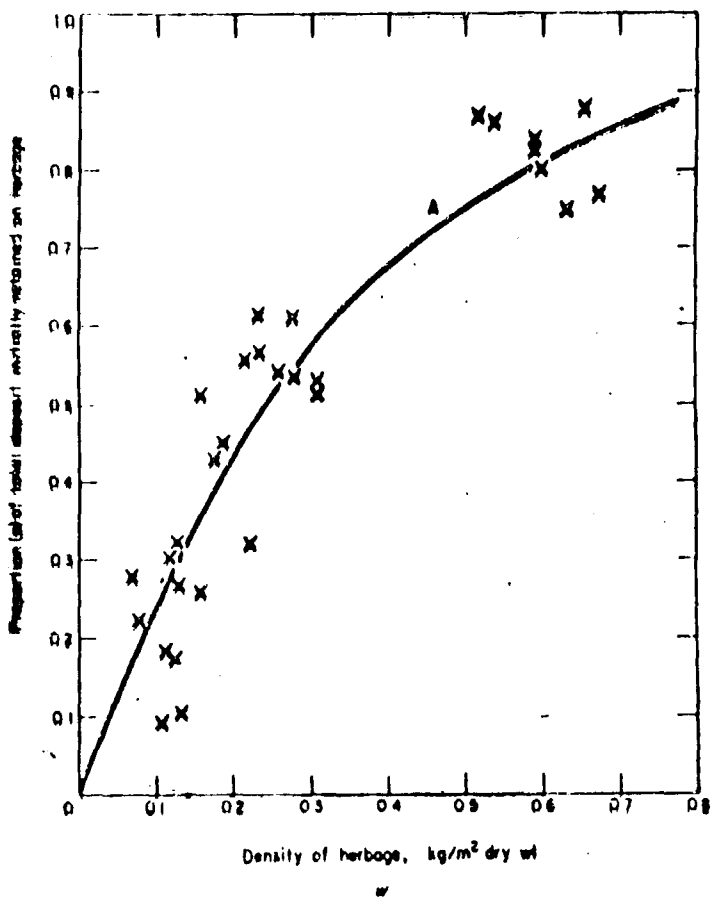


TABLE I. INITIAL RETENTION OF ACTIVITY BY GRASS

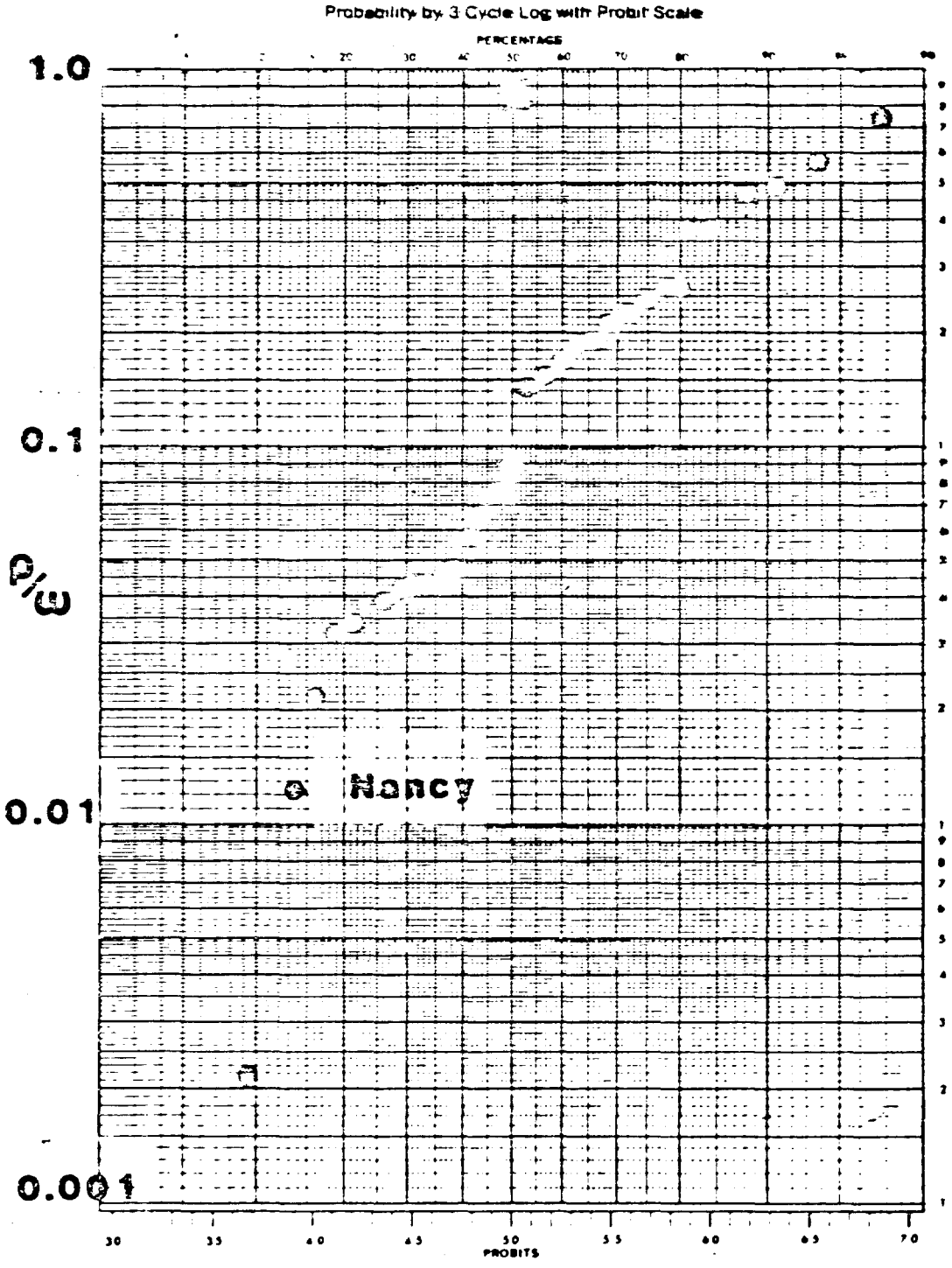
Form of activity	Absorption coefficient μ ($m^3 \cdot kg^{-1}$)
Droplets with ^{89}Sr (MILBOURN and TAYLOR)	3·33 ± 0·56
Droplets with ^{91}Sr (CHADWICK and CHAMBERLAIN)	2·30 ± 0·08
Lycopodium spores with ^{131}I	3·08 ± 0·15
Iodine vapour	2·78 ± 0·14

CALCULATION OF P/W IN NANCY FALLOUT FIELD

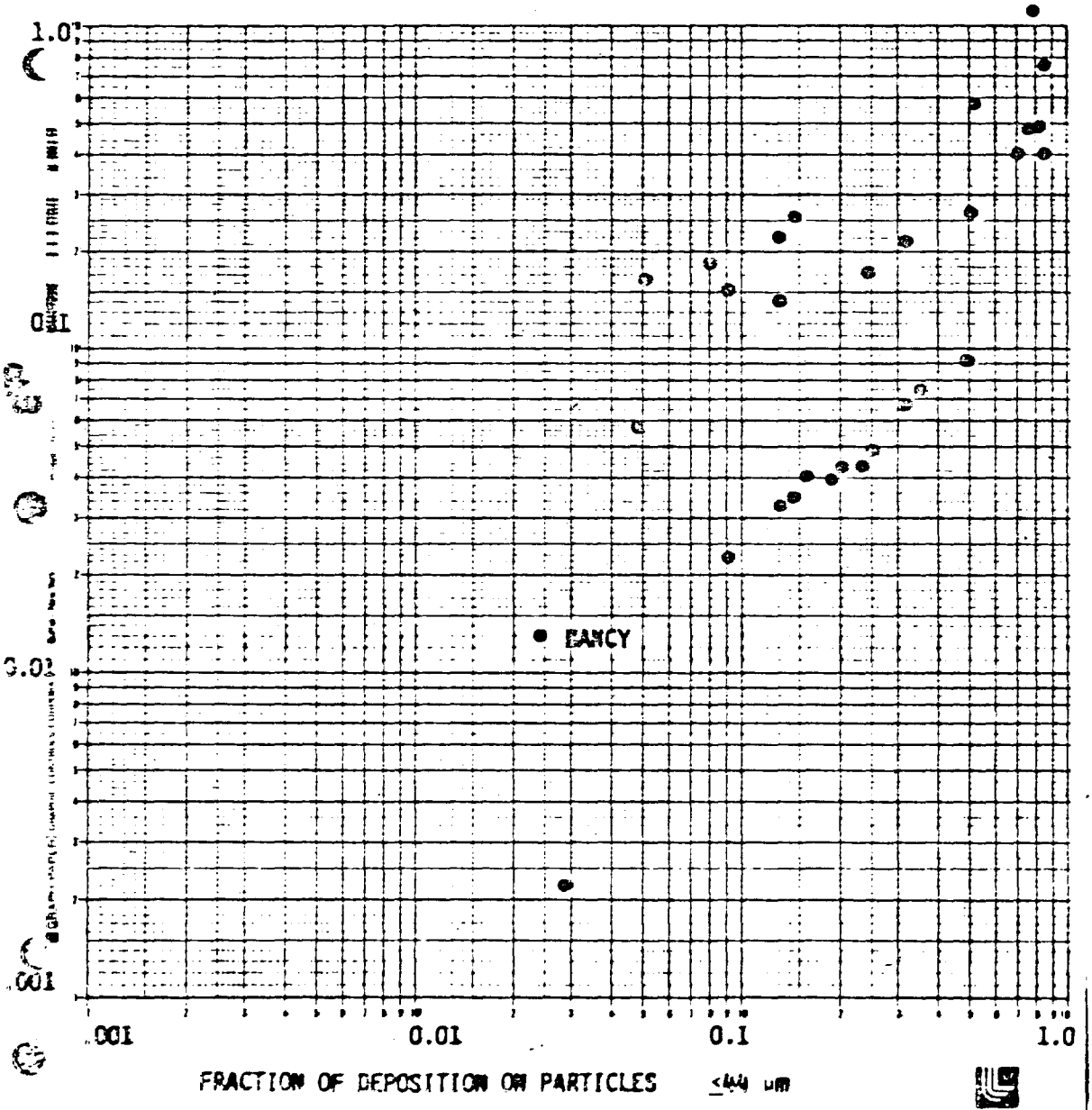
$$\frac{P}{W} = \frac{c}{d} = \frac{186\ \mu Ci}{kg} \times \frac{ft^2}{1340\ \mu Ci} \times \frac{m^2}{10.76\ ft^2}$$

$$= 0.0129\ m^2/kg$$

c and d from Lindberg et al., WT-812 (1954)


Probability by 3 Cycle Log with Probit Scale
PERCENTAGE
1.0
0.1
0.01
0.001
P/3
Nancy
30
35
40
45
50
55
60
65
70
PROBITS

NORMALIZED DEPOSITION ON NATIVE VEGETATION AS A FUNCTION OF FRACTION OF ACTIVITY ASSOCIATED WITH SMALL PARTICLES



VALUES CHOSEN FOR P/W

Most likely: 0.0129 m^2/kg

Maximum: 0.1 m^2/kg

(Knapp used 14.3 m^2/kg)

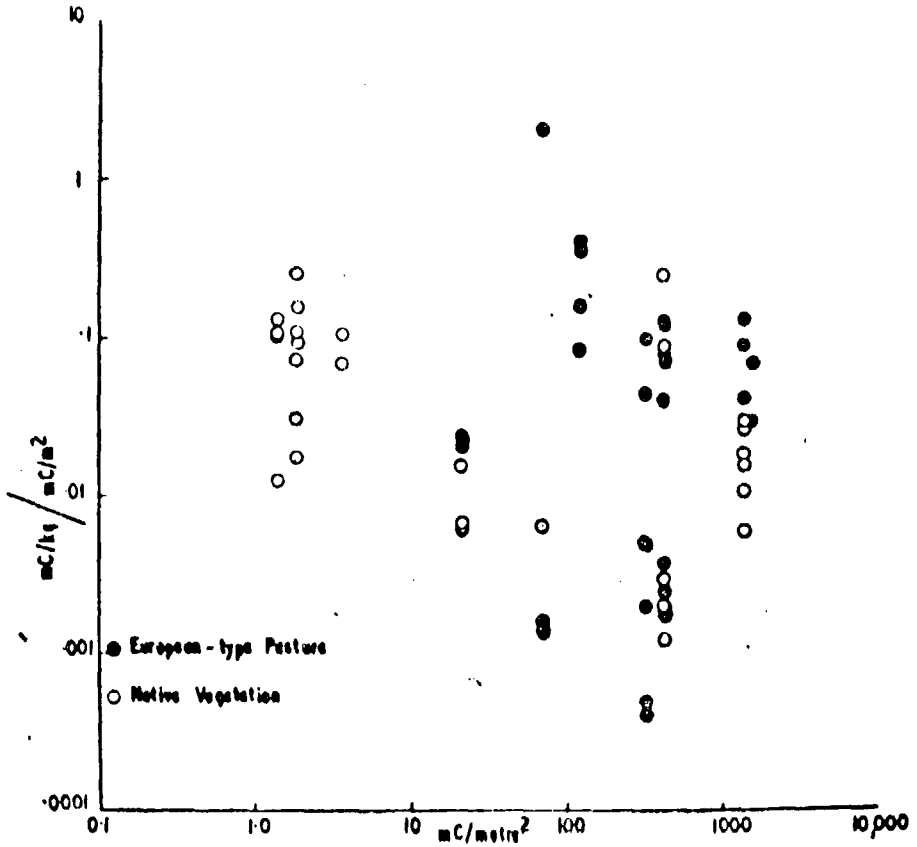


FIG. 6. Round 1. The relationship between the total fission product deposition per m² of ground surface and the ratio of contamination per kg of dry herbage to the deposition of fission products per m².

Fig. 3

Source: Russell and Possingham, FWE-229 (1959)

RESULTS FOR DOSE TO LLI

Knapp: 1000 to 3000 mrem

This study: 5 to 50 mrem

PRELIMINARY