United States
Environmental Protection
Agency

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Research and Development

EPA

Creation of a Data Base of Survey Meter Readings in the Western United States After Nuclear Tests

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PROJECT SUMMARY

Creation of a Data Base of Survey Meter Readings In The Western United States After Nuclear Tests

ABSTRACT

During the 1950s and 1960s, aboveground nuclear tests at the Nevada Test Site caused radioactive fallout in off-site areas. To help protect the people living in these areas, radiation levels were closely monitored during and after each test. All the monitoring data collected in the western U.S. since the start of nuclear testing in 1945 have recently been organized into a computerized data base, the Survey Meter Data Base, as part of the Off-Site Radiation Exposure Review Project. This report describes the contents and organization of the Survey Meter Data Base and the Procedures used to verify the accuracy of its records.

INTRODUCTION:

More then 700 nuclear tests have been conducted at the Nevada Test Site (NTS) since it was established in 1951. Many of these tests, especially the aboveground tests of nuclear weapons in the 1950s, resulted in radioactive fallout being deposited on the ground in regions outside the NTS boundary. To help protect the public from excessive exposure to radiation from this fallout, monitoring programs were (and continue to be) an important part of the operational support for every nuclear test.

In the days of atmospheric testing, the monitoring programs relied heavily on measurements of external gamma exposure rates made with hand-held instruments. These measurements were typically made at various locations along streets and highways throughout the region expected to be downwind from a given test. As the measurements were taken, the results were sent by radio to safety officials on the NTS to help them track the movement of fallout.

Each measurement was also recorded on a log sheet such as the one shown in Figure 1. Although the logs changed in format over the years, they usually included the gross radiation reading, a previously determined background level, the date and time, the instrument type and serial number, the location or the distance from some landmark, and comments about the measurement or the weather conditions. The logs were evaluated after the test to determine the extent of fallout deposition and the maximum readings, to prepare maps with exposure rate isopleths, and to estimate external exposures to off-site residents.

The earliest monitoring programs were carried out by Los Alamos Scientific Laboratory (now Los Alamos National Laboratory) and the military. In 1954, responsibility for the off-site radiological safety program was given to the U.S. Public Health Service (PHS). The University of California, Los Angeles (UCLA), also assisted with he monitoring programs in the 1950s. In 1970, the monitoring became a task of the newly created Environmental Protection Agency (EPA), which has maintained an extensive monitoring program around the NTS to the present day.

In 1979, renewed interest in the possible health effects of NTS fallout led the U.S. Department of Energy (DOE) to begin the Off-Site Radiation Exposure Review Project (ORERP). One objective of this project was to estimate the radiation doses that off-site populations may have received as a result of NTS activities. The old monitoring data have a key role in fulfilling this objective, and a major task of the ORERP was to collect those data and incorporate them into a computerized data base, the Survey Meter Data Base (SMDB).

The SMDB provides computer access to the available monitoring data and serves as a permanent historical record of the data. Creating it was the responsibility of the EPA's Environmental Monitoring Systems Laboratory in Las Vegas, with assistance from Reynolds

Electrical and Engineering Co., Inc. (REECo), and the Desert Research Institute (DRI) of the University of Nevada System.

MONITORING LOG

Name NEILL Vehicle No. 42178 Date 8/31/57 Shot No. XVI

Time	Speedometer Reading	Location	Levels - mr/hr MX-5 Gross	MX-5 Bkgd	MX-5 Net	T1-B Gross	T1-B Bkgd	T1-B Net	Reported Time	Via	To	Instrument No. MX-5	T1-B
1325	12150.6	(TRAVELING SOUTH				50						T475	624
1330	12151.0	DOWN RR. VALLEY				60							
1335	12151.3	OR [illegible] VALLEY				80							
1340	12151.1					130					*	PEAK	
1350	1523	GALT ([illegible])				120			*				
1353	1524					120							
1355	1530					120							
1400	153.7					160							
1410	154.5					160							
1415	154.5					160							
1420	155.4					180					*	PEAK	
1435	157.0					100							
1445	157.8	HOYA				50			*				
1500	159.4	(HIT-JOE [illegible] 250)				15			*				

Form 1 Sheet 2 of 4

Figure 1. Sample monitoring log sheet from nuclear event SMOKY.

CONTENTS OF THE SURVEY METER DATA BASE:

The SMDB contains the results of about 119,000 radiation measurements made after more than 225 nuclear tests. The tests represented in the data base are listed in Appendix A. They include the 1945 TRINITY test conducted in New Mexico and all nuclear tests conducted in Nevada between 1951 and 1972 for which monitoring data are available. Later tests are not included because none of them resulted in detectable radiation outside the NTS.

The primary sources of information for the SMDB were the original monitoring logs on which the readings were recorded. When the original logs for an event could not be found, written correspondence and reports were used as secondary sources. Occasionally, summary sheets and tables had to be used, although these were considered the least desirable sources of information. Appendix B lists all the documents used as sources of monitoring data for the SMDB. Copies of all source documents have been archived at the Coordination and Information Center (CIC) operated by REECo in Las Vegas.

Appendix C contains the rules and guidelines given to the people who transcribed the information from the monitoring logs for entry into the data base. This protocol helped ensure that the logs were interpreted consistently.

In general, a record in the SMDB contains the information from a single reading taken with a radiation survey instrument.

RESULTS AND DISCUSSION:

For additional information regarding the SMDB, a complete report can be obtained through NTIS.

CONCLUSIONS:

This report was not intended to assess the results contained in the SMDB, rather it was intended to merely describe its contents and organization.

CREATION OF A DATA BASE OF SURVEY METER READINGS IN THE WESTERN UNITED STATES AFTER NUCLEAR TESTS

by

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Carol B. Thompson
Desert Research Institute

October 1991

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ABSTRACT

During the 1950s and 1960s, aboveground nuclear tests at the Nevada Test Site caused radioactive fallout in off-site areas. To help protect the people living in these areas, radiation levels were closely monitored during and after each test. All the monitoring data collected in the western U.S. since the start of nuclear testing in 1945 have recently been organized into a computerized data base, the Survey Meter Data Base, as part of the Off-Site Radiation Exposure Review Project. This report describes the contents and organization of the Survey Meter Data Base and the procedures used to verify the accuracy of its records.

ACKNOWLEDGEMENTS

Creating the Survey Meter Data Base was a joint effort of several organizations, including the Nuclear Radiation Assessment Division of the U.S. Environmental Protection Agency, Reynolds Electrical & Engineering Co., Inc. (REECo), and the Desert Research Institute (DRI). Many people in these organizations played a role in making the effort successful. Those whom we would like to single out for special appreciation include John Harney, Pat Herrin, and Sheryl Pfeuffer of REECo's Coordination and Information Center, who helped with the final quality check of the data, and Dr. Richard McArthur of DRI, who helped revise the report and coordinated its preparation. To these people and the many others who have not been individually mentioned, we extend our thanks.

CREATION OF A DATA BASE OF SURVEY METER READINGS MADE IN THE WESTERN UNITED STATES AFTER NUCLEAR TESTS

INTRODUCTION

More than 700 nuclear tests have been conducted at the Nevada Test Site (NTS) since it was established in 1951. Many of these tests, especially the aboveground tests of nuclear weapons in the 1950s, resulted in radioactive fallout being deposited on the ground in regions outside the NTS boundary. To help protect the public from excessive exposure to radiation from this fallout, monitoring programs were (and continue to be) an important part of the operational support for every nuclear test.

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MONITORING LOG

Name NEILL Vehicle No. 42173 Date 8/31/57 Shot No. XVI

Time	Speedometer Reading	Location	Levels - mr/hr MK-5 Gross	MK-5 Bkgd	MK-5 Net	T1-B Gross	T1-B Bkgd	T1-B Net	Reported Time	Reported Via	Reported To	Instrument No. MK-5	Instrument No. T1-B
1325	12150.6	(TRAVELING SOUTH				50						17475	624
1330	12151.0	DOWN RR. VALLEY				60							
1335	12151.3	OR [illegible] VALLEY				80							
1340	12151.1					130					*	PEAK	
1350	1523	GALT (9A1)				120			*				
1353	1524					120 [illegible]							
1355	1530					120							
1400	153.2					160							
1410	154.5					160							
1415	154.5					160							
1420	155.8					180						* PEAK	
1435	157.0					100							
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1500	159.4	(HEST: JOE [illegible] 250)				15			*				

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The primary sources of information for the SMDB were the original monitoring logs on which the readings were recorded. When the original logs for an event could not be found, written correspondence and reports were used as secondary sources. Occasionally, summary sheets and tables had to be used, although these were considered the least desirable sources of information. Appendix B lists all the documents used as sources of monitoring data for the SMDB. Copies of all source documents have been archived at the Coordination and Information Center (CIC) operated by REECo in Las Vegas.

Appendix C contains the rules and guidelines given to the people who transcribed the information from the monitoring logs for entry into the data base. This protocol helped ensure that the logs were interpreted consistently.

In general, a record in the SMDB contains the information from a single reading taken with a radiation survey instrument. Each record contains the following data elements and attributes:

REC# (Record Number): A number assigned to each record within an event, used to randomly select records for quality assurance checks.

SEQ# (Sequence Number): A six-digit integer that uniquely identifies each record.

SERIES and EVENT: The operational series and the name of the nuclear event whose fallout was being monitored (see Appendix A). Beginning with the Upshot-Knothole series in 1953, the event name is unique.

EVENT# (Event Number): An alphanumeric code for the event, used to help in sorting the records.

OAGCY (Originating Agency): A number identifying the agency responsible for collecting the data:

00 Agency unknown
01 Public Health Service/Environmental Protection Agency
02 Department of Defense
03 University of California, Los Angeles
04 Los Alamos National Laboratory

SOURCE (Source Document Number): The CIC number for the document from which the information was obtained (see Appendix B).

LOGNUM (Log Number): A number assigned to each page of a source document from which information was transcribed. This number was used to sort retrievals from the data base in the same order that the data appear in the source document, thus making checks of the data base easier.

NEAR-TOWN (Nearest Town): The town nearest to where the reading was taken. The near-town designation gives the general location of the reading. Map coordinates are needed to find the exact location.

UTM (Universal Transverse Mercator): The map coordinate of the location where the reading was taken. It was determined by finding the location described in the source document on a U. S. Geological Survey map (1:250,000 scale) and reading the corresponding UTM coordinate. If a given location was in a city or town, the coordinate for the center of the city or town was used.

LAT and LONG (Latitude and Longitude): These were calculated from the UTM coordinate. They are used for calculating distances and plotting the data.

FLAGS: Letters or symbols used to explain characteristics or qualifications of the data that might affect their usefulness for dose assessment. The flags were used only with 12 events reanalyzed for the ORERP by the Weather Service Nuclear Support Office (WSNSO) of the National Oceanic and Atmospheric Administration[2-14]. The meanings of the flags are different for each event. Not all of the available records for an event were used in the WSNSO reanalysis. An "N" flag denotes records which are in the data base but not in the WSNSO reports (except in the case of event BOLTZMANN, where "$N" was used to eliminate conflict with the WSNSO flag "N").

NUFDC (Not Used For Dose Calculations): A letter code indicating the suitablity of a reading for dose assessment. A "Y" (for yes) or a "W" (for WSNSO review) in this field means the reading was not used in dose calculations, for reasons explained in the COMMENTS field. An "N" (for no) or a blank means there was no reason to exclude the reading. Possible reasons for not using a reading were that it was taken at some height other than 1 meter from the ground; the instrument was out of calibration; the instrument was contaminated to an unknown level; or the reading was taken indoors, in a vehicle, or next to a building.

DATE: A six-digit integer with the leading two digits representing the year, the next two digits the month, and the last two digits the day of the month on which the reading was made. Thus 570518 denotes May 18, 1957.

TIME: The time of day the reading was made, in military time (24-hour clock). For example, 0600 denotes 6:00 a.m., 1800 denotes 6:00 p.m., and 2400 denotes midnight. The time noted in the logs was assumed to be the local time at the NTS, which may have been different from the local time at the place of the measurement.

INSTTYP (Instrument Type): Alphanumeric characters representing the model number or abbreviated manufacturer's name of the instrument used. Appendix D provides details about all the types of instruments recorded in the logs.

INST# (Instrument Number): In most cases, the serial number of the instrument. On occasion, an agency-assigned property number was used.

GROSS (Gross Radiation Reading): The radiation reading measured with a survey instrument, including the contribution of ambient background. In some instances, readings were adjusted in the field using calibration curves. In these situations the field-adjusted measurements were used. When the original monitoring log information was not available, the adjusted (background subtracted) readings in reports were used.

Most readings entered on the logs were taken outdoors 1 meter above the ground, with no nearby obstructions. However, additional readings were sometimes taken at the ground surface and at various distances above the ground surface, and some were taken inside buildings or vehicles or near people. Such readings are noted in the COMMENTS field. In most cases, only one reading was taken with a given instrument at a given place, date, and time, although the UCLA monitors took as many as three readings to help determine the effect of shielding by the monitor's body.

BACK (Background Radiation Level): The radiation level at a given location before any fallout arrived from the event for which the monitoring was being performed (usually measured during a several-day period before the event). Contributions to the background radiation came from naturally occurring cosmic and terrestrial sources and in some cases from the fallout of previous nuclear tests or from contaminated instruments.

UNITS: A one- or two-character code specifying the unit of measurement for the gross and background readings.

R	Roentgens per hour, R/h
MR	Milliroentgens per hour, mR/h
UR	Microroentgens per hour, μR/h
CM	Counts per minute, cpm

RT (Radiation Type): A code indicating the type of radiation measured by the survey instrument. Most measurements were of gamma radiation (G), but some readings were taken of alpha radiation (A), of beta radiation (B) and of beta and gamma radiation combined (BG).

COMMENTS: The comments explain why a record is marked "NUFDC," the reasoning used in making a particular judgment for encoding a reading, or any facts recorded in the source document that might affect how a reading is used or interpreted.

A few records in the SMDB contain no radiation data. Such records represent nuclear events which presumably caused off-site fallout, but for which no monitoring records have been found. These events include SUGAR and UNCLE (Jangle series, 1951), for which exposure rate isopleths derived from the monitoring data were published by the Weather Bureau[15] even though the monitoring records or reports have been lost. They also include events such as COULOMB B whose fallout could not be distinguished from the fallout from another event conducted on the same day.

To obtain data from the SMDB, write to:

Chief, Dose Assessment Branch
Nuclear Radiation Assessment Division
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
P.O. Box 93478
Las Vegas, NV 89193-3478

QUALITY ASSURANCE

To help ensure the accuracy of the SMDB, the initial entry of data and any subsequent changes and corrections were all carefully checked by the person entering the data and the supervisor. However, the procedure for entering data was modified and new attributes were added at several points during development of the data base. As the SMDB neared completion, questions began to arise as to whether the first data entered were entirely consistent with the data entered at later stages.

To make sure that all records were encoded consistently, a complete review of the SMDB was carried out between March 1988 and July 1991. This review included developing a procedure for checking and updating data and creating the protocol for transcribing the data from the monitoring logs (Appendix C). In addition to assuring consistency of the records, the review also resulted in the removal of duplicate records. The instrument number, latitude, longitude, and source document number were added to each record during the review.

The first step in checking the data was to compare a printout of the SMDB records for an event with the source documents and the protocol. Any corrections to the records were reviewed by a supervisor before the data base was changed. After the changes were made, the corrected records were retrieved and again checked by the supervisor. The process of changing, retrieving, and checking records continued until all corrections had been made accurately.

The second data-checking step was to compare a map of the monitoring locations with the locations given in the source documents. Any necessary corrections resulting from this step were again validated by a supervisor after being made.

The final check used a random sampling of the records for each event to assure (with 95 percent confidence) that the transcription error rate was no greater than 2.5 percent. DRI developed the sampling procedure based on the procedures for assessing acceptable quality levels (AQL) in MIL-STD-105D[16]. In setting up the procedure, it was assumed that the records for each event represented a single batch of a distinct process and that an erroneous record was one which had at least one incorrect field. Schilling[17] defines a procedure for judging the AQL of single batches that provides a level of protection comparable to MIL-STD-105D. Burr[18] provides more information. A two-stage sampling plan was selected instead of a one-stage plan because such plans usually require fewer records to be sampled before coming to a decision on the AQL.

The AQL for the records associated with an event was judged by the following procedure:

1. After being given the number of records for the event, DRI produced a printout with the number of records to be sampled at each stage, the number of incorrect records required for accepting or rejecting the event at either stage, and a list of the record numbers of the randomly chosen records to be reviewed at each stage.

2. This printout and a second printout of all the records for the event were given to the person responsible for the AQL review. The reviewer checked each record in the first set of record numbers, recorded the number of incorrect records, and determined if the event passed or failed. If the number of records in error fell in the middle ground between passing and failing, the reviewer checked each record in the second set of record numbers. The total number of incorrect records was then used to determine if the event passed or failed.

3. If the event passed the review, any errors found were corrected in the data base, and after the supervisor checked the corrections, the review of the event was considered complete.

4. If the event did not pass the review, any errors found were corrected in the data base, and after the supervisory check, the event was reviewed again from step 1.

5. To prevent the same interpretation of possible errors, each AQL review of a given event was made by a different person. A different random number seed was also used in step 1 to ensure that the set of records checked in subsequent reviews was not exactly the same.

6. The records in an event were reviewed and corrected through this process until the event passed.

If the number of records in an event was less than 26, all the records were checked, because the MIL-STD-105D process was not set up to handle batch sizes that small.

The TRINITY readings were taken at ground level, which makes them not directly usable for dose calculations, and some readings were in roentgens per 8 hours, a unit not used for any other event. Only some of these readings (1,479 records) were entered into the SMDB. The TRINITY data were not given the supervisory reviews and quality checks given to the data for all other events.

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APPENDIX A
NUCLEAR EVENTS REPRESENTED IN THE SURVEY METER DATA BASE

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
TRINITY	07/16/45	0530 MDT	1,115	NM300
Operation Jangle				
SUGAR	11/19/51	0900 PST	1	NV001
UNCLE	11/29/51	1200 PST	1	NV002
Operation Tumbler–Snapper				
ABLE	04/01/52	0900 PST	23	NV085
BAKER	04/15/52	0930 PST	91	NV086
CHARLIE	04/22/52	0930 PST	135	NV087
DOG	05/01/52	0830 PDT	163	NV088
EASY	05/07/52	0415 PDT	337	NV003
FOX	05/25/52	0400 PDT	349	NV004
GEORGE	06/01/52	0355 PDT	168	NV005
HOW	06/05/52	0355 PDT	141	NV006
Operation Upshot–Knothole				
ANNIE	03/17/53	0520 PST	543	NV007
NANCY	03/24/53	0510 PST	689	NV008
RUTH	03/31/53	0500 PST	327	NV009
DIXIE	04/06/53	0730 PST	168	NV089
RAY	04/11/53	0445 PST	408	NV010
BADGER	04/18/53	0435 PST	722	NV011
SIMON	04/25/53	0430 PST	676	NV012
ENCORE	05/08/53	0830 PDT	288	NV090
HARRY	05/19/53	0505 PDT	751	NV013
GRABLE	05/25/53	0830 PDT	457	NV014
CLIMAX	06/04/53	0415 PDT	451	NV015
Operation Teapot				
WASP	02/18/55	1200 PST	332	NV091
MOTH	02/22/55	0545 PST	451	NV016
TESLA	03/01/55	0530 PST	725	NV017

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
TURK	03/07/55	0520 PST	832	NV018
HORNET	03/12/55	0520 PST	578	NV019
BEE	03/22/55	0505 PST	451	NV020
ESS	03/23/55	1230 PST	386	NV021
APPLE-1	03/29/55	0455 PST	734	NV022
HA	04/06/55	1000 PST	160	NV093
POST	04/09/55	0430 PST	303	NV023
MET	04/15/55	1115 PST	660	NV024
APPLE-2	05/05/55	0510 PDT	733	NV025
ZUCCHINI	05/15/55	0500 PDT	543	NV026

Operation Plumbbob

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
BOLTZMANN	05/28/57	0455 PDT	4,647	NV027
FRANKLIN	06/02/57	0455 PDT	352	NV094
LASSEN	06/05/57	0445 PDT	228	NV111
WILSON	06/18/57	0445 PDT	1,164	NV028
PRISCILLA	06/24/57	0630 PDT	2,608	NV029
COULOMB-A	07/01/57	1030 PDT	9	NV155
HOOD	07/05/57	0440 PDT	1,925	NV030
DIABLO	07/15/57	0430 PDT	3,535	NV031
JOHN	07/19/57	0700 PDT	212	NV095
KEPLER	07/24/57	0450 PDT	505	NV032
OWENS	07/25/57	0630 PDT	638	NV033
STOKES	08/07/57	0525 PDT	534	NV034
SHASTA	08/18/57	0500 PDT	3,108	NV035
DOPPLER	08/23/57	0530 PDT	562	NV036
FRANKLIN PRIME	08/30/57	0540 PDT	441	NV037
SMOKY	08/31/57	0530 PDT	3,530	NV038
GALILEO	09/02/57	0540 PDT	1,635	NV071
WHEELER	09/06/57	0545 PDT	441	NV097
COULOMB-B	09/06/57	1305 PDT	1	NV039
LAPLACE	09/08/57	0600 PDT	256	NV098
FIZEAU	09/14/57	0945 PDT	1,890	NV040
NEWTON	09/16/57	0550 PDT	752	NV041
RAINIER	09/19/57	1000 PDT	46	NV177
WHITNEY	09/23/57	0530 PDT	1,521	NV042
CHARLESTON	09/28/57	0600 PDT	203	NV099
MORGAN	10/07/57	0500 PST	441	NV043

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
Operation Hardtack II				
OTERO	09/12/58	1300 PDT	152	NV044
BERNALILLO	09/17/58	1230 PST	63	NV147
EDDY	09/19/58	0700 PDT	412	NV045
LUNA	09/21/58	1200 PDT	15	NV168
MERCURY	09/23/58	1500 PDT	1	NV171
VALENCIA	09/26/58	1300 PDT	7	NV183
MARS	09/28/58	1700 PDT	1	NV169
MORA	09/29/58	0605 PST	565	NV046
HIDALGO	10/05/58	0610 PST	1	NV047
COLFAX	10/05/58	0815 PST	78	NV154
TAMALPAIS	10/08/58	1400 PST	1	NV181
QUAY	10/10/58	0630 PST	494	NV048
LEA	10/13/58	0520 PST	276	NV049
NEPTUNE	10/14/58	1000 PST	1	NV174
HAMILTON	10/15/58	0800 PST	213	NV072
DONA ANA	10/16/58	0620 PST	90	NV050
LOGAN	10/16/58	2200 PST	1	NV167
VESTA	10/17/58	1500 PST	138	NV051
RIO ARRIBA	10/18/58	0625 PST	419	NV052
SAN JUAN	10/20/58	0630 PST	1	NV178
SOCORRO	10/22/58	0530 PST	117	NV053A
WRANGELL	10/22/58	0850 PST	290	NV053B
OBERON	10/22/58	1230 PST	1	NV175
RUSHMORE	10/22/58	1540 PST	1	NV101
CATRON	10/24/58	0700 PST	133	NV054
JUNO	10/24/58	0801 PST	1	NV165
SANFORD	10/26/58	0220 PST	337	NV055A
DE BACA	10/26/58	0800 PST	1	NV055B
CERES	10/26/58	2000 PST	1	NV150
CHAVEZ	10/27/58	0630 PST	34	NV056
MAZAMA	10/29/58	0320 PST	114	NV170
HUMBOLDT	10/29/58	0645 PST	1	NV057
EVANS	10/29/58	1600 PST	1	NV159
SANTA FE	10/29/58	1900 PST	21	NV058
GANYMEDE	10/30/58	0300 PST	1	NV161
BLANCA	10/30/58	0700 PST	1	NV112
TITANIA	10/30/58	1234 PST	26	NV102

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
Operation Nougat				
ANTLER	09/15/61	1000 PDT	209	NV114
SHREW	09/16/61	1245 PDT	69	NV194
CHENA	10/10/61	1000 PDT	204	NV185
FISHER	12/03/61	1505 PST	72	NV208
RINGTAIL	12/17/61	0835 PST	23	NV246
FEATHER	12/22/61	0830 PST	194	NV115
MAD	12/31/61	1000 PST	247	NV192
STOAT	01/09/62	0830 PST	146	NV195
AGOUTI	01/18/62	1000 PST	110	NV201
DORMOUSE	01/30/62	1000 PST	183	NV188
ARMADILLO	02/09/62	0830 PST	232	NV202
HARD HAT	02/15/62	1000 PST	124	NV189
CHINCHILLA	02/19/62	0830 PST	58	NV186
CIMARRON	02/23/62	1000 PST	80	NV205
PLATYPUS	02/24/62	0830 PST	140	NV244
PAMPAS	03/01/62	1110 PST	691	NV119
DANNY BOY	03/05/62	1015 PST	763	NV059
BRAZOS	03/08/62	1000 PST	203	NV184
HOGNOSE	03/15/62	0830 PST	57	NV191
HOOSIC	03/28/62	1000 PST	108	NV209
CHINCHILLA II	03/31/62	1000 PST	70	NV204
DORMOUSE II	04/05/62	1000 PST	45	NV207
PASSAIC	04/06/62	1000 PST	33	NV236
HUDSON	04/12/62	1000 PST	7	NV210
PLATTE	04/14/62	1000 PST	650	NV066
DEAD	04/21/62	1040 PST	8	NV206
BLACK	04/27/62	1000 PST	33	NV203
PACA	05/07/62	1233 PDT	24	NV234
AARDVARK	05/12/62	1200 PDT	26	NV200
EEL	05/19/62	0800 PDT	782	NV067
WHITE	05/25/62	0800 PDT	10	NV250
RACCOON	06/01/62	1000 PDT	2	NV245
PACKRAT	06/06/62	1000 PDT	4	NV235
DES MOINES	06/13/62	1400 PDT	911	NV074
DAMAN I	06/21/62	1000 PDT	8	NV187
HAYMAKER	06/27/62	1100 PDT	55	NV190
MARSHMALLOW	06/28/62	1000 PDT	34	NV193
SACRAMENTO	06/30/62	1430 PDT	15	NV247

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
Operation Storax				
SEDAN	07/06/62	1000 PDT	1,463	NV060
ALLEGHENY	09/29/62	0900 PDT	34	NV260
BANDICOOT	10/19/62	1100 PDT	981	NV069
MISSISSIPPI	10/05/62	0900 PDT	7	NV265
ANACOSTIA	11/27/62	1000 PST	39	NV261
GERBIL	03/29/63	0745 PST	43	NV262
Operation Sunbeam				
LITTLE FELLER II	07/07/62	1100 PST	11	NV263
JOHNIE BOY	07/11/62	0945 PDT	550	NV061
SMALL BOY	07/14/62	1130 PDT	6,324	NV062
LITTLE FELLER I	07/17/62	1000 PDT	216	NV103
Operation Fishbowl				
MERRIMAC	07/13/62	0800 PST	4	NV264
WICHITA	07/27/62	1300 PST	28	NV267
Operation Roller Coaster				
DOUBLE TRACKS	05/15/63	0255 PDT	217	NV157
CLEAN SLATE I	05/25/63	0417 PDT	213	NV151
CLEAN SLATE II	05/31/63	0347 PDT	102	NV152
CLEAN SLATE III	06/09/63	0330 PDT	104	NV153
Operation Niblick				
GRUNION	10/11/63	0700 PDT	67	NV162
SHOAL	10/26/63	1000 PST	591	NV266
OCONTO	01/23/64	0800 PST	48	NV176
PIKE	03/13/64	0802 PST	1,481	NV064
BACKSWING	05/14/64	0740 PDT	41	NV145
Operation Whetstone				
CANVASBACK	08/22/64	1517 PDT	44	NV148
CREPE	12/05/64	1315 PST	128	NV156
PARROT	12/16/64	1200 PST	805	NV126
SULKY	12/18/64	1135 PST	715	NV127

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
PALANQUIN	04/14/65	0514 PST	2,957	NV075
TEE	05/07/65	0847 PDT	189	NV129
DILUTED WATERS	06/16/65	0930 PDT	123	NV130
TINY TOT	06/17/65	1000 PDT	13	NV182
Operation Flintlock				
SCREAMER	09/01/65	1308 PDT	292	NV179
ELKHART	09/17/65	0808 PDT	5	NV158
SEPIA	11/12/65	1000 PST	24	NV180
PIN STRIPE	04/25/66	1138 PDT	1,933	NV065
Operation Latchkey				
DERRINGER	09/12/66	0830 PDT	142	NV133
UMBER	06/29/67	0425 PDT	1,030	NV136
Operation Crosstie				
DOOR MIST	08/31/67	0930 PDT	115	NV137
HUPMOBILE	01/18/68	0830 PST	829	NV138
FAULTLESS	01/19/68	1015 PST	108	NV160
CABRIOLET	01/26/68	0800 PST	876	NV073
BUGGY	03/12/68	0904 PST	3,334	NV068
MILK SHAKE	03/25/68	1044 PST	90	NV172
Operation Bowline				
SCHOONER	12/08/68	0800 PST	6,633	NV063
BENHAM	12/19/68	0830 PST	44	NV146
Operation Mandrell				
JORUM	09/16/69	0730 PDT	16	NV164
POD	10/29/69	1200 PST	321	NV139
HANDLEY	03/26/70	1100 PST	17	NV163
SNUBBER	04/21/70	0630 PST	908	NV141
MINT LEAF	05/05/70	0830 PDT	21	NV142
Operation Emery				
CARPETBAG	12/17/70	0805 PST	26	NV149
BANEBERRY	12/18/70	0730 PST	2,996	NV070

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
Operation Grommet				
MINIATA	07/08/71	0700 PDT	1	NV173
DIAGONAL LINE	11/24/71	1215 PST	138	NV143
Project Rover				
KIWI A	07/01/59	--	67	NV211
KIWI A PRIME	07/08/60	--	167	NV166
KIWI A-3	10/19/60	--	40	NV212
KIWI B-1A LOW POWER	11/05/61	--	58	NV213
KIWI B-1A FULL POWER	12/07/61	1415 PST	144	NV254
KIWI B-1B IV	09/01/62	1230 PDT	303	NV216
KIWI B-4A VI	11/30/62	1207 PST	128	NV217
KIWI B-4D IV	05/13/64	1045 PDT	709	NV218
KIWI B-4E V	08/28/64	1247 PDT	577	NV219
KIWI B-4E VI	09/10/64	1155 PST	897	NV220
NRX-A2 IV	09/24/64	1105 PDT	901	NV223
NRX-A2 V	10/15/64	1230 PDT	92	NV259
KIWI TNT	01/12/65	1057 PST	2,024	NV221
NRX-A3 IV	04/23/65	1258 PST	252	NV224
NRX-A3 V	05/20/65	1046 PDT	397	NV225
NRX-A3 VI	05/28/65	1100 PDT	33	NV257
PHOEBUS 1A IV	06/25/65	1326 PDT	291	NV239
NRX-A4/EST IIB	02/03/66	1510 PST	30	NV226
NRX-A4/EST IIC	02/11/66	1443 PST	297	NV227
NRX-A4/EST III	03/03/66	1605 PST	134	NV228
NRX-A4/EST IV	03/16/66	1020 PST	265	NV229
NRX-A4/EST IVA	03/25/66	0948 PST	1,056	NV230
NRX-A5 III	06/08/66	1418 PDT	22	NV231
NRX-A5 IV	06/23/66	1050 PDT	595	NV232
PHOEBUS 1B III	02/10/67	--	198	NV258
PHOEBUS 1B IV	02/23/67	--	1,165	NV240
NRX-A6 IIIA	12/15/67	1059 PST	2,915	NV233
PHOEBUS 2A III	06/08/68	1125 PDT	275	NV242
PHOEBUS 2A IV	06/26/68	1309 PDT	872	NV241
PHOEBUS 2A V	07/18/68	--	1,031	NV243
PEEWEE 1 II	11/21/68	1415 PST	176	NV237
PEEWEE 1 III	12/04/68	1435 PST	95	NV238
XE PRIME VC	06/11/69	1053 PDT	45	NV252

EVENT NAME	DATE	TIME	# OF RECORDS	EVENT #
XE PRIME IXA	08/28/69	1651 PDT	200	NV251
NF-1 II	06/29/72	1158 PDT	63	NV222
Project Pluto				
TORY IIA-I	05/14/61	--	74	NV255
TORY IIA-II	09/28/61	--	177	NV256
TORY IIA-III	10/06/61	--	395	NV248
TORY IIC	05/20/64	1350 PDT	997	NV249

APPENDIX B
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Many of these documents are unpublished and cannot readily be obtained from the sponsoring agency. Request for copies should be directed to the Coordination and Information Center, REECo, P.O. Box 98521, Las Vegas, NV 89193–8521. Please use the CIC number when referring to any source document. The documents are also available for public examination at 3084 South Highland Drive in Las Vegas.

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APPENDIX C
PROTOCOL FOR CODING MONITORING RECORDS

The following set of rules and guidelines was given to the people who transcribed the monitoring data from the original records for entry into the SMDB. Its purpose was to help the transcribers interpret the logs in situations where the original notes were not clear. By defining procedures for handling the most common problems, the protocol helped ensure that the records in the SMDB consistently reflect the efforts of the monitors to describe radiological conditions.

Rules (R) provide coding conventions for situations where little, if any, interpretation of the monitor's notes is needed. Guidelines (G) give conventions for situations where some interpretation may be necessary to determine what radiological conditions the monitor was attempting to record.

1. (R) There should be a record in the SMDB for each unique radiological assessment. A unique radiological assessment describes the measurements by a particular instrument at a particular time, location and distance from the ground.

2. (R) For each unique radiological assessment, the following information should be picked up from the monitor's logs (or summary report):

   Event Name
   Source Document Number
   Log Number from Source Document
   Date of Measurement (yymmdd)
   Time of Measurement (24–hour clock) at the NTS
   Location of Measurement (in UTM coordinates)
   Instrument Type (e.g., MX–5, T1B, THYAC)
   Instrument Number
   Radiation Type (e.g., Gamma or Beta–Gamma)
   Gross Radiation Value
   Background Radiation Value
   Unit of Measurement for Gross and Background (e.g., mR or μR)
   Comment relating to status of measurement (either from the log sheets or reports or to explain interpretations or judgments made)

3. (R) For each unique radiological assessment, the following information will also be kept in the SMDB:

   Series name associated with the event
   Sequence number of record in the data base
   Nearest town to measurement location (determined by computer program)
   Location of measurement (longitude and latitude, determined by program)
   Flags (indicating notes from WSNSO reanalysis or about use of measurement)

Agency responsible for collecting monitoring information or providing final report
Event number

4. (R) If a line on an original monitoring log or final report contains no radiological assessment, that is, no background or gross value, no record will be entered into the data base. If such a line contains a comment that describes something about the radiological or environmental situation, add the comment to the next earliest record from that log sheet.

5. (R) In some instances, information from final reports was entered into the data base before the original monitoring logs were located. The records relating to the information in the final reports should be replaced by the information from the original logs. If instances of this are found in situations where records come from more than one document, please notify the supervisor.

6. (R) When original monitoring logs are not available, net survey readings from final reports have to be entered into the data base.

[A] If no background information is available in the report, the net values will be entered in the GROSS data field and a zero (0.0) will be entered in the BACKGROUND data field.

[B] If background information is available in the report, the value should be entered in the BACKGROUND data field and the reading should be considered the GROSS value for Tumbler–Snapper events. For other events check the report or check with the supervisor.

7. (R) [A] If a line on an original monitoring log or final report contains only a net and a gross reading, i.e., no background reading, the BACKGROUND value will be calculated by subtracting the net value from the gross value. This BACKGROUND value and the indicated GROSS value will be entered into the data base.

[B] If the net value equals the gross value, enter the gross value in the GROSS data field and a null, "–0–", in the BACKGROUND data field.

8. (R) If a line on an original monitoring log or final report contains only a net and a background value, i.e., no gross reading, the GROSS value will be calculated by adding the background value to the net value. This GROSS value and the indicated BACKGROUND value will be entered into the data base.

9. (R) [A] If a non–numeric entry such as "BKGD" appears in the gross and background columns on an original monitoring log without any interpretation of what numeric value is represented by that entry, the GROSS and BACKGROUND values in the data base should be coded as a null, "–0–." An entry in the COMMENT field should be made to the effect that "BKGD (or whatever) was indicated for the gross and background readings." (revised 4/4/88)

[B] If a non–numeric entry such as "BKGD" appears in the background column and a numeric entry appears in the gross column for that reading, enter the numeric value in the GROSS value of the data base and enter a null, "–0–", in the BACKGROUND value. An entry in the COMMENT field should also be made to the effect that "BKGD (or whatever) was indicated on the log sheet for the background reading." (revised 4/4/88)

10. (R) Readings for on–site and off–site locations, i.e., those beyond the boundaries of the Nevada Test Site will be entered into the data base. The attached map (Figure C–1) shows the area considered to be on–site. Maps will be available for this assessment.(revised 10/3/88)

11. (R) Any comment on a log sheet or final report describing the unique radiological assessment should be entered in the COMMENTS field of the the data base. Comments relating to transmission of information via radio should not be entered.

12. (R) Comments on monitoring logs that are listed for one record but pertain to more than one record should be entered in the COMMENTS field of the data base for each appropriate record. Again one needs to assess what the monitor intended to describe about the situation.

13. (R) Any indication on a log sheet, whether in the comments area or other places on the line, that the reading was taken inside a building, inside a vehicle, or at any height other than 1 meter above ground surface will be noted in the COMMENTS field of the data base.

14. (R) Any interpretations or judgments made about the intent of the monitor for a radiological assessment will be noted in the COMMENTS field of the data base.

15. (R) Open shield survey instrument readings are considered beta–gamma radiation measurements; closed shield readings are considered gamma radiation measurements.

16. (R) Some original monitoring logs contain three readings from CDV–700 survey meters for the same date, time and location. Each of these readings will be entered into the data base as a unique radiological assessment. For instances where the original survey meter readings for these instruments were corrected by a factor, only the original survey meter readings will be entered into the data base.(revised 10/3/88)

17. (R) Some log sheets include notations that a reading with a particular instrument was off–scale.

[A] If an MX–5 reading is noted as being off–scale, but a useable reading from another instrument for that date, time and location is available, the information from the other instrument should be included in the data base and a note should be made in the COMMENTS field of the data base that the "MX–5 reading was off–scale."

[B] If an MX–5 reading is noted as being off–scale, but there is no other instrument reading available for that date, time and location, the full scale record will be entered in the data base as a GROSS value and a notation in the COMMENTS field will be made that the "MX–5 reading was off–scale." (revised 5/6/88)

18. (R) The monitoring logs labeled "D/R" and "G/C" stand for direct readings 1 meter above the ground surface and ground contact readings, respectively. For any record containing a G/C reading, the entry "Ground contact reading" will be made in the COMMENTS field.

19. (G) A ditto or vertical arrow is often used on an original monitoring log sheet to indicate identical readings to those listed above. However, one needs to carefully interpret the radiological assessments described by the monitor. For example, a reading whose gross or background readings are "dittoed" should not be entered as a record in the data base if the

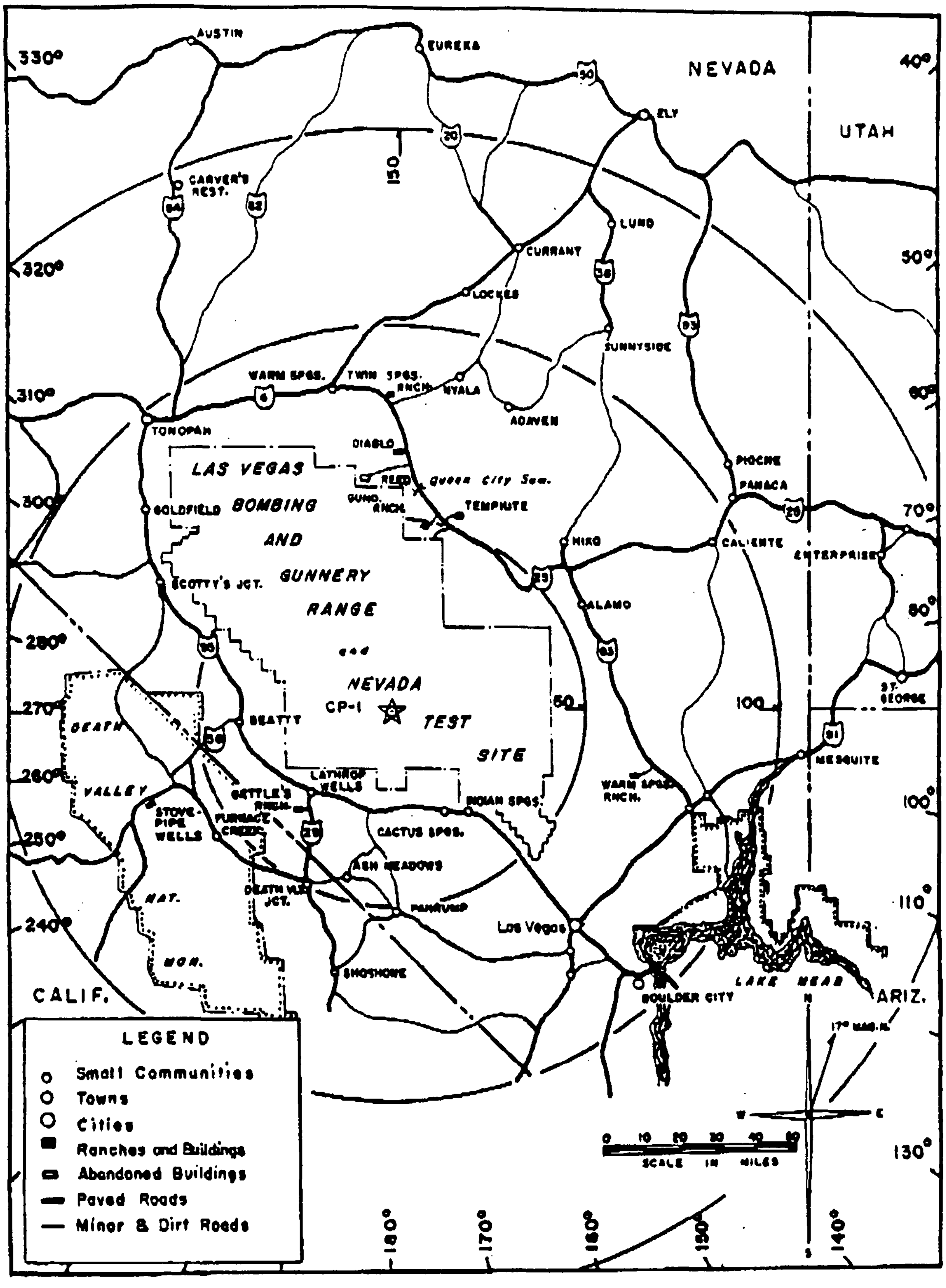

Figure C-1. Map used to define the on-site area (the Las Vegas Bombing and Gunnery Range and Nevada Test Site).

implied measurement would be inconsistent with measurements by other instruments at the same time. If in doubt, please check with a supervisor.

20. (G) [A] If a survey meter reading is found only in the background column on an original monitoring log and the magnitude of the reading is less than 0.06 mR/h, the reading will be entered into both the GROSS and BACKGROUND fields of the data base and a notation will be made in the COMMENTS field that "This is a background reading."

[B] If a reading is found only in the background column, the reading is greater than or equal to 0.06 mR/h, and it can be assessed that the reading is intended to be a background measurement, that reading will be entered into both the GROSS and BACKGROUND fields of the data base and a notation with be made in the COMMENTS field that "This is a background reading."

[C] If a reading is found only in the background column, the reading is greater than or equal to 0.06 mR/h, and it can be assessed that it was intended to be a gross measurement, then the indicated value should be entered into the GROSS field of the data base, a null, "−0−", should be entered into the BACKGROUND field and a notation should be made in the COMMENTS field about the interpretation. For example, the comment might be: "Gross value is assumed even though in background column on log sheet." If there are any questions about the appropriate interpretation, please check with the supervisor.

21. (G) If a survey meter reading is recorded only in the gross column of an original monitoring log and no reading is either entered in the corresponding background column or can be assessed from surrounding comments, then the gross reading will be entered into the GROSS field of the data base and a null, "−0−", will be entered into the BACKGROUND field.

22. (G) If a range of survey meter readings is recorded as the gross measurement on an original monitoring log or final report, an average of the readings will be entered in the GROSS field of the data base, a null, "−0−", will be entered in the BACKGROUND field and a notation will be entered in the COMMENTS field that "The gross reading is an average of the given range of values: XXX−YYY." NOTE: If this information is already in the data base as two individual records and one of the records has something in the FLAGS column other than an "*", please notify the supervisor.

23. (G) [A] If a range of survey meter readings is recorded as the background measurement on an original monitoring log, no gross reading is indicated, and both of the readings are less than 0.06 mR/h, the lower value of the range will be entered in the GROSS and BACKGROUND fields of the data base and a notation will be entered in the COMMENTS field that "The gross and background readings are the lower of the given range of values: XXX−YYY." (revised 4/7/88)

[B] In [A] if there is a gross reading available, that value will be entered in the GROSS field, the lower value of the range will be entered in the BACKGROUND field of the data base and a notation will be entered in the COMMENTS field that "The background reading is the lower of the given range of values: XXX–YYY."

[C] If either reading in the range is greater than 0.06 mR/h, a judgment needs to be made as to whether it could have been a background reading given fallout levels or whether the reading is meant to be the gross value. Please check with the supervisor.

24. (R) For any event for which radiation was detected off–site and for which no monitoring records are available, a single record entry will be made in the data base as a place holder. The following information will be entered for these records:

Date/time	Shot date (yymmdd)/time
UTM Coord	11SNL9058 (Mercury, NV)
Meter type	UNK
Radiation type	G
Gross	–0–
Back	–0–
Units	MR
Originating Agency	01
Comments	Explanation of why there are no readings

25. (R) The scales for the more frequently used survey instruments are:

E–500B	0–20mR/h	X0.01,	X0.1,	X1,	X10,	X100
MX–5	0–0.2mR/h,	0–2mR/h	0–20mR/h			
CDV–700	0–0.5mR/h,	0–5mR/h	0–50mR/h			
CDV–710	0–0.5R/h,	0–5R/h,	0–50R/h (revised 4/7/88)			
CDV–720	0–5R/h,	0–50R/h,	0–500R/h (added 4/7/88)			
T1B	0–5mR/h,	0–50mR/h,	0–500mR/h, 0–5000mR/h, 0–50,000mR/h			
THYAC	0–0.2mR/h 0–800cpm,	0–2mR/h 0–8000cpm,	0–20mR/h and 0–80,000cpm (added 4/4/88)			
PRE111	0–0.25mR/h, 0–5mR/h (revised 5/6/88)					
NE148A	0–30μR/h,	0–300μR/h, 0–3000μR/h (revised 5/6/88, 10/3/88)				
RADEC	0.05–50mR/h, 0.05–50 R/h (added 5/6/88)					

26. (G) In some instances, the readings that are noted indicate the top of the scale for an MX–5 or below scale for a T1B. This reading, if it is top–of–scale or below scale and is compared to a measurement taken with a different instrument type at the same time, may show that it is not a good descriptor of the radiological situation. We would like these situations to be handled similarly to #17 for off–scale (revised 4/18/88):

[A] If an MX–5 reading is noted as being top–of–scale, but a useable reading from another instrument for that date, time and location is available, the information from the other instrument should be included in the data base and a note should be made in the COMMENTS field of the data base that the "MX−5 reading was top−of−scale." (revised 4/18/88)

[B] If an MX−5 reading is noted as being top−of−scale, but there is no other instrument reading available for that date, time and location, a record will be entered in the data base with a null, "−0−", for the GROSS and BACKGROUND values and a notation in the COMMENTS field that the "MX−5 reading was top−of−scale." (revised 4/18/88)

[C] If an instrument reading is noted as being below scale (or equal to 0.0), but a useable reading from another instrument for that date, time and location is available, the information from the other instrument should be included in the data base and a note should be made in the COMMENTS field that the "Reading for instrument was below scale with a value of XX.XX." (revised 4/18/88)

[D] If an instrument reading is noted as being below scale, but there is no other instrument reading available for that date, time and location, a record will be entered in the data base with a null, "−0−", for the GROSS and BACKGROUND values and a notation in the COMMENTS field that the "Reading for instrument was below scale with a value of XX.XX." (revised 4/18/88)

27. (R) Some measurements contain "<", ">", "+", or "−." The values in the associated GROSS and BACKGROUND data fields should contain the numerical value of the measurement without the sign. A notation should be made in the COMMENTS field to reflect what was actually on the log sheet. (revised 10/3/88)

28. (G) If a line on an original log sheet contains a value only in the net column, apply Guideline 20 in this protocol and make a notation in the COMMENTS field about the judgment made, such as, "Readings are background readings, but were recorded as net."

29. (R) We are trying to code the precision of the measurements as the monitors recorded them. GROSS and BACKGROUND data fields for a record should contain as many and only as many trailing zeroes as are indicated on the log sheet. For example, even though the previous line may indicate gross to be 0.050, if the current line on the log sheet is recorded as 0.35, that is what is to be entered in the GROSS field of the data base.

30. (G) [A] If the log sheet indicates that several measurements were taken over time at one location and if the background value is not recorded along with each gross value, but is recorded for the first measurement, this value should be used as the BACKGROUND data field for each of the measurements.

[B] If no background value is recorded for the first measurement, then a null, "−0−", should be entered in the BACKGROUND field.

31. (G) If "instrument contamination" is suspected about a reading on a log sheet or from a report and the estimated contamination level is given, use the estimated contamination level for the BACKGROUND value in the data base and record the indicated reading as the GROSS value. (added 3/19/88)

32. (R) [A] If the time field on a log sheet is blank, the associated reading is not blank, and a time cannot be estimated from the surrounding readings, enter the code "9999" for the TIME value in the data base and a comment in the COMMENT field indicating that "The actual time of this reading was not recorded on the log sheet." (revised 4/7/88)

[B] If the time field on a log sheet is blank, the associated reading is not blank, and a time can be estimated from the times and odometer readings of the surrounding radiological measurements, the estimated time should be entered into the TIME field of the data base with an entry in the COMMENT field like: "The time for this reading was not recorded on the log sheet, but fell between XXXX and XXXX. This is an estimate of the time." (added 4/7/88)

33. (G) If upon inspection of a fallout pattern, a gross reading > 0.06 mR/h with no background value on the log sheets may be interpreted as a background reading (i.e., probably residual from a previous event(s)), then the gross reading should be entered in the GROSS and BACKGROUND fields of the data base. An entry should also be made in the COMMENT field such as: "Gross readings are attributed to residual fallout from previous test(s)." (added 4/4/88)

34. (R) If a zero value is reported in the net column with no readings recorded in the gross and background columns, then a null, "−0−", should be entered in the GROSS and BACKGROUND fields of the data base. An entry in the COMMENTS field should also be added as: "A zero in the net column is interpreted as a background reading." (added 4/7/88)

35. (G) The NUFDC field on the printouts was meant to provide a flag only for those "gamma" readings that would be considered inappropriate to use in making estimates for the Town Data Base. The situations that we feel this most likely covers are readings taken inside or adjacent to vehicles or buildings, readings taken at a height of other than 3 ft., readings where the monitor noted on the log that the instrument was erratic, and readings where a notation on the log indicates that the reading is inappropriate. Only gamma readings need to be marked, because others are automatically ignored in the estimation program. Other guidelines in this protocol have been set up to take into account the effect of other possibly inappropriate readings for the estimates. (added 4/7/88)

36. (G) We ask that special care be taken to make corrections or additions to the printouts legible so the data entry clerks will not have to interpret what was meant. It is not necessary to cross out the whole GROSS or BACKGROUND value if a change is being made to account for the significant digits; extra zeroes can be crossed out or zeroes can be added on to the end of the number. It is also important that when changes are made to corrections on the printouts, the final correction and what is to be corrected are obvious. Thank you for your cooperation. (added 4/7/88)

37. When the instrument type used for a reading cannot be deduced from the log sheet or report but it can be determined that the instrument was either an MX−5 or a T1B, then the following rules should be used to specify the instrument type in the INSTRUMENT field of the data base:

If the reading is:	use:
≤ 0.1 mR/h	MX-5
> 0.1 mR/h but < 20 mR/h	UNK
≥ 20 mR/h	T1B (added 5/6/88)

38. Procedure for reviewing survey meter records obtained from reports and monitoring logs (added 5/6/88, revised 10/3/88)

[A] Obtain a special retrieval that separates the records derived from the different sources. For example, for some events, the survey meter type was entered as unknown (UNK) for records entered from reports. Two separate retrievals, one for all UNK survey meter types and one for all other types, each sorted by log number and date/time, separates the information and makes it easier to follow.

[B] Compare the monitoring logs with the printout of all survey meter types other than those designated UNK. Make changes and additions as required in accordance with the protocol. If you use any of the records in the UNK listing, note on the monitoring log what page number they are on so that your work can be checked easily.

[C] Then compare the monitoring logs with the report source documents making a check along side each report reading for which there is an entry on the monitoring logs.

[D] Compare the unchecked survey meter readings in the report source document with the printout listing of all records with UNK survey meter types. If the report readings are listed in this printout, make the necessary changes in the source document number on the printout and any other changes required by the protocol. Delete all other records in this printout that are not usable.

APPENDIX D
MAKES AND MODELS OF SURVEY INSTRUMENTS

CD-700

Model: CDV-700
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Anton Electronics
Scale: 0-0.5, 0-5, 0-50 mR/h
Used for: Plumbbob

CD-710

Model: CDV-710
Detector Type: Ionization chamber
Radiation Type Detected: Beta, gamma
Manufacturer: Anton Electronics
Scale: 0-0.5, 0-5, 0-50 R/h
Used for: Plumbbob

CD-720

Model: CDV-720
Detector Type: Ionization chamber
Radiation Type Detected: Beta, gamma
Manufacturer: Anton Electronics
Scale: 0-5, 0-50, 0-500 R/h
Used for: Plumbbob

E500-B

Model: E500-B
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Eberline Instrument Co.
Scale: 0-0.2, 0-2, 0-20, 0-200, 0-2,000 mR/h
Used for: Nougat, Storax, Sunbeam, Niblick, Whetstone, Flintlock, Latchkey, Crosstie, Bowline, Mandrel, Emery, Grommet

HALICR

Model: 5
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Halicrafter Instrument Co.
Scale: 0.00004-0.001, 0.0008-0.02 R/8h
Used for: TRINITY

JUNO

Model: Juno
Detector Type: Ionization chamber
Radiation Type Detected: Alpha, beta, gamma
Manufacturer: Technical Associates
Scale: 0-50, 0-500, 0-5,000 mR/h
Used for: Teapot

LUDLUM

Model: 20
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Ludlum Measurements, Inc.
Scale: Unknown (mR/h)
Used for: Crosstie, Bowline

MX-5

Model: MX-5
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Beckman Instruments Co.
Scale: 0-0.2, 0-2, 0-20 mR/h
Used for: Ranger, Buster, Jangle, Tumbler-Snapper, Upshot-Knothole, Teapot, Plumbbob, Hardtack II, Nougat, Storax

NE148A

Model: NE-148A
Detector Type: Scintillation
Radiation Type Detected: Gamma
Manufacturer: General Radiological Limited
Scale: 0-30, 0-300, 0-3,000 μR/h
Used for: Latchkey, Crosstie, Bowline, Mandrel, Emery, Grommet

PAC-1A

Model: PAC-1A
Detector Type: Gas-flow, proportional counter
Radiation Type Detected: Alpha
Manufacturer: Eberline Instrument Co.
Scale: Unknown (cpm)
Used for: Plumbbob

PAC-1S

Model: PAC-1S
Detector Type: Scintillation
Radiation Type Detected: Alpha
Manufacturer: Eberline Instrument Co.
Scale: 0-2,000, 0-20,000, 0-200,000, 0-2,000,000 cpm
Used for: Plumbbob

PAC-2G

Model: PAC-2G
Detector Type: Gas-flow, proportional counter
Radiation Type Detected: Alpha
Manufacturer: Eberline Instrument Co.
Scale: Unknown (cpm)
Used for: Storax

PAC-3G

Model: PAC-3G
Detector Type: Gas-flow, proportional counter
Radiation Type Detected: Alpha
Manufacturer: Eberline Instrument Co.
Scale: Unknown (cpm)
Used for: Storax, Project Pluto, Project Rover

PDR-34

Model: AN/PDR-34 (modified T1B)
Detector Type: Ionization chamber
Radiation Type Detected: Alpha, beta, gamma
Manufacturer: Tracerlab
Scale: 0-5, 0-50, 0-500, 0-50,000 mR/h
Used for: Upshot-Knothole

PDR27J

Model: AN/PDR-27J
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Tung Sol Electric Co.
Scale: 0-0.5, 0-5, 0-50, 0-500 mR/h
Used for: Sunbeam

PEEWEE

Model: 48A
Detector Type: Proportional counter
Radiation Type Detected: Alpha
Manufacturer: Nuclear Measurements Corp.
Scale: 0-20,000 cpm
Used for: Plumbbob

PRE111

Model: 111-B
Detector Type: Scintillation
Radiation Type Detected: Gamma
Manufacturer: Precision Radiation Instruments, Inc.
Scale: 0-0.25, 0-5 mR/h
Used for: Nougat, Storax, Sunbeam, Niblick, Whetstone, Flintlock, Latchkey

THYAC

Model: 389
Detector Type: Geiger-Mueller
Radiation Type Detected: Beta, gamma
Manufacturer: Victoreen Instrument Co.
Scale: 0-0.2, 0-2, 0-20 mR/h and 0-800, 0-8000, 0-80,000 cpm
Used for: Upshot-Knothole, Plumbbob, Niblick

T1B

Model: AN/PDR-T1B OR AN/PDR-39
Detector Type: Ionization chamber
Radiation Type Detected: Gamma
Manufacturer: Tracerlab, Inc.
Scale: 0-5, 0-50, 0-500, 0-5,000, 0-50,000 mR/h
Used for: Ranger, Buster, Tumbler-Snapper, Upshot-Knothole, Teapot, Plumbbob, Hardtack II, Nougat, Sunbeam, Storax

RADEC

Model: Radector AGB-50
Detector Type: Ionization chamber
Radiation Type Detected: Beta, gamma
Manufacturer: Victoreen Instrument Co.
Scale: 0.05-50 mR/h
Used for: Whetstone, Flintlock, Latchkey, Crosstie, Bowline, Mandrel, Emery

VIC-LG

Model: 247
Detector Type: Ionization chamber
Radiation Type Detected: Beta, gamma
Manufacturer: Victoreen Instrument Co.
Scale: 0.01-0.10, 0.10-1.0, 1.0-10.0 mR/h
Used for: TRINITY

VIC-SM

Model: 247 modified to include only one tube
Detector Type: Ionization chamber
Radiation Type Detected: Beta, gamma
Manufacturer: Victoreen Instrument Co.
Scale: Unknown (mR/h)
Used for: TRINITY

VIC247

Model: 247
Detector Type: Ionization chamber
Radiation Type Detected: Gamma
Manufacturer: Victoreen Instrument Co.
Scale: 0.01-0.10, 0.10-1, 1-10 R/h
Used for: TRINITY

VIC263

Model: 263
Detector Type: Unknown
Radiation Type Detected: Gamma
Manufacturer: Victoreen Instrument Co.
Scale: Unknown
Used for: TRINITY

WATTS

Model: Unknown
Detector Type: Methane-filled proportional detector
Radiation Type Detected: Alpha
Manufacturer: Unknown (cpm)
Used for: TRINITY