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Volume 2 of 3
(consists of 3 volumes)

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Intended for: Reference

Final Report
Volume II Appendices

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Prepared for

Los Alamos National Laboratory
University of California
Los Alamos, New Mexico 87545

24 February 1995

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FINAL REPORT
VOLUME II

SEISMIC HAZARDS EVALUATION OF THE LOS ALAMOS NATIONAL LABORATORY

by

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24 February 1995

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LIST OF APPENDICES

APPENDIX A
HISTORICAL EARTHQUAKE CATALOGUE FOR THE LANL REGION

EARTHQUAKE CATALOGUE
EXPLANATION AND ABBREVIATIONS

Cat. No.	Catalogue number
Date	Year, month and day
Time (GMT)	Origin time in Greenwich Mean Time - hour, minute and second
Latitude	Latitude in degrees
Longitude	Longitude in degrees
Depth	Depth in km
Mag 1 or Mag 2	Magnitudes
(After magnitude value, the scale and magnitude data source are specified)	
MD, MC	Coda duration magnitude
ML	Local magnitude
Mb	Body-wave magnitude
MI	Intensity magnitude
Magnitude data sources	
AS	Sanford, 1976
CA	Cash et al., 1978
CN	Newton et al., 1976
GLD	Golden, Colorado
GS, NEIC	National Earthquake Information Center, USGS
LA, NM	Los Alamos Seismographic Network
NMI	New Mexico Institute of Mines and Technology
OL	Olsen, 1979
SF	Sanford (1994, written communication)
SNM	Socorro, New Mexico
WC	Woodward-Clyde
Inten (MM)	Modified Mercalli maximum intensity
Dist (km)	Source-to-site distance in km
Data Srce	Data source for earthquake location and origin time
AS	Sanford, 1978
CA	Cash et al., 1978
CN	Newton et al., 1976
DG	Decade of North American Geology
GS	National Earthquake Information Center (NEIC), USGS
JA	Jaksha and Locke, 1978 and Jaksha et al., 1978
LA, NM	Los Alamos Seismographic Network
PE	NEIC Preliminary Determination of Epicenters
SA, ST	Stover et al., 1988
SJ	Jaksha, 1985
WC	Woodward-Clyde
No. Arr	Number of P- and S-wave arrival times
Az Gap	Azimuth gap in seismographic coverage
Q	Quality of location (see data sources for description)
Std Err	Standard error in km
Horiz	Horizontal
Vert	Vertical

1351 Events Selected Searched: 25 OCT 1994 File: CMBEDT9.RST By: JDJB

SOURCE DATABASE:
Root name: cmbedt8

Created: 25 OCT 1994 08:48
By: jdjb
Original file: cmbedt8.dmp Type: ASCII Dump
Hypoctr rec: 1364
Comment rec: 131
Time span: 1873 08 03 05:00:00.00 -> 1991 02 04 05:13:00.00

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31 Mag 1: -9.99 -> 9.99 Type: All
Lat: 35.000 -> 36.750 Mag 2: -9.99 -> 9.99 Type: None
Long: -107.250 -> -105.250 Intensity: 0 -> 12 Mode: 0
Depth: .00 -> 999.00 Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1	1873 AUG 03	05:00:00.00	35.700	-105.900	.00	....	....	III	43	SA	...	...	G	.....	.....
2	1893 JUL 12	13:40:00.00	35.000	-106.400	.00	....	....	V	92	ST	...	...	.	.....	.....
		EQH THREE SHOCKS SHOOK EVERY HOUSE IN ALBUQUERQUE. CLOCKS STOPPED. A CHANDELIER SWUNG FOR 10 MINUTES. RIO GRANDE RIFT ZONE. REGION TO THE N STRONGLY SHAKEN.													
3	1906 SEP 15	10:30:00.00	35.500	-106.000	.00	....	....	..	48	SA	...	...	H	.....	.....
4	1918 MAY 28	11:30:00.00	35.450	-106.100	.00	5.25MLOL	....	VII	48	AS	...	...	.	.....	.....
		CERRILLOS. MINOR DAMAGE IN SANTA FE COUNTY, 20 MILES (33 KM) TO NORTHEAST. NO ORIGINAL DATA SOURCE = EQH NON-INSTRUMENTAL													
5	1921 JUL 31	03:55:00.00	36.000	-107.000	.00	....	....	IV	62	SA	...	...	G	.....	.....
6	1930 MAR 23	18:56:00.00	35.100	-106.600	.00	....	....	IV	84	SA	...	...	F	.....	.....
7	1930 DEC 03	21:36:00.00	35.000	-106.400	.00	4.50MLAS	....	VI	92	SA	...	...	.	.....	.....
8	1930 DEC 04	22:30:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
9	1931 JAN 28	04:28:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
10	1931 FEB 03	23:45:00.00	35.100	-106.450	.00	....	....	V	81	AS	...	...	.	.....	.....
		ALBUQUERQUE.													
11	1931 FEB 05	04:48:00.00	35.100	-106.600	.00	4.50MLAS	....	VI	84	SA	...	...	.	.....	.....
		EQH PEOPLE LEFT HOMES AND THEATRES IN NEAR PANIC.													
12	1936 SEP 09	12:55:00.00	35.100	-106.600	.00	....	....	IV	84	SA	...	...	F	.....	.....
13	1936 SEP 09	12:57:00.00	35.100	-106.600	.00	....	....	II	84	SA	...	...	F	.....	.....
14	1936 SEP 11	23:54:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
15	1936 SEP 12	00:00:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
16	1936 SEP 12	00:05:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
17	1938 APR 15	21:00:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
18	1938 APR 16	08:15:00.00	35.100	-106.600	.00	....	....	III	84	SA	...	...	F	.....	.....
19	1947 NOV 06	16:50:00.00	35.000	-106.400	.00	4.25MLAS	....	VI	92	AS	...	...	.	.....	.....
		SL SAN ANTONITO. PLASTER AND FIREPLACE CRACKED AT ZAMORA. SOUTH WALL OF HOUSE DAMAGED.													
20	1952 AUG 03	20:42:00.00	36.500	-106.000	.00	....	....	V	81	AS	...	...	.	.....	.....
21	1952 AUG 17	10:45:00.00	35.500	-106.200	.00	4.00MLAS	....	V	39	AS	...	...	.	.....	.....
		EQH LOS ALAMOS. SLIGHT DAMAGE TO WALLS IN HOME. AS FELT IN ESPANOLA.													

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
22	1954 NOV 02	17:00:00.00	35.200	-106.700	.00	....	....	IV	77	SA	...	...	.	.....	.....
		ALBUQUERQUE.													
		AS FELT ALONG 32 KM OF RIO GRANDE VALLEY, FROM													
		ALBUQUERQUE TO BERNALILLO NM.													
23	1954 NOV 03	20:39:00.00	35.100	-106.700	.00	....	....	V	87	AS	...	...	.	.....	.....
		EQH MINOR CRACKS REPORTED. ALSO FELT AT ALBUQUERQUE,													
		SANDOVAL AND SANDIA PUEBLO.													
24	1955 AUG 12	16:20:00.00	35.700	-106.000	.00	....	....	V	35	SA	...	...	.	.....	.....
		EQH SANTA FE. PLASTER WALL CRACKED IN BUILDING 15 MI													
		(24 KM) SW OF SANTA FE. BUILDINGS SHAKEN IN SANTA FE.													
25	1956 APR 26	03:30:00.00	35.100	-106.300	1.00	4.00	....	V	81	AS	...	...	.	.....	.....
		SANDIA MTS. AWAKENED ALL AND FRIGHTENED FEW													
		IN TIJERAS CANYON, SANDIA.													
26	1962 JUN 14	07:27:55.80	35.583	-106.867	10.00	2.80ML	....	..	54	AS	...	...	.	.....	.....
27	1963 NOV 25	12:52:33.80	36.540	-105.370	.00	2.40ML	....	..	118	AS	...	...	.	.....	.....
28	1965 DEC 29	00:05:24.00	35.030	-105.780	.00	3.10ML	....	..	103	AS	...	...	.	.....	.....
		NE OF ESTANCIA NM.													
29	1966 AUG 12	09:18:53.90	36.600	-107.200	5.00	2.40MnTGG	2.80mbNEIC	..	115	SA	...	...	.	.....	.....
		005 P AND/OR P' ARRIVALS USED IN HYPOCENTER SOLUTION													
		ORIGINAL DATA SOURCE = CGS													
30	1969 JUL 04	14:43:34.00	36.100	-106.100	10.00	2.80MLNMI	4.40mbNEIC	IV	37	SA	...	...	.	.....	.....
		AS FELT MOST STRONGLY 10 AND 20 KM N OF ESPANOLA.													
		MAXIMUM INTENSITY (M.M.) IV 0													
		HYPOCENTER SOLUTION DEPTH CONSTRAINED BY GEOPHYSICIST													
		009 P AND/OR P' ARRIVALS USED IN HYPOCENTER SOLUTION													
		ORIGINAL DATA SOURCE = USE													
		MAGNITUDE(FRACTIONAL NOTATION,AVE)=4.40, AUTHORITY-													
31	1970 MAY 22	09:43:35.60	35.640	-106.000	.00	1.50ML	....	..	38	AS	...	...	.	.....	.....
32	1970 JUL 31	11:57:31.00	35.400	-106.500	.00	2.70ML	....	..	50	AS	...	...	.	.....	.....
33	1970 AUG 07	11:59:06.00	35.400	-105.890	.00	2.00ML	....	..	63	AS	...	...	.	.....	.....
34	1970 NOV 28	07:40:11.80	35.100	-106.610	9.00	3.80MLGS	4.50mbNEIC	VI	84	SA	...	...	.	.....	.....
		REPORTED DAMAGE													
		013 P AND/OR P' ARRIVALS USED IN HYPOCENTER SOLUTION													
		ORIGINAL DATA SOURCE = USE													
		LOCAL MAGNITUDE = 3.80 SCALE =ML AUTHORITY= NOS													
35	1970 NOV 30	05:35:21.70	36.300	-106.200	.00	3.20ML	....	..	54	AS	...	...	.	.....	.....
36	1971 JAN 04	07:39:06.70	35.100	-106.600	9.00	3.80MLNMI	4.70mbNEIC	VI	84	SA	...	...	.	.....	.....
		REPORTED DAMAGE													
		013 P AND/OR P' ARRIVALS USED IN HYPOCENTER SOLUTION													
		ORIGINAL DATA SOURCE = NOS													
37	1971 JAN 04	13:15:00.00	35.000	-106.700	.00	....	....	V	97	SA	...	...	F	.....	.....
38	1971 FEB 18	11:28:13.70	36.220	-105.710	5.00	2.80MLNMI	3.70mbNEIC	III	72	SA	...	...	C	.....	.....
39	1971 APR 28	11:36:52.70	35.790	-105.560	5.00	2.70MLNMI	4.00mbNEIC	..	72	SA	...	...	C	.....	.....
40	1971 JUN 04	03:55:13.50	36.300	-106.600	.00	3.00ML	3.80mbNEIC	..	57	AS	...	...	.	.....	.....
41	1971 JUN 24	22:12:36.70	36.700	-105.670	.00	2.30ML	....	..	114	AS	...	...	.	.....	.....
42	1971 DEC 06	05:18:13.70	36.060	-106.320	5.00	3.20ML GS	4.20mbNEIC	V	26	SA	...	...	B	.....	.....
43	1971 DEC 06	05:22:50.70	36.060	-106.320	.00	2.80ML	....	..	26	AS	...	...	.	.....	.....
44	1971 DEC 06	05:38:08.90	36.060	-106.320	.00	2.50ML	....	..	26	AS	...	...	.	.....	.....
45	1971 DEC 06	06:14:10.30	36.060	-106.320	.00	3.10ML	....	..	26	AS	...	...	.	.....	.....
46	1971 DEC 06	11:20:00.00	36.100	-106.300	.00	....	....	III	30	SA	...	...	F	.....	.....
47	1971 DEC 06	22:40:00.00	36.100	-106.300	.00	....	....	III	30	SA	...	...	F	.....	.....
48	1971 DEC 10	00:00:00.00	36.100	-106.300	.00	....	....	III	30	SA	...	...	F	.....	.....
49	1971 DEC 10	05:45:00.00	36.100	-106.300	.00	....	....	III	30	SA	...	...	F	.....	.....
50	1971 DEC 11	02:28:23.60	36.060	-106.320	.00	2.50ML	....	..	26	AS	...	...	.	.....	.....
51	1972 MAR 28	01:53:34.90	36.140	-106.160	.00	3.40ML	2.70MLNMI	..	38	AS	...	...	.	.....	.....
52	1972 MAR 28	02:03:17.20	36.140	-106.160	.00	2.70ML	....	..	38	AS	...	...	.	.....	.....
53	1972 MAR 31	20:14:20.60	36.140	-106.160	.00	3.20ML	....	..	38	AS	...	...	.	.....	.....
54	1972 DEC 18	04:07:36.20	35.420	-107.160	.00	2.70ML	....	..	86	AS	...	...	.	.....	.....
55	1973 MAR 17	07:43:05.50	36.090	-106.170	6.00	2.40MLNMI	4.50mbNEIC	III	33	SA	...	...	C	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
56	1973 OCT 13	03:56:02.70	35.867	-106.333	.00	1.50ML	....	..	4	CN	...	...	.	.....	.....
57	1973 NOV 25	16:45:20.90	35.600	-105.883	20.00	1.70ML	....	..	49	CN	...	...	.	.....	.....
58	1973 NOV 25	16:52:01.30	35.600	-105.883	22.00	1.70ML	....	..	49	CN	...	...	.	.....	.....
59	1973 DEC 24	15:06:11.49	35.452	-106.101	10.36	1.98MDLA	....	..	48	LA	10	324	D	1.6	7.6
60	1974 JAN 04	23:29:31.60	35.800	-106.900	.00	1.70ML	....	..	50	CN	...	...	.	.....	.....
61	1974 JAN 17	23:04:20.10	36.188	-106.193	1.54	2.07MDLA	....	..	42	WC	10	268	.	.0	.0
62	1974 JAN 17	23:06:26.30	36.183	-106.200	.00	1.30ML	....	..	41	CN	...	...	.	.....	.....
63	1974 MAR 04	06:55:01.00	36.150	-106.233	.00	1.70ML	....	..	37	CN	...	...	.	.....	.....
64	1974 MAR 07	13:52:14.20	36.300	-106.600	.00	1.30ML	....	..	57	CN	...	...	.	.....	.....
65	1974 MAR 14	13:50:39.11	35.501	-107.213	10.00	1.15MDLA	....	..	86	LA	9	340	D	5.3	299.8
66	1974 MAR 23	10:44:15.00	36.500	-107.083	32.00	2.40ML	....	..	99	CN	...	...	.	.....	.....
67	1974 APR 02	11:06:53.73	36.215	-106.194	2.53	1.65MDLA	....	..	45	WC	11	267	.	.0	.0
68	1974 APR 05	21:02:11.20	35.533	-107.217	25.00	1.30ML	....	..	85	CN	...	...	.	.....	.....
69	1974 APR 08	16:13:53.50	35.090	-106.799	.00	1.30MDGS	....	..	92	GS	0	0	.	.0	.0
70	1974 APR 20	20:43:01.80	35.933	-106.150	8.00	1.30ML	....	..	21	CN	...	...	.	.....	.....
71	1974 APR 30	02:47:20.70	36.750	-105.783	.00	1.80ML	....	..	114	CN	...	...	.	.....	.....
72	1974 MAY 25	20:09:16.10	35.750	-106.417	.00	1.30ML	....	..	11	CN	...	...	.	.....	.....
73	1974 JUN 05	18:18:08.90	36.267	-106.667	.00	1.70ML	....	..	56	CN	...	...	.	.....	.....
74	1974 JUN 20	17:31:16.90	36.717	-105.883	.00	1.50ML	....	..	107	CN	...	...	.	.....	.....
75	1974 JUN 22	09:53:42.80	35.083	-106.700	.00	2.40ML	....	..	89	CN	...	...	.	.....	.....
76	1974 OCT 15	12:47:38.80	35.250	-107.083	.00	2.60ML	....	..	93	CN	...	...	.	.....	.....
77	1974 OCT 18	04:30:57.30	35.083	-106.817	.00	2.30ML	....	..	93	CN	...	...	.	.....	.....
78	1974 NOV 05	19:33:18.00	36.150	-106.900	.00	1.30ML	....	..	61	CN	...	...	.	.....	.....
79	1974 NOV 07	03:07:36.00	36.267	-106.750	.00	1.10ML	....	..	60	CN	...	...	.	.....	.....
80	1974 DEC 29	01:11:54.00	35.367	-107.100	.00	1.70ML	....	..	85	CN	...	...	.	.....	.....
81	1974 DEC 30	12:11:22.10	35.017	-106.700	.00	1.50ML	....	..	96	CN	...	...	.	.....	.....
82	1975 JAN 03	12:33:13.00	35.266	-105.281	.00	1.70MDGS	....	..	115	GS	0	0	.	.0	.0
83	1975 FEB 09	09:12:35.70	36.183	-106.233	26.00	2.00ML	....	..	41	CN	...	...	.	.....	.....
84	1975 FEB 10	00:28:05.70	36.233	-106.217	32.00	1.30ML	....	..	46	CN	...	...	.	.....	.....
85	1975 MAR 13	11:01:05.30	36.567	-106.917	26.00	1.70ML	....	..	96	CN	...	...	.	.....	.....
86	1975 APR 08	15:12:10.60	35.826	-106.256	27.40	.80MDLA	....	..	8	LA	5	218	D	20.3	10.6
87	1975 MAY 09	15:44:27.90	36.267	-106.467	.00	.80ML	....	..	50	CN	...	...	.	.....	.....
88	1975 MAY 21	04:46:59.00	36.746	-106.662	.00	2.00MDGS	....	..	105	GS	0	0	.	.0	.0
89	1975 MAY 28	09:21:38.80	35.767	-106.533	.00	.70ML	....	..	18	CN	...	...	.	.....	.....
90	1975 AUG 25	12:21:14.60	35.733	-105.783	17.00	.80ML	....	..	52	CN	...	...	.	.....	.....
91	1975 AUG 29	18:01:50.80	36.217	-106.883	8.00	.80ML	....	..	64	CN	...	...	.	.....	.....
92	1975 SEP 04	06:25:24.10	35.217	-106.450	.00	1.50ML	....	..	69	CN	...	...	.	.....	.....
93	1975 SEP 06	03:46:49.99	36.187	-106.175	3.85	2.30MLCN	....	..	43	WC	10	268	.	.0	.0
94	1975 SEP 07	00:24:06.86	36.201	-106.261	4.93	1.30MLCN	....	..	42	LA	8	306	D	2.7	5.3
95	1975 SEP 07	13:43:26.47	36.237	-106.242	8.07	1.40MLCN	....	..	46	LA	9	308	D	2.9	6.8
96	1975 SEP 10	01:01:48.20	36.733	-105.667	.00	2.00ML	....	..	118	CN	...	...	.	.....	.....
97	1975 SEP 15	07:19:53.97	36.210	-106.167	.69	1.10MLCN	....	..	45	LA	7	304	D	1.8	44.9
98	1975 SEP 18	01:48:17.08	36.046	-106.856	15.85	1.11MDLA	....	..	52	LA	8	322	C	1.7	4.9
99	1975 SEP 25	03:39:02.53	36.226	-106.202	9.57	1.00MLCN	....	..	46	LA	8	312	D	2.6	1.7
100	1975 SEP 25	15:28:50.20	36.000	-106.867	38.00	.50ML	....	..	50	CN	...	...	.	.....	.....
101	1975 SEP 27	12:07:20.41	36.045	-106.890	6.76	.55MDLA	....	..	54	LA	9	318	C	1.1	1.4
102	1975 SEP 29	11:09:41.90	36.037	-106.862	7.39	3.04MDLA	....	..	52	LA	7	315	D	8.8	2.4
103	1975 SEP 29	11:14:20.52	36.044	-106.877	6.31	.69MDLA	....	..	53	LA	9	317	D	2.9	7.6
104	1975 SEP 29	11:17:07.27	36.037	-106.862	7.96	1.57MDLA	....	..	52	LA	12	315	C	1.1	1.2
105	1975 SEP 29	12:53:45.15	36.038	-106.876	10.00	.72MDLA	....	..	53	LA	9	317	D	1.4	145.0
106	1975 SEP 29	13:17:18.99	36.046	-106.850	7.24	1.97MDLA	....	..	51	LA	11	312	C	1.1	1.4
107	1975 SEP 29	14:19:41.70	36.058	-106.885	1.95	.72MDLA	....	..	55	LA	8	317	D	2.0	18.4
108	1975 SEP 29	14:47:02.01	36.047	-106.847	6.18	.77MDLA	....	..	51	LA	9	312	C	1.3	1.5
109	1975 SEP 29	17:29:14.97	36.033	-106.882	9.60	.60MDLA	....	..	53	LA	9	318	D	3.1	2.2
110	1975 DEC 03	13:41:32.10	35.798	-106.176	2.22	1.44MDLA	....	..	16	WC	9	166	.	.0	.0
111	1976 JAN 01	23:44:28.20	36.050	-106.893	7.39	1.21MDLA	....	..	55	LA	13	318	C	1.5	1.9
112	1976 JAN 12	22:50:29.00	35.200	-106.217	.00	.70	....	..	71	CA	...	...	.	.....	.....
113	1976 JAN 22	20:12:46.14	36.422	-106.546	10.00	1.30MDLA	....	..	68	LA	13	280	D	.9	101.1
114	1976 MAR 07	07:48:57.20	35.200	-106.133	.00	.70	....	..	73	CA	...	...	.	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
115	1976 MAR 12	18:30:04.00	35.090	-106.110	.00	.40	....	..	85	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
116	1976 MAR 27	06:54:28.00	35.130	-106.430	.00	.40	....	..	78	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
117	1976 APR 01	09:26:16.00	35.030	-106.690	.00	.40	....	..	94	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
118	1976 APR 03	05:56:56.90	35.233	-106.117	.00	.70	....	..	70	CA	...	...	.	.....	.....
119	1976 APR 10	22:39:33.49	36.288	-106.148	4.60	1.67MDLA	....	..	54	WC	15	139	.	.0	.0
120	1976 APR 11	07:44:01.96	36.293	-106.152	4.05	1.94MDLA	....	..	54	WC	15	172	.	.0	.0
121	1976 APR 11	07:45:31.28	36.286	-106.149	5.39	1.35MDLA	....	..	54	WC	14	172	.	.0	.0
122	1976 APR 17	02:40:33.41	36.050	-107.091	16.64	.51MDLA	....	..	71	LA	8	334	D	3.2	4.2
123	1976 APR 17	06:46:21.10	36.460	-106.286	10.00	.96MDLA	....	..	70	LA	12	322	D	1.8	247.6
124	1976 APR 24	08:14:18.92	35.682	-105.672	16.00	.72MDLA	....	..	63	LA	10	301	C	.7	.6
125	1976 APR 24	08:24:42.61	35.704	-105.750	11.22	1.47MDLA	....	..	56	LA	10	271	C	1.5	1.1
126	1976 MAY 02	00:32:35.71	36.402	-106.762	9.41	2.69MDLA	....	..	73	WC	9	201	.	.0	.0
127	1976 MAY 10	07:55:37.00	35.500	-107.250	.00	.70	....	..	89	CA	...	...	.	.....	.....
128	1976 MAY 15	11:23:27.00	35.610	-106.930	.00	1.00	....	..	58	JA	...	...	.	.....	.....
		MAGNITUDE BETWEEN 0.5 AND 1.5													
129	1976 MAY 22	10:50:38.86	36.338	-105.782	10.01	.89MDLA	....	..	76	WC	13	200	.	.0	.0
130	1976 MAY 22	14:04:58.64	36.345	-105.782	12.21	1.04MDLA	....	..	77	WC	12	200	.	.0	.0
131	1976 MAY 24	13:36:02.00	35.460	-107.090	.00	.40	....	..	79	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
132	1976 MAY 26	01:32:34.00	35.430	-107.090	.00	.40	....	..	80	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
133	1976 MAY 26	07:10:39.55	36.709	-105.294	.00	.80MDGS	....	..	136	GS	0	0	.	.0	.0
134	1976 JUN 01	16:39:58.73	36.522	-106.211	6.98	1.12MDLA	....	..	78	WC	8	194	.	.0	.0
135	1976 JUN 08	03:57:17.45	36.116	-106.257	8.80	.80 CA	....	..	33	LA	5	315	C	.3	.4
136	1976 JUN 26	12:55:39.04	36.168	-106.207	2.55	2.00 CA	....	..	40	WC	11	244	.	.0	.0
137	1976 JUN 29	01:31:35.25	36.174	-106.239	2.53	1.50 CA	....	..	39	WC	7	244	.	.0	.0
138	1976 JUL 05	12:39:19.42	36.157	-106.236	3.23	2.30 CA	....	..	38	WC	11	121	.	.0	.0
139	1976 JUL 06	12:48:44.66	36.161	-106.227	3.11	2.00 CA	....	..	38	WC	12	242	.	.0	.0
140	1976 JUL 12	21:44:26.90	35.817	-107.083	.00	.80	....	..	66	CA	...	...	.	.....	.....
141	1976 JUL 26	04:00:20.00	35.590	-106.890	.00	.40	....	..	56	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
142	1976 AUG 08	18:05:47.90	36.750	-106.517	.00	.70	....	..	103	CA	...	...	.	.....	.....
143	1976 AUG 23	12:33:48.00	35.120	-106.430	.00	.40	....	..	79	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
144	1976 SEP 01	11:26:24.40	35.267	-107.217	.00	.80	....	..	100	CA	...	...	.	.....	.....
145	1976 SEP 04	06:41:41.00	35.020	-105.880	.00	.40	....	..	99	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
146	1976 SEP 12	18:59:02.60	35.400	-107.250	.00	1.80	....	..	94	CA	...	...	.	.....	.....
147	1976 SEP 28	01:37:45.00	35.120	-107.150	.00	.40	....	..	107	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
148	1976 OCT 02	00:13:28.32	36.218	-106.173	13.21	.70 CA	....	..	46	LA	5	305	D	4.6	3.9
149	1976 OCT 08	12:07:44.50	36.717	-106.583	.00	1.10	....	..	101	CA	...	...	.	.....	.....
150	1976 OCT 08	12:44:34.00	36.733	-106.700	.00	.80	....	..	105	CA	...	...	.	.....	.....
151	1976 OCT 08	15:44:50.80	35.033	-106.883	.00	1.70	....	..	101	CA	...	...	.	.....	.....
152	1976 OCT 08	19:29:19.90	36.717	-106.700	.00	.80	....	..	103	CA	...	...	.	.....	.....
153	1976 OCT 08	19:29:57.80	36.633	-106.667	.00	1.50	....	..	94	CA	...	...	.	.....	.....
154	1976 OCT 08	19:33:40.60	36.599	-106.645	25.50	1.30MDGS	....	..	89	GS	0	0	.	.0	.0
155	1976 OCT 08	20:18:13.20	36.150	-106.833	.00	.70	....	..	56	CA	...	...	.	.....	.....
156	1976 OCT 08	20:42:34.30	36.683	-106.583	.00	.80	....	..	97	CA	...	...	.	.....	.....
157	1976 OCT 08	21:08:32.40	36.633	-106.583	.00	.80	....	..	92	CA	...	...	.	.....	.....
158	1976 OCT 09	00:50:33.00	36.750	-106.717	.00	.80	....	..	107	CA	...	...	.	.....	.....
159	1976 OCT 09	01:14:01.40	36.683	-106.633	.00	.30	....	..	98	CA	...	...	.	.....	.....
160	1976 OCT 14	07:27:11.00	35.010	-105.850	.00	1.00	....	..	102	JA	...	...	.	.....	.....
		MAGNITUDE BETWEEN 0.5 AND 1.5													
161	1976 OCT 24	07:15:29.69	36.004	-106.273	9.87	.50 CA	....	..	21	WC	6	151	.	.0	.0
162	1976 NOV 02	20:23:59.80	35.500	-106.917	.00	.70	....	..	63	CA	...	...	.	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
163	1976 NOV 03	14:43:00.00	35.320	-107.200	.00	.40	....	..	96	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
164	1976 NOV 03	21:05:00.36	35.332	-107.230	8.54	1.09MDLA	....	..	97	WC	13	184	.	.0	.0
165	1976 NOV 09	13:24:50.32	35.280	-107.128	11.55	.52MDLA	....	..	93	WC	12	200	.	.0	.0
166	1976 NOV 11	10:00:08.82	36.007	-106.142	6.27	1.00 CA	....	..	27	WC	11	104	.	.0	.0
167	1976 NOV 24	02:13:58.00	35.440	-107.090	.00	.40	....	..	80	JA	...	...	.	.....	.....
		MAGNITUDE LESS THAN 0.5													
168	1976 DEC 10	14:42:08.43	36.709	-106.721	7.57	1.36MDLA	....	..	103	WC	20	228	.	.0	.0
169	1976 DEC 17	10:41:50.16	36.011	-106.136	4.93	1.40 CA	....	..	28	WC	10	108	.	.0	.0
170	1976 DEC 31	07:53:58.37	36.674	-106.685	7.15	2.11MDLA	....	..	98	WC	13	222	.	.0	.0
171	1977 JAN 03	01:02:36.50	36.450	-105.333	.00	1.50	....	..	115	CA	...	...	.	.....	.....
172	1977 JAN 05	03:19:15.60	35.067	-106.617	.00	.50	....	..	88	CA	...	...	.	.....	.....
173	1977 JAN 09	13:03:00.58	35.961	-106.188	.91	1.30 CA	....	..	21	LA	6	148	C	1.6	31.0
174	1977 JAN 20	23:26:47.43	36.272	-106.295	5.48	1.40MDLA	....	..	49	WC	12	156	.	.0	.0
175	1977 FEB 01	12:44:37.90	36.617	-106.683	.00	.80	....	..	92	CA	...	...	.	.....	.....
176	1977 FEB 17	13:48:40.60	36.600	-106.633	.00	.70	....	..	89	CA	...	...	.	.....	.....
177	1977 MAR 02	08:54:10.97	36.056	-106.176	6.95	.30 CA	....	..	30	WC	5	138	.	.0	.0
178	1977 MAR 03	13:35:46.19	36.009	-106.134	8.49	....	....	..	28	WC	11	123	.	.0	.0
179	1977 MAR 14	19:54:04.00	35.320	-105.640	.00	.70	....	..	86	JA	...	...	.	.....	.....
180	1977 APR 03	19:26:49.25	36.140	-106.220	.12	2.32MDLA	....	..	36	WC	13	75	.	.0	.0
181	1977 APR 07	13:13:03.50	35.467	-107.217	.00	.70	....	..	88	CA	...	...	.	.....	.....
182	1977 APR 09	11:08:02.31	35.759	-106.435	10.00	1.30 CA	....	..	11	LA	6	261	D	5.4	4.1
183	1977 APR 11	16:45:35.89	35.659	-107.043	9.24	.80 CA	....	..	65	WC	16	190	.	.0	.0
184	1977 APR 14	16:24:25.30	36.733	-106.767	.00	.50	....	..	107	CA	...	...	.	.....	.....
185	1977 APR 17	08:49:52.88	36.726	-106.703	7.17	1.16MDLA	....	..	104	LA	8	294	C	.8	1.0
186	1977 APR 18	03:12:54.04	36.700	-106.713	4.02	.67MDLA	....	..	102	LA	7	292	C	.9	1.5
187	1977 APR 24	11:37:38.40	36.341	-105.834	13.37	.74MDLA	....	..	73	LA	12	287	C	1.8	1.6
188	1977 APR 26	11:35:05.38	36.127	-106.182	7.97	....	....	..	36	WC	7	156	.	.0	.0
189	1977 APR 26	11:59:47.32	36.141	-106.216	4.66	.50 CA	....	..	37	WC	13	164	.	.0	.0
190	1977 APR 26	12:01:43.79	36.107	-106.253	.66	.86MDLA	....	..	32	WC	11	231	.	.0	.0
191	1977 APR 26	12:41:00.76	36.148	-106.218	1.51	....	....	..	37	LA	9	166	C	.4	5.8
192	1977 MAY 05	00:33:37.00	35.550	-106.833	.00	1.50	....	..	54	CA	...	...	.	.....	.....
193	1977 MAY 13	08:19:46.30	35.598	-106.695	.00	1.00MDGS	....	..	40	GS	0	0	.	.0	.0
194	1977 MAY 23	06:42:00.90	35.483	-106.250	.00	....	....	..	40	CA	...	...	.	.....	.....
195	1977 MAY 26	08:03:51.20	36.683	-106.683	.00	.80	....	..	99	CA	...	...	.	.....	.....
196	1977 MAY 27	06:19:05.60	36.550	-106.500	.00	.80	....	..	81	CA	...	...	.	.....	.....
197	1977 MAY 28	23:12:00.00	35.470	-107.130	.00	.10	....	..	81	JA	...	...	.	.....	.....
198	1977 MAY 28	23:14:14.84	35.549	-107.138	3.32	.67MDLA	....	..	78	LA	7	302	D	7.9	133.2
199	1977 MAY 29	05:10:42.50	35.533	-107.050	.00	1.30	....	..	71	CA	...	...	.	.....	.....
200	1977 JUN 03	18:41:25.24	35.738	-106.264	1.21	1.36MDLA	....	..	13	WC	6	123	.	.0	.0
201	1977 JUN 07	01:58:12.10	36.717	-105.617	.00	1.00	....	..	118	CA	...	...	.	.....	.....
202	1977 JUN 23	04:52:35.00	35.520	-107.110	10.00	.10	....	..	77	JA	...	...	.	.....	.....
203	1977 JUN 27	00:34:21.57	36.502	-105.401	10.00	1.15MDLA	....	..	113	LA	10	310	D	1.5	173.8
204	1977 JUL 02	01:24:41.17	36.231	-107.219	9.16	1.87MDLA	....	..	90	WC	13	219	.	.0	.0
205	1977 JUL 28	07:44:29.92	35.849	-106.185	3.47	1.14MDLA	....	..	15	WC	9	147	.	.0	.0
206	1977 JUL 29	16:42:08.76	35.106	-106.309	2.12	.89MDLA	....	..	80	WC	10	232	.	.0	.0
207	1977 JUL 31	14:21:38.00	35.370	-106.110	10.00	1.60	....	..	55	JA	...	...	.	.....	.....
208	1977 AUG 05	16:06:26.20	35.333	-107.233	.00	.70	....	..	97	CA	...	...	.	.....	.....
209	1977 AUG 10	19:11:06.90	35.550	-106.867	.00	1.10	....	..	56	CA	...	...	.	.....	.....
210	1977 AUG 11	04:24:53.46	35.834	-106.189	4.87	.68MDLA	....	..	15	WC	9	143	.	.0	.0
211	1977 AUG 20	13:52:07.35	36.708	-106.761	7.00	1.72MDLA	....	..	104	WC	11	229	.	.0	.0
212	1977 AUG 21	05:43:25.70	35.667	-106.067	.00	.70	....	..	31	CA	...	...	.	.....	.....
213	1977 AUG 22	15:10:56.20	35.617	-107.233	.00	2.00	....	..	83	CA	...	...	.	.....	.....
214	1977 AUG 26	21:44:24.88	35.694	-106.250	16.16	.29MDLA	....	..	18	WC	8	146	.	.0	.0
215	1977 AUG 28	16:57:06.00	35.320	-107.150	9.00	.10	....	..	92	JA	...	...	.	.....	.....
216	1977 AUG 29	07:13:38.43	35.541	-107.101	10.16	1.78MDLA	....	..	75	WC	12	172	.	.0	.0
217	1977 AUG 29	08:02:45.00	35.380	-107.250	6.00	.10	....	..	96	JA	...	...	.	.....	.....
218	1977 AUG 29	08:31:38.16	35.535	-107.105	12.01	.87MDLA	....	..	76	WC	9	181	.	.0	.0
219	1977 AUG 29	22:17:08.51	36.354	-106.644	17.12	1.23MDLA	....	..	64	WC	17	189	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
220	1977 SEP 01	22:48:40.21	35.529	-107.088	6.67	1.24MDLA	....	..	75	WC	9	175	.	.0	.0
221	1977 SEP 02	11:29:22.75	35.510	-107.085	10.05	.83MDLA	....	..	75	WC	13	154	.	.0	.0
222	1977 SEP 04	00:17:48.00	35.470	-107.100	.00	.10	....	..	79	JA	...	...	.	.....	.....
223	1977 SEP 17	07:04:27.10	36.017	-106.950	.00	....	....	..	58	CA	...	...	.	.....	.....
224	1977 OCT 02	14:38:35.70	35.800	-106.951	8.46	.85MDLA	....	..	54	WC	15	159	.	.0	.0
225	1977 OCT 02	20:54:35.70	35.517	-106.867	.00	.80	....	..	58	CA	...	...	.	.....	.....
226	1977 OCT 04	05:48:57.80	35.583	-106.883	.00	....	....	..	55	CA	...	...	.	.....	.....
227	1977 OCT 04	06:08:00.50	35.733	-106.867	.00	....	....	..	48	CA	...	...	.	.....	.....
228	1977 OCT 04	20:08:17.00	35.530	-105.420	.00	1.00	....	..	91	JA	...	...	.	.....	.....
229	1977 OCT 04	20:57:42.24	36.181	-106.866	4.14	1.65MDLA	....	..	61	WC	14	168	.	.0	.0
230	1977 OCT 06	04:20:52.40	36.683	-106.650	.00	.70	....	..	98	CA	...	...	.	.....	.....
231	1977 OCT 13	19:28:17.24	36.073	-106.956	5.66	.94MDLA	....	..	61	WC	16	175	.	.0	.0
232	1977 NOV 06	12:21:39.40	36.733	-105.409	70.20	.50MDGS	....	..	131	GS	0	0	.	.0	.0
233	1977 NOV 11	11:26:55.27	35.430	-107.167	9.65	.95MDLA	....	..	86	WC	14	105	.	.0	.0
234	1977 NOV 16	09:20:21.20	35.616	-107.217	15.00	....	....	..	82	CA	...	...	.	.....	.....
235	1977 NOV 17	13:02:28.88	35.520	-107.085	5.56	.61MDLA	....	..	75	WC	8	171	.	.0	.0
236	1977 DEC 02	12:10:07.39	36.185	-106.300	2.72	.91MDLA	....	..	40	WC	8	245	.	.0	.0
237	1977 DEC 10	00:13:50.80	36.663	-106.755	47.00	.60	....	..	99	CA	...	...	.	.....	.....
238	1977 DEC 10	06:58:57.30	35.730	-106.930	.00	.80MDGS	....	..	54	GS	0	0	.	.0	.0
239	1977 DEC 11	23:58:59.00	35.320	-107.170	1.00	.10	....	..	93	JA	...	...	.	.....	.....
240	1977 DEC 14	16:41:39.90	36.119	-106.218	9.60	.80MDGS	....	..	34	GS	0	0	.	.0	.0
241	1977 DEC 16	00:38:13.00	35.290	-107.180	3.00	.20	....	..	96	JA	...	...	.	.....	.....
242	1977 DEC 16	00:47:48.00	35.290	-107.180	3.00	.10	....	..	96	JA	...	...	.	.....	.....
243	1977 DEC 19	09:14:42.00	35.420	-107.240	2.00	.20	....	..	93	JA	...	...	.	.....	.....
244	1977 DEC 24	19:28:23.10	35.451	-106.148	13.00	1.30	....	..	46	CA	...	...	.	.....	.....
245	1978 JAN 21	05:05:33.00	35.380	-106.330	.00	....	....	..	50	NM	...	...	.	.....	.....
246	1978 JAN 22	00:27:02.00	36.012	-106.906	3.00	....	....	..	54	CA	...	...	.	.....	.....
247	1978 JAN 26	10:26:18.00	36.250	-106.830	.00	....	....	..	64	CA	...	...	.	.....	.....
248	1978 JAN 30	02:53:01.40	35.874	-106.843	8.47	.87MDLA	....	..	45	WC	17	166	.	.0	.0
249	1978 FEB 07	04:05:03.00	35.230	-107.120	.00	.30	....	..	96	NM	...	...	.	.....	.....
250	1978 FEB 13	09:48:00.40	36.007	-106.845	4.80	.80MDGS	....	..	49	GS	0	0	.	.0	.0
251	1978 FEB 13	18:57:38.91	35.736	-107.197	10.74	1.51MDLA	....	..	77	WC	15	172	.	.0	.0
252	1978 FEB 14	16:49:04.46	36.297	-106.927	10.47	1.35MDLA	....	..	73	WC	14	196	.	.0	.0
253	1978 FEB 15	07:18:58.60	36.330	-106.780	.00	....	....	..	68	CA	...	...	.	.....	.....
254	1978 FEB 23	11:30:41.10	36.688	-106.739	18.00	....	....	..	101	CA	...	...	.	.....	.....
255	1978 FEB 23	12:43:45.90	36.320	-105.817	12.70	.30MDGS	....	..	73	GS	0	0	.	.0	.0
256	1978 FEB 26	10:27:50.67	36.309	-105.849	11.70	-.01MDLA	....	..	70	LA	7	310	C	1.1	.5
257	1978 FEB 28	01:15:47.60	36.632	-106.058	87.00	....	....	..	93	CA	...	...	.	.....	.....
258	1978 MAR 05	02:58:32.00	36.623	-105.476	15.00	.70	....	..	118	CA	...	...	.	.....	.....
259	1978 MAR 08	17:07:30.20	36.401	-106.116	5.00	1.70	....	..	67	CA	...	...	.	.....	.....
260	1978 MAR 12	00:30:12.13	36.074	-106.223	3.16	.54MDLA	....	..	29	WC	9	147	.	.0	.0
261	1978 MAR 12	02:28:48.16	36.069	-106.216	6.05	1.16MDLA	....	..	29	WC	11	145	.	.0	.0
262	1978 MAR 12	03:04:04.22	36.050	-106.230	7.37	.54MDLA	....	..	27	WC	6	162	.	.0	.0
263	1978 MAR 12	06:04:43.28	36.070	-106.206	2.53	.80 CA	....	..	30	WC	9	144	.	.0	.0
264	1978 MAR 12	06:22:07.13	36.061	-106.215	6.21	....	....	..	28	WC	7	172	.	.0	.0
265	1978 MAR 12	11:41:57.91	36.055	-106.221	7.22	....	....	..	28	WC	5	171	.	.0	.0
266	1978 MAR 12	13:19:59.41	36.054	-106.210	5.12	....	....	..	28	WC	5	187	.	.0	.0
267	1978 MAR 14	10:43:22.81	36.065	-106.220	4.90	1.57MDLA	....	..	29	WC	14	124	.	.0	.0
268	1978 MAR 19	22:51:46.10	36.188	-105.643	7.00	.50	....	..	75	CA	...	...	.	.....	.....
269	1978 MAR 22	00:29:17.70	35.103	-105.686	45.00	....	....	..	101	CA	...	...	.	.....	.....
270	1978 MAR 22	06:27:44.50	36.420	-106.670	.00	....	....	..	72	CA	...	...	.	.....	.....
271	1978 APR 12	09:07:04.60	36.240	-106.360	.00	1.30MDGS	....	..	46	GS	0	0	.	.0	.0
272	1978 APR 16	08:38:14.45	36.473	-107.133	10.00	1.21MDLA	....	..	100	LA	12	236	D	2.3	383.0
273	1978 APR 16	08:47:09.30	36.455	-107.138	11.00	.50	....	..	99	CA	...	...	.	.....	.....
274	1978 APR 23	13:10:59.91	35.663	-106.975	5.97	.33MDLA	....	..	59	WC	15	136	.	.0	.0
275	1978 APR 23	17:06:28.66	35.661	-106.963	8.47	.44MDLA	....	..	59	WC	18	134	.	.0	.0
276	1978 APR 23	17:41:07.90	35.416	-106.216	6.00	.80	....	..	48	CA	...	...	.	.....	.....
277	1978 APR 23	17:45:34.20	35.465	-106.204	4.00	.80	....	..	43	CA	...	...	.	.....	.....
278	1978 APR 23	23:25:35.75	35.659	-106.974	5.41	1.27MDLA	....	..	60	WC	16	135	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
279	1978 APR 23	23:59:49.45	35.657	-106.967	8.59	1.18MDLA	....	..	59	WC	15	134	.	.0	.0
280	1978 APR 24	00:03:30.25	35.659	-106.975	9.18	.67MDLA	....	..	60	WC	14	135	.	.0	.0
281	1978 APR 24	02:09:22.09	35.663	-106.977	7.57	.77MDLA	....	..	60	WC	17	136	.	.0	.0
282	1978 APR 24	03:01:24.98	35.665	-106.976	4.23	.99MDLA	....	..	59	WC	16	136	.	.0	.0
283	1978 APR 27	23:41:26.70	35.147	-106.187	96.50	....	....	..	77	GS	0	0	.	.0	.0
284	1978 APR 30	00:32:00.10	36.645	-106.530	8.00	.70	....	..	92	CA	...	...	.	.....	.....
285	1978 APR 30	00:34:10.58	36.722	-106.728	4.48	.97MDLA	....	..	105	LA	10	278	C	1.3	1.5
286	1978 MAY 02	00:03:27.73	35.870	-106.837	4.38	.56MDLA	....	..	44	WC	16	132	.	.0	.0
287	1978 MAY 07	14:26:08.70	36.251	-106.230	13.20	.40MDGS	....	..	48	GS	0	0	.	.0	.0
288	1978 MAY 28	05:04:06.63	36.356	-106.810	5.40	.64MDLA	....	..	72	WC	9	171	.	.0	.0
289	1978 JUN 23	13:32:41.40	35.278	-106.152	12.99	.44MDLA	....	..	64	WC	7	199	.	.0	.0
290	1978 JUN 29	04:44:50.20	36.616	-106.440	25.00	.80	....	..	88	CA	...	...	.	.....	.....
291	1978 JUN 29	05:21:53.50	36.614	-106.251	47.00	.30	....	..	87	CA	...	...	.	.....	.....
292	1978 JUL 02	16:27:43.70	36.710	-106.525	.00	.80	....	..	99	NM	...	...	.	.....	.....
293	1978 JUL 03	15:13:47.60	35.561	-107.250	.00	.50	....	..	87	NM	...	...	.	.....	.....
294	1978 JUL 09	13:30:18.40	36.659	-106.610	.00	1.30	....	..	95	NM	...	...	.	.....	.....
295	1978 JUL 17	17:05:11.40	35.432	-106.171	.00	1.20	....	..	47	NM	...	...	.	.....	.....
296	1978 AUG 05	23:08:05.39	35.472	-106.201	3.94	1.97MDLA	....	..	42	WC	11	162	.	.0	.0
297	1978 AUG 15	06:55:00.60	36.705	-106.575	.00	1.20	....	..	99	NM	...	...	.	.....	.....
298	1978 AUG 31	04:02:30.00	35.084	-106.553	.00	.50	....	..	85	NM	...	...	.	.....	.....
299	1978 SEP 19	07:33:45.41	36.361	-105.547	9.27	1.67MDLA	....	..	93	WC	7	235	.	.0	.0
300	1978 SEP 24	18:01:47.20	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
301	1978 SEP 24	18:19:08.63	35.729	-106.783	7.60	-.20MDLA	....	..	41	WC	12	216	.	.0	.0
302	1978 SEP 24	18:27:59.20	35.750	-106.770	.00	.40MDGS	....	..	39	GS	0	0	.	.0	.0
303	1978 SEP 24	20:24:33.00	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
304	1978 SEP 24	20:32:48.40	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
305	1978 SEP 24	20:47:32.48	35.747	-106.765	9.16	-.23MDLA	....	..	39	WC	14	108	.	.0	.0
306	1978 SEP 24	21:18:51.40	35.702	-106.827	3.20	.80MDGS	....	..	45	GS	0	0	.	.0	.0
307	1978 SEP 24	21:30:13.00	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
308	1978 SEP 24	21:43:15.70	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
309	1978 SEP 24	22:37:35.40	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
310	1978 SEP 24	22:38:16.23	35.741	-106.754	10.23	-.35MDLA	....	..	38	WC	14	105	.	.0	.0
311	1978 SEP 24	23:15:22.80	35.630	-106.920	.00	.80MDGS	....	..	56	GS	0	0	.	.0	.0
312	1978 SEP 24	23:24:01.80	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
313	1978 SEP 24	23:28:29.30	35.745	-106.805	10.10	.40MDGS	....	..	42	GS	0	0	.	.0	.0
314	1978 SEP 25	00:31:49.93	35.734	-106.765	5.81	.18MDLA	....	..	39	WC	15	107	.	.0	.0
315	1978 SEP 25	00:37:23.50	35.793	-106.755	16.90	1.70MDGS	....	..	37	GS	0	0	.	.0	.0
316	1978 SEP 25	00:49:26.22	35.777	-106.756	9.69	-.59MDLA	....	..	37	WC	9	160	.	.0	.0
317	1978 SEP 25	00:50:12.90	35.843	-106.782	14.60	.80MDGS	....	..	39	GS	0	0	.	.0	.0
318	1978 SEP 25	00:53:12.30	35.747	-106.751	9.00	.80MDGS	....	..	37	GS	0	0	.	.0	.0
319	1978 SEP 25	01:13:20.90	35.955	-106.694	19.30	.80MDGS	....	..	34	GS	0	0	.	.0	.0
320	1978 SEP 25	01:44:31.13	35.735	-106.764	6.84	1.85MDLA	....	..	39	WC	16	99	.	.0	.0
321	1978 SEP 25	01:45:37.30	35.750	-106.770	.00	....	....	..	39	GS	0	0	.	.0	.0
322	1978 SEP 25	01:47:05.16	35.742	-106.760	10.28	-.04MDLA	....	..	38	WC	11	209	.	.0	.0
323	1978 SEP 25	01:55:47.30	35.882	-106.732	21.90	.80MDGS	....	..	35	GS	0	0	.	.0	.0
324	1978 SEP 25	02:02:57.50	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
325	1978 SEP 25	02:07:44.25	35.740	-106.778	8.22	-.04MDLA	....	..	40	WC	15	110	.	.0	.0
326	1978 SEP 25	02:11:39.54	35.739	-106.765	8.17	-.32MDLA	....	..	39	WC	14	108	.	.0	.0
327	1978 SEP 25	02:12:07.37	35.740	-106.758	9.66	-.26MDLA	....	..	38	WC	16	150	.	.0	.0
328	1978 SEP 25	02:12:30.76	35.744	-106.763	10.16	.02MDLA	....	..	39	WC	16	107	.	.0	.0
329	1978 SEP 25	02:15:47.58	35.731	-106.785	7.04	....	....	..	41	WC	10	246	.	.0	.0
330	1978 SEP 25	02:15:56.16	35.735	-106.767	10.57	.85MDLA	....	..	39	WC	21	108	.	.0	.0
331	1978 SEP 25	02:17:49.21	35.734	-106.767	8.17	.62MDLA	....	..	39	WC	25	108	.	.0	.0
332	1978 SEP 25	02:19:15.10	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
333	1978 SEP 25	02:27:18.00	35.739	-106.800	8.20	1.70MDGS	....	..	42	GS	0	0	.	.0	.0
334	1978 SEP 25	02:27:53.20	35.908	-106.790	15.10	1.70MDGS	....	..	41	GS	0	0	.	.0	.0
335	1978 SEP 25	02:28:13.62	35.745	-106.757	10.60	.31MDLA	....	..	38	WC	22	106	.	.0	.0
336	1978 SEP 25	02:32:47.77	35.747	-106.757	10.09	-.12MDLA	....	..	38	WC	15	106	.	.0	.0
337	1978 SEP 25	02:40:48.10	35.750	-106.770	.00	1.70MDGS	....	..	39	GS	0	0	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
338	1978 SEP 25	02:42:03.80	35.750	-106.770	.00	1.70MDGS	....	..	39	GS	0	0	.	.0	.0
339	1978 SEP 25	02:43:17.20	35.807	-106.699	17.60	.40MDGS	....	..	32	GS	0	0	.	.0	.0
340	1978 SEP 25	02:47:56.00	35.750	-106.770	.00	.40MDGS	....	..	39	GS	0	0	.	.0	.0
341	1978 SEP 25	03:11:03.03	35.836	-106.745	19.55	-.33MDLA	....	..	36	WC	13	128	.	.0	.0
342	1978 SEP 25	03:32:49.30	35.793	-106.726	19.10	1.70MDGS	....	..	34	GS	0	0	.	.0	.0
343	1978 SEP 25	03:44:31.88	35.728	-106.791	8.61	-.76MDLA	....	..	41	WC	11	153	.	.0	.0
344	1978 SEP 25	03:48:27.90	35.728	-106.782	9.27	-.43MDLA	....	..	41	WC	10	110	.	.0	.0
345	1978 SEP 25	03:57:32.29	35.728	-106.759	8.13	.57MDLA	....	..	39	WC	23	106	.	.0	.0
346	1978 SEP 25	04:01:17.40	35.730	-106.760	6.32	.27MDLA	....	..	39	WC	23	106	.	.0	.0
347	1978 SEP 25	04:06:32.79	35.763	-106.753	17.21	-.55MDLA	....	..	37	LA	13	129	C	2.5	4.3
348	1978 SEP 25	04:09:44.40	35.750	-106.770	.00	....	....	..	39	NM	...	...	.	.....	.....
349	1978 SEP 25	04:22:27.58	35.729	-106.779	10.18	-.50MDLA	....	..	40	WC	14	110	.	.0	.0
350	1978 SEP 25	04:39:06.18	35.739	-106.759	10.33	.23MDLA	....	..	38	WC	19	106	.	.0	.0
351	1978 SEP 25	04:51:28.73	35.741	-106.750	6.51	.31MDLA	....	..	37	WC	22	104	.	.0	.0
352	1978 SEP 25	06:13:43.40	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
353	1978 SEP 25	06:42:01.20	35.841	-106.734	12.90	.70MDGS	....	..	35	GS	0	0	.	.0	.0
354	1978 SEP 25	06:42:03.29	35.730	-106.767	9.52	....	....	..	39	WC	15	113	.	.0	.0
355	1978 SEP 25	06:42:16.16	35.794	-106.753	15.03	-.19MDLA	....	..	37	WC	13	123	.	.0	.0
356	1978 SEP 25	06:50:16.70	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
357	1978 SEP 25	06:55:34.94	35.728	-106.772	9.29	-.21MDLA	....	..	40	WC	17	108	.	.0	.0
358	1978 SEP 25	06:58:05.68	35.728	-106.782	12.92	-.40MDLA	....	..	41	LA	15	110	B	1.2	3.0
359	1978 SEP 25	07:09:01.00	35.766	-106.793	9.40	.40MDGS	....	..	41	GS	0	0	.	.0	.0
360	1978 SEP 25	07:17:30.80	35.798	-106.768	14.40	.80MDGS	....	..	38	GS	0	0	.	.0	.0
361	1978 SEP 25	07:18:43.85	35.730	-106.761	8.96	-.12MDLA	....	..	39	WC	13	111	.	.0	.0
362	1978 SEP 25	08:02:42.20	35.750	-106.770	.00	1.70MDGS	....	..	39	GS	0	0	.	.0	.0
363	1978 SEP 25	08:29:15.01	35.730	-106.762	6.34	.42MDLA	....	..	39	WC	18	107	.	.0	.0
364	1978 SEP 25	08:59:43.00	35.804	-106.754	.00	.30	....	..	37	NM	...	...	.	.....	.....
365	1978 SEP 25	10:45:33.00	35.731	-106.766	7.21	.10MDLA	....	..	39	WC	17	107	.	.0	.0
366	1978 SEP 25	12:28:40.30	35.750	-106.770	.00	.40MDGS	....	..	39	GS	0	0	.	.0	.0
367	1978 SEP 25	12:30:47.49	35.725	-106.767	7.96	.12MDLA	....	..	39	WC	16	107	.	.0	.0
368	1978 SEP 25	12:37:20.10	35.750	-106.770	.00	1.70MDGS	....	..	39	GS	0	0	.	.0	.0
369	1978 SEP 25	12:56:36.50	35.750	-106.770	.00	.40MDGS	....	..	39	GS	0	0	.	.0	.0
370	1978 SEP 25	15:07:16.93	35.730	-106.787	9.61	-.16MDLA	....	..	41	WC	13	216	.	.0	.0
371	1978 SEP 25	16:03:18.60	35.806	-106.728	14.10	.40MDGS	....	..	34	GS	0	0	.	.0	.0
372	1978 SEP 25	16:04:45.30	35.798	-106.736	.00	-.24MDLA	....	..	35	NM	...	...	.	.....	.....
373	1978 SEP 26	02:16:31.40	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
374	1978 SEP 26	02:37:57.80	35.862	-106.762	9.60	.40MDGS	....	..	37	GS	0	0	.	.0	.0
375	1978 SEP 26	15:32:21.90	36.328	-105.647	11.23	.79MDLA	....	..	84	LA	13	293	C	1.8	4.0
376	1978 SEP 26	15:52:36.00	35.750	-106.770	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
377	1978 SEP 26	16:55:24.70	35.823	-106.701	.00	.30	....	..	32	NM	...	...	.	.....	.....
378	1978 SEP 26	20:10:41.70	35.726	-106.767	9.91	.08MDLA	....	..	39	WC	10	213	.	.0	.0
379	1978 SEP 27	20:21:12.00	35.120	-106.800	10.00	.30	....	..	89	NM	...	...	.	.....	.....
380	1978 SEP 28	09:00:45.40	35.106	-106.802	7.80	1.69MDLA	....	..	90	WC	19	209	.	.0	.0
381	1978 SEP 28	10:37:03.10	35.809	-106.737	13.50	.40MDGS	....	..	35	GS	0	0	.	.0	.0
382	1978 SEP 28	12:12:23.24	35.112	-106.804	7.85	1.34MDLA	....	..	90	WC	18	208	.	.0	.0
383	1978 SEP 28	12:33:57.00	35.120	-106.800	9.00	.20	....	..	89	NM	...	...	.	.....	.....
384	1978 SEP 28	12:50:39.32	35.076	-106.812	10.00	.88MDLA	....	..	94	LA	17	214	D	2.0	417.0
385	1978 SEP 28	16:24:24.87	35.132	-106.816	9.01	.80MDLA	....	..	88	WC	15	204	.	.0	.0
386	1978 SEP 28	22:01:47.86	35.104	-106.806	8.53	2.08MDLA	....	..	91	WC	18	209	.	.0	.0
387	1978 SEP 28	22:10:19.66	35.088	-106.800	10.47	.33MDLA	....	..	92	WC	13	212	.	.0	.0
388	1978 SEP 29	00:37:03.00	35.110	-106.800	8.00	.40	....	..	90	NM	...	...	.	.....	.....
389	1978 SEP 29	02:44:12.94	35.111	-106.805	9.18	1.39MDLA	....	..	90	WC	20	208	.	.0	.0
390	1978 SEP 29	02:50:56.90	35.217	-106.820	.00	....	....	..	80	GS	0	0	.	.0	.0
391	1978 SEP 29	09:00:46.20	35.202	-106.831	.00	1.10	....	..	82	NM	...	...	.	.....	.....
392	1978 SEP 29	09:38:39.20	35.110	-106.804	7.38	2.18MDLA	....	..	90	WC	21	208	.	.0	.0
393	1978 SEP 29	09:47:16.80	35.129	-106.811	.00	.30	....	..	88	NM	...	...	.	.....	.....
394	1978 SEP 29	09:49:16.63	35.096	-106.801	10.00	.17MDLA	....	..	91	LA	15	210	D	1.1	241.1
395	1978 SEP 29	09:50:39.23	35.056	-106.794	9.96	.44MDLA	....	..	95	WC	9	218	.	.0	.0
396	1978 SEP 29	21:26:34.80	35.099	-106.807	9.99	.24MDLA	....	..	91	WC	12	210	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
397	1978 SEP 29	22:26:18.40	35.100	-106.804	8.88	.39MDLA	....	..	91	WC	12	210	.	.0	.0
398	1978 SEP 30	00:36:14.42	35.100	-106.801	9.42	1.25MDLA	....	..	91	WC	18	210	.	.0	.0
399	1978 SEP 30	00:38:59.54	35.092	-106.808	9.72	.41MDLA	....	..	92	WC	9	237	.	.0	.0
400	1978 SEP 30	00:52:40.00	35.120	-106.800	8.00	.40	....	..	89	NM	...	...	.	.....	.....
401	1978 SEP 30	02:43:00.00	35.120	-106.800	9.00	.20	....	..	89	NM	...	...	.	.....	.....
402	1978 SEP 30	07:48:17.00	35.120	-106.800	8.00	.50	....	..	89	NM	...	...	.	.....	.....
403	1978 SEP 30	08:18:52.88	35.114	-106.802	7.84	1.61MDLA	....	..	89	WC	19	208	.	.0	.0
404	1978 SEP 30	10:58:28.10	35.217	-106.820	.00	.50	....	..	80	NM	...	...	.	.....	.....
405	1978 SEP 30	11:52:46.33	35.124	-106.812	10.39	.79MDLA	....	..	89	WC	16	206	.	.0	.0
406	1978 SEP 30	13:14:48.40	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
407	1978 SEP 30	14:56:52.00	35.130	-106.800	9.00	1.00	....	..	88	NM	...	...	.	.....	.....
408	1978 SEP 30	15:39:08.00	35.130	-106.800	8.00	.50	....	..	88	NM	...	...	.	.....	.....
409	1978 SEP 30	18:31:04.97	35.098	-106.815	10.00	.79MDLA	....	..	92	LA	14	210	D	1.6	317.4
410	1978 OCT 01	00:16:39.31	35.109	-106.804	10.38	1.41MDLA	....	..	90	WC	17	208	.	.0	.0
411	1978 OCT 01	11:46:57.02	35.105	-106.804	9.22	.90MDLA	....	..	90	WC	19	209	.	.0	.0
412	1978 OCT 01	11:55:11.00	35.130	-106.800	9.00	.30	....	..	88	NM	...	...	.	.....	.....
413	1978 OCT 01	11:57:15.66	35.103	-106.799	7.06	-.13MDLA	....	..	90	WC	10	210	.	.0	.0
414	1978 OCT 01	14:35:04.00	35.140	-106.800	10.00	.50	....	..	87	NM	...	...	.	.....	.....
415	1978 OCT 01	18:55:06.40	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
416	1978 OCT 01	20:09:40.00	35.110	-106.800	8.00	.50	....	..	90	NM	...	...	.	.....	.....
417	1978 OCT 01	22:22:18.00	35.120	-106.790	9.00	.90	....	..	88	NM	...	...	.	.....	.....
418	1978 OCT 01	22:34:45.30	35.217	-106.820	.00	.50	....	..	80	NM	...	...	.	.....	.....
419	1978 OCT 02	02:03:44.72	35.124	-106.813	10.08	.42MDLA	....	..	89	WC	13	205	.	.0	.0
420	1978 OCT 02	03:11:37.00	35.118	-106.802	9.45	.93MDLA	....	..	89	WC	18	207	.	.0	.0
421	1978 OCT 02	03:31:56.30	35.217	-106.820	.00	.50	....	..	80	NM	...	...	.	.....	.....
422	1978 OCT 02	11:05:01.00	35.130	-106.800	10.00	.10	....	..	88	NM	...	...	.	.....	.....
423	1978 OCT 02	11:06:39.90	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
424	1978 OCT 02	17:41:15.00	35.140	-106.790	10.00	.70	....	..	86	NM	...	...	.	.....	.....
425	1978 OCT 02	17:49:38.00	35.130	-106.800	10.00	.30	....	..	88	NM	...	...	.	.....	.....
426	1978 OCT 03	11:07:35.10	35.217	-106.820	.00	.40MDGS	....	..	80	GS	0	0	.	.0	.0
427	1978 OCT 03	12:28:23.60	35.217	-106.820	.00	.30	....	..	80	NM	...	...	.	.....	.....
428	1978 OCT 03	12:29:27.40	35.584	-107.224	.00	.80	....	..	84	NM	...	...	.	.....	.....
429	1978 OCT 03	17:01:24.34	35.118	-106.798	10.06	.49MDLA	....	..	89	WC	12	207	.	.0	.0
430	1978 OCT 04	03:15:56.00	35.130	-106.810	10.00	.30	....	..	88	NM	...	...	.	.....	.....
431	1978 OCT 05	03:14:03.80	35.571	-107.250	.00	.80	....	..	86	NM	...	...	.	.....	.....
432	1978 OCT 05	11:39:39.00	35.140	-106.800	9.00	.40	....	..	87	NM	...	...	.	.....	.....
433	1978 OCT 07	23:13:18.76	36.091	-106.814	5.26	.88MDLA	....	..	51	WC	16	151	.	.0	.0
434	1978 OCT 10	07:34:07.30	35.860	-106.740	.00	....	....	..	35	NM	...	...	.	.....	.....
435	1978 OCT 10	17:56:06.50	35.038	-106.316	.00	1.10	....	..	88	NM	...	...	.	.....	.....
436	1978 OCT 11	13:43:06.98	36.311	-106.050	10.12	1.18MDLA	....	..	60	WC	13	101	.	.0	.0
437	1978 OCT 11	14:47:11.66	36.312	-105.988	12.44	-.06MDLA	....	..	63	WC	9	117	.	.0	.0
438	1978 OCT 11	15:41:32.70	36.420	-106.920	.00	.50	....	..	83	NM	...	...	.	.....	.....
439	1978 OCT 24	17:00:47.62	36.738	-105.449	9.48	1.84MDLA	....	..	129	WC	15	270	.	.0	.0
440	1978 OCT 24	20:04:39.10	35.208	-106.194	21.92	.94MDLA	....	..	70	LA	11	296	D	6.0	5.0
441	1978 OCT 25	08:37:35.00	35.950	-106.250	.00	.50	....	..	16	NM	...	...	.	.....	.....
442	1978 OCT 29	08:55:51.40	35.950	-106.920	.00	....	....	..	53	NM	...	...	.	.....	.....
443	1978 OCT 30	03:59:27.72	36.506	-106.549	9.25	1.14MDLA	....	..	77	WC	17	127	.	.0	.0
444	1978 OCT 30	05:46:14.10	35.947	-106.856	.00	.30	....	..	47	NM	...	...	.	.....	.....
445	1978 NOV 05	00:05:27.80	35.983	-106.592	22.90	.40MDGS	....	..	28	GS	0	0	.	.0	.0
446	1978 NOV 05	06:40:24.70	35.765	-106.748	9.74	-.33MDLA	....	..	37	WC	11	251	.	.0	.0
447	1978 NOV 14	17:45:49.67	35.139	-106.173	10.00	.84MDLA	....	..	78	LA	7	319	D	5.5	411.8
448	1978 NOV 15	23:43:06.87	36.150	-106.192	6.54	1.26MDLA	....	..	38	WC	16	78	.	.0	.0
449	1978 NOV 16	00:13:49.65	36.153	-106.190	3.15	.80 NM	....	..	39	WC	12	164	.	.0	.0
450	1978 NOV 16	02:11:57.35	36.153	-106.192	5.54	.50 NM	....	..	39	WC	10	120	.	.0	.0
451	1978 NOV 16	03:40:12.40	36.138	-106.190	7.00	.80MDGS	....	..	37	GS	0	0	.	.0	.0
452	1978 NOV 16	05:11:22.90	36.138	-106.208	.00	.30	....	..	36	NM	...	...	.	.....	.....
453	1978 NOV 16	09:12:27.08	36.152	-106.194	4.57	.80 NM	....	..	38	WC	9	120	.	.0	.0
454	1978 NOV 16	09:36:34.43	36.156	-106.191	6.24	....	....	..	39	WC	8	165	.	.0	.0
455	1978 NOV 16	10:55:13.40	36.151	-106.159	6.40	.40MDGS	....	..	40	GS	0	0	.	.0	.0

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Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
456	1978 NOV 17	02:13:52.00	36.132	-106.186	.00	....	....	..	37	NM	...	...	.	.....	.....
457	1978 NOV 17	02:16:25.81	36.151	-106.190	5.31	....	....	..	38	WC	8	164	.	.0	.0
458	1978 NOV 17	02:34:26.09	36.197	-106.182	20.53	....	....	..	43	WC	5	177	.	.0	.0
459	1978 NOV 17	05:59:34.76	36.154	-106.191	5.61	....	....	..	39	WC	7	165	.	.0	.0
460	1978 NOV 17	12:34:31.30	36.146	-106.188	6.32	.30 NM	....	..	38	WC	8	162	.	.0	.0
461	1978 NOV 17	13:05:17.45	36.153	-106.186	4.99	.80 NM	....	..	39	WC	14	120	.	.0	.0
462	1978 NOV 17	13:31:47.70	36.128	-106.137	.00	....	....	..	38	NM	...	...	.	.....	.....
463	1978 NOV 18	00:30:49.84	36.148	-106.185	4.92	.30 NM	....	..	38	WC	7	118	.	.0	.0
464	1978 NOV 23	05:08:47.60	35.745	-106.625	.00	....	....	..	27	NM	...	...	.	.....	.....
465	1978 NOV 28	05:25:39.56	35.201	-106.709	5.58	1.92MDLA	....	..	77	WC	16	269	.	.0	.0
466	1978 NOV 28	13:38:24.43	36.742	-106.535	10.00	.24MDLA	....	..	103	LA	9	281	D	2.9	234.6
467	1978 DEC 03	03:59:23.29	35.637	-106.815	6.20	.62MDLA	....	..	47	WC	14	154	.	.0	.0
468	1978 DEC 07	07:04:31.10	35.195	-106.829	.00	.40MDGS	....	..	83	GS	0	0	.	.0	.0
469	1978 DEC 07	20:27:23.38	35.138	-106.818	10.08	1.14MDLA	....	..	88	WC	21	203	.	.0	.0
470	1978 DEC 07	23:25:50.31	35.107	-106.809	4.01	.69MDLA	....	..	90	WC	10	232	.	.0	.0
471	1978 DEC 13	21:55:43.80	35.048	-106.430	.00	.50	....	..	87	NM	...	...	.	.....	.....
472	1978 DEC 15	00:15:12.10	35.949	-106.810	.00	.30	....	..	44	NM	...	...	.	.....	.....
473	1978 DEC 15	18:59:31.33	35.151	-106.825	10.08	.94MDLA	....	..	87	WC	17	200	.	.0	.0
474	1978 DEC 16	23:06:34.44	35.317	-106.126	3.78	1.57MDLA	....	..	60	WC	8	209	.	.0	.0
475	1978 DEC 17	02:59:39.70	35.055	-106.224	.00	.70	....	..	87	NM	...	...	.	.....	.....
476	1978 DEC 17	05:59:06.20	35.126	-106.283	.00	1.00	....	..	78	NM	...	...	.	.....	.....
477	1978 DEC 17	06:12:34.20	35.061	-106.238	.00	.80	....	..	86	NM	...	...	.	.....	.....
478	1978 DEC 17	16:13:02.30	35.077	-106.306	32.60	1.40MDGS	....	..	84	GS	0	0	.	.0	.0
479	1978 DEC 26	03:08:02.92	35.925	-106.855	10.20	.22MDLA	....	..	47	WC	14	144	.	.0	.0
480	1978 DEC 29	20:44:50.18	35.174	-106.141	10.00	1.45MDLA	....	..	75	LA	6	333	D	8.6	541.3
481	1978 DEC 31	04:09:02.90	36.410	-106.660	.00	.30	....	..	70	NM	...	...	.	.....	.....
482	1978 DEC 31	14:09:53.98	36.112	-106.167	12.17	1.10 NM	....	..	35	WC	7	167	.	.0	.0
483	1979 JAN 05	22:48:37.80	35.228	-106.854	.00	.70	....	..	81	NM	...	...	.	.....	.....
484	1979 JAN 12	23:08:17.01	35.258	-106.083	1.64	1.77MDLA	....	..	68	LA	11	284	D	2.7	5.9
485	1979 JAN 14	01:43:18.28	35.685	-107.154	10.57	1.20MDLA	....	..	74	WC	22	162	.	.0	.0
486	1979 JAN 17	00:15:38.86	36.284	-106.798	8.00	.46MDLA	....	..	65	WC	13	159	.	.0	.0
487	1979 JAN 17	02:43:38.20	36.633	-106.702	.00	1.20	....	..	95	NM	...	...	.	.....	.....
488	1979 JAN 17	08:22:56.60	36.289	-106.781	.00	.80	....	..	64	NM	...	...	.	.....	.....
489	1979 JAN 17	11:32:25.41	36.285	-106.811	7.08	1.54MDLA	....	..	65	WC	22	82	.	.0	.0
490	1979 JAN 18	09:31:36.94	36.584	-106.563	8.32	1.72MDLA	....	..	86	WC	22	138	.	.0	.0
491	1979 JAN 18	10:34:17.00	36.500	-106.430	.00	.70	....	..	75	NM	...	...	.	.....	.....
492	1979 JAN 19	02:20:30.06	36.296	-106.806	8.63	.20MDLA	....	..	66	WC	9	185	.	.0	.0
493	1979 JAN 19	18:54:42.20	35.032	-106.207	.00	.50	....	..	89	NM	...	...	.	.....	.....
494	1979 JAN 20	14:04:07.42	35.822	-106.883	2.09	.01MDLA	....	..	48	LA	14	286	C	1.3	3.7
495	1979 JAN 20	15:17:30.63	35.800	-106.870	.22	.13MDLA	....	..	47	WC	16	138	.	.0	.0
496	1979 JAN 21	11:40:04.90	36.652	-106.719	.00	1.30	....	..	97	NM	...	...	.	.....	.....
497	1979 JAN 22	20:18:13.42	35.125	-106.804	8.37	.50MDLA	....	..	88	WC	12	205	.	.0	.0
498	1979 JAN 24	14:14:30.73	35.113	-106.801	4.61	.94MDLA	....	..	90	WC	19	208	.	.0	.0
499	1979 JAN 24	16:13:11.20	35.165	-106.824	.00	.50	....	..	85	NM	...	...	.	.....	.....
500	1979 JAN 25	02:51:26.18	35.115	-106.806	7.07	.09MDLA	....	..	89	WC	10	207	.	.0	.0
501	1979 JAN 25	03:01:29.90	35.115	-106.819	.00	....	....	..	90	NM	...	...	.	.....	.....
502	1979 JAN 25	03:21:54.50	35.191	-106.829	.00	....	....	..	83	NM	...	...	.	.....	.....
503	1979 JAN 25	11:16:00.24	35.126	-106.810	8.50	.82MDLA	....	..	89	WC	15	205	.	.0	.0
504	1979 JAN 27	00:24:09.47	35.094	-106.805	5.66	.17MDLA	....	..	91	WC	13	211	.	.0	.0
505	1979 JAN 27	03:47:44.97	35.109	-106.816	6.84	.40MDLA	....	..	90	WC	12	208	.	.0	.0
506	1979 JAN 28	02:45:06.95	35.098	-106.799	7.24	.17MDLA	....	..	91	WC	13	211	.	.0	.0
507	1979 JAN 28	18:29:11.84	35.117	-106.802	8.14	.97MDLA	....	..	89	WC	22	207	.	.0	.0
508	1979 JAN 28	18:37:03.25	35.112	-106.798	7.21	.03MDLA	....	..	89	WC	9	208	.	.0	.0
509	1979 JAN 30	15:57:42.70	35.243	-106.825	.00	1.70	....	..	78	NM	...	...	.	.....	.....
510	1979 JAN 30	18:15:06.83	35.101	-106.805	6.69	.15MDLA	....	..	91	WC	11	210	.	.0	.0
511	1979 JAN 31	12:01:32.14	35.115	-106.805	10.19	.53MDLA	....	..	89	WC	20	207	.	.0	.0
512	1979 JAN 31	16:29:26.42	35.121	-106.803	6.29	-.11MDLA	....	..	89	WC	10	206	.	.0	.0
513	1979 FEB 02	18:05:35.38	35.132	-106.819	7.11	.35MDLA	....	..	88	WC	13	229	.	.0	.0
514	1979 FEB 03	10:27:41.63	35.118	-106.810	8.49	.10MDLA	....	..	89	WC	12	207	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
515	1979 FEB 03	12:22:16.74	35.120	-106.806	8.21	-.02MDLA	....	..	89	WC	10	206	.	.0	.0
516	1979 FEB 03	12:27:34.10	35.119	-106.807	9.26	-.17MDLA	....	..	89	WC	13	206	.	.0	.0
517	1979 FEB 03	12:39:51.22	35.104	-106.811	9.23	.30MDLA	....	..	91	WC	13	209	.	.0	.0
518	1979 FEB 05	19:54:24.30	35.171	-106.832	.00	....	....	..	85	NM	...	...	.	.....	.....
519	1979 FEB 05	22:32:51.30	35.148	-106.826	.00	....	....	..	87	NM	...	...	.	.....	.....
520	1979 FEB 05	23:10:38.51	35.119	-106.794	10.04	....	....	..	89	WC	14	232	.	.0	.0
521	1979 FEB 05	23:10:43.26	35.151	-106.803	8.82	1.51MDLA	....	..	86	WC	17	252	.	.0	.0
522	1979 FEB 06	19:00:38.00	35.158	-106.284	.00	1.00	....	..	75	NM	...	...	.	.....	.....
523	1979 FEB 06	23:09:16.81	36.019	-106.264	.00	.50 NM	....	..	22	WC	6	222	.	.0	.0
524	1979 FEB 06	23:15:08.98	35.306	-106.110	4.79	.93MDLA	....	..	62	WC	14	201	.	.0	.0
525	1979 FEB 08	23:24:00.57	35.312	-106.122	3.13	1.33MDLA	....	..	61	WC	18	192	.	.0	.0
526	1979 FEB 09	09:39:58.30	35.023	-106.249	.00	.50	....	..	90	NM	...	...	.	.....	.....
527	1979 FEB 10	19:34:44.53	35.108	-106.804	10.00	-.07MDLA	....	..	90	LA	12	283	D	1.6	214.6
528	1979 FEB 10	20:34:08.40	35.148	-106.841	.00	....	....	..	88	NM	...	...	.	.....	.....
529	1979 FEB 10	20:35:01.43	35.069	-106.873	10.00	-.19MDLA	....	..	97	LA	11	289	D	1.6	230.4
530	1979 FEB 12	06:55:51.28	35.097	-106.801	6.95	.10MDLA	....	..	91	WC	10	211	.	.0	.0
531	1979 FEB 12	09:23:47.30	36.500	-106.750	.00	.50	....	..	83	NM	...	...	.	.....	.....
532	1979 FEB 12	12:29:43.80	35.228	-106.808	.00	....	....	..	79	NM	...	...	.	.....	.....
533	1979 FEB 12	15:17:29.76	35.104	-106.810	3.06	.30MDLA	....	..	91	WC	13	209	.	.0	.0
534	1979 FEB 13	15:21:08.73	35.107	-106.798	8.37	1.67MDLA	....	..	90	WC	17	209	.	.0	.0
535	1979 FEB 15	04:41:53.30	35.237	-106.863	.00	....	....	..	81	NM	...	...	.	.....	.....
536	1979 FEB 17	16:56:02.93	35.124	-106.806	6.01	.42MDLA	....	..	89	WC	15	206	.	.0	.0
537	1979 FEB 20	12:53:53.88	35.110	-106.807	6.41	.25MDLA	....	..	90	WC	8	208	.	.0	.0
538	1979 FEB 21	03:00:57.50	35.144	-106.841	.00	.30	....	..	88	NM	...	...	.	.....	.....
539	1979 FEB 23	04:13:46.20	35.139	-106.826	.00	....	....	..	88	NM	...	...	.	.....	.....
540	1979 FEB 23	20:33:28.07	35.265	-106.129	20.42	1.54MDLA	....	..	66	WC	11	243	.	.0	.0
541	1979 FEB 24	02:25:20.55	35.128	-106.816	11.20	1.13MDLA	....	..	89	WC	21	205	.	.0	.0
542	1979 FEB 25	07:27:05.80	36.675	-106.673	.00	1.10	....	..	98	NM	...	...	.	.....	.....
543	1979 FEB 25	07:57:56.71	35.123	-106.806	10.61	.56MDLA	....	..	89	WC	18	206	.	.0	.0
544	1979 FEB 25	22:10:34.73	35.123	-106.804	4.54	.33MDLA	....	..	89	WC	16	206	.	.0	.0
545	1979 FEB 25	22:13:36.38	35.127	-106.803	7.41	....	....	..	88	WC	16	205	.	.0	.0
546	1979 FEB 25	22:14:00.50	35.171	-106.843	10.30	.45MDLA	....	..	86	WC	14	235	.	.0	.0
547	1979 MAR 01	11:15:00.65	36.149	-106.174	3.36	.70 NM	....	..	39	WC	9	118	.	.0	.0
548	1979 MAR 01	16:38:57.74	35.302	-106.099	4.33	1.18MDLA	....	..	63	WC	12	227	.	.0	.0
549	1979 MAR 03	13:23:59.65	35.105	-106.806	10.00	.04MDLA	....	..	90	LA	14	209	D	.7	192.7
550	1979 MAR 05	10:18:20.62	35.115	-106.801	3.18	.11MDLA	....	..	89	WC	9	207	.	.0	.0
551	1979 MAR 05	11:33:58.23	35.121	-106.802	6.15	.80MDLA	....	..	89	WC	15	206	.	.0	.0
552	1979 MAR 05	13:00:05.62	36.312	-106.200	5.21	2.66MDLA	....	..	55	WC	19	88	.	.0	.0
553	1979 MAR 06	13:48:05.65	35.119	-106.809	4.47	.04MDLA	....	..	89	WC	15	206	.	.0	.0
554	1979 MAR 07	10:51:05.87	35.126	-106.806	8.39	.76MDLA	....	..	88	WC	13	205	.	.0	.0
555	1979 MAR 07	10:54:01.18	35.124	-106.808	7.29	.71MDLA	....	..	89	WC	12	206	.	.0	.0
556	1979 MAR 07	11:03:53.21	35.109	-106.802	6.16	.07MDLA	....	..	90	WC	11	209	.	.0	.0
557	1979 MAR 07	15:08:23.40	35.564	-106.119	.00	1.10	....	..	36	NM	...	...	.	.....	.....
558	1979 MAR 07	22:11:35.46	36.319	-106.193	7.54	1.94MDLA	....	..	56	WC	20	88	.	.0	.0
559	1979 MAR 09	18:07:59.60	35.120	-106.399	.00	1.00	....	..	79	NM	...	...	.	.....	.....
560	1979 MAR 10	13:53:24.47	35.115	-106.800	6.44	2.19MDLA	....	..	89	WC	21	207	.	.0	.0
561	1979 MAR 11	21:11:22.60	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
562	1979 MAR 11	23:52:24.23	35.121	-106.814	6.34	-.31MDLA	....	..	89	WC	9	206	.	.0	.0
563	1979 MAR 12	00:21:38.12	35.108	-106.811	6.11	.04MDLA	....	..	90	WC	12	209	.	.0	.0
564	1979 MAR 12	21:00:45.04	35.850	-106.207	9.28	1.50 NM	....	..	13	WC	15	71	.	.0	.0
565	1979 MAR 12	22:54:12.00	35.104	-106.804	8.98	.44MDLA	....	..	90	WC	13	209	.	.0	.0
566	1979 MAR 13	23:03:27.68	35.119	-106.802	7.43	.48MDLA	....	..	89	WC	14	206	.	.0	.0
567	1979 MAR 15	00:29:24.08	35.118	-106.805	6.64	.26MDLA	....	..	89	WC	11	207	.	.0	.0
568	1979 MAR 15	04:48:30.35	35.112	-106.817	6.42	.49MDLA	....	..	90	WC	13	208	.	.0	.0
569	1979 MAR 15	19:00:48.10	35.097	-106.347	.00	1.20	....	..	81	NM	...	...	.	.....	.....
570	1979 MAR 17	11:25:59.48	36.319	-106.193	7.10	1.69MDLA	....	..	56	WC	21	88	.	.0	.0
571	1979 MAR 17	17:14:34.02	35.116	-106.809	5.54	.04MDLA	....	..	89	WC	9	207	.	.0	.0
572	1979 MAR 18	03:34:51.38	35.128	-106.806	8.47	1.05MDLA	....	..	88	WC	21	205	.	.0	.0
573	1979 MAR 19	02:28:50.22	36.547	-105.338	10.78	1.01MDLA	....	..	121	WC	16	265	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
574	1979 MAR 19	04:13:54.28	35.128	-106.806	8.46	.70MDLA	....	..	88	WC	19	205	.	.0	.0
575	1979 MAR 21	01:30:55.50	35.217	-106.820	.00	.30	....	..	80	NM	...	...	.	.....	.....
576	1979 MAR 21	02:27:09.10	35.217	-106.820	.00	....	....	..	80	GS	0	0	.	.0	.0
577	1979 MAR 21	02:27:41.63	35.112	-106.796	11.86	1.18MDLA	....	..	89	WC	22	208	.	.0	.0
578	1979 MAR 21	08:10:01.40	35.139	-106.848	.00	.30	....	..	89	NM	...	...	.	.....	.....
579	1979 MAR 21	15:56:07.70	35.195	-106.845	.00	.50	....	..	84	NM	...	...	.	.....	.....
580	1979 MAR 22	18:08:55.60	35.139	-106.818	10.12	.65MDLA	....	..	88	WC	15	228	.	.0	.0
581	1979 MAR 25	09:12:06.40	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
582	1979 MAR 25	12:14:07.55	35.105	-106.799	10.00	.34MDLA	....	..	90	LA	18	209	D	.7	168.4
583	1979 MAR 25	20:04:24.89	36.488	-105.340	6.87	.71MDLA	....	..	117	WC	12	262	.	.0	.0
584	1979 MAR 26	00:28:19.24	35.097	-106.799	6.90	-.20MDLA	....	..	91	WC	7	211	.	.0	.0
585	1979 MAR 26	04:12:55.47	35.567	-106.057	4.73	.33MDLA	....	..	39	WC	13	153	.	.0	.0
586	1979 MAR 27	19:08:42.60	35.123	-106.803	6.89	-.07MDLA	....	..	89	WC	9	206	.	.0	.0
587	1979 MAR 28	18:49:19.18	35.095	-106.803	9.37	.28MDLA	....	..	91	WC	10	211	.	.0	.0
588	1979 MAR 30	09:28:02.22	35.119	-106.801	7.68	2.00MDLA	....	..	89	WC	20	207	.	.0	.0
589	1979 MAR 30	09:44:02.00	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
590	1979 MAR 30	10:41:55.17	35.112	-106.796	7.05	2.58MDLA	....	..	89	WC	18	208	.	.0	.0
591	1979 MAR 30	10:46:17.23	35.123	-106.799	7.88	-.34MDLA	....	..	88	WC	9	219	.	.0	.0
592	1979 MAR 30	11:57:39.20	35.217	-106.820	.00	....	....	..	80	NM	...	...	.	.....	.....
593	1979 APR 01	05:13:10.80	36.333	-106.221	.00	.80	....	..	57	NM	...	...	.	.....	.....
594	1979 APR 02	03:48:58.90	35.173	-106.835	21.80	.40MDGS	....	..	85	GS	0	0	.	.0	.0
595	1979 APR 02	11:17:12.92	35.138	-106.816	6.00	-.07MDLA	....	..	88	WC	14	234	.	.0	.0
596	1979 APR 02	17:49:56.06	35.120	-106.815	10.00	.52MDLA	....	..	89	LA	20	230	D	.6	133.0
597	1979 APR 04	00:44:17.20	35.135	-106.813	.00	1.00	....	..	88	NM	...	...	.	.....	.....
598	1979 APR 04	12:14:07.26	35.106	-106.811	10.19	.10MDLA	....	..	91	WC	12	254	.	.0	.0
599	1979 APR 06	21:56:11.69	35.141	-106.824	10.43	.04MDLA	....	..	88	WC	13	233	.	.0	.0
600	1979 APR 07	03:43:50.80	36.677	-106.387	.00	.80	....	..	94	NM	...	...	.	.....	.....
601	1979 APR 07	03:45:17.00	36.701	-106.357	.00	1.10	....	..	97	NM	...	...	.	.....	.....
602	1979 APR 07	08:17:06.73	35.680	-106.656	11.17	1.56MDLA	....	..	32	WC	20	124	.	.0	.0
603	1979 APR 07	13:22:03.27	35.839	-106.099	7.53	....	....	..	23	WC	13	99	.	.0	.0
604	1979 APR 07	23:35:39.95	35.148	-106.817	10.55	1.04MDLA	....	..	87	WC	21	227	.	.0	.0
605	1979 APR 07	23:40:53.41	35.124	-106.812	10.53	1.35MDLA	....	..	89	WC	19	230	.	.0	.0
606	1979 APR 11	01:49:54.74	35.136	-106.808	8.39	1.04MDLA	....	..	88	WC	15	228	.	.0	.0
607	1979 APR 11	02:22:41.11	35.147	-106.821	10.13	.60MDLA	....	..	87	WC	15	227	.	.0	.0
608	1979 APR 11	11:41:24.99	35.126	-106.816	9.43	.39MDLA	....	..	89	WC	10	250	.	.0	.0
609	1979 APR 12	03:48:53.99	35.143	-106.812	9.49	.34MDLA	....	..	87	WC	15	233	.	.0	.0
610	1979 APR 12	09:33:47.00	35.176	-106.835	15.10	.40MDGS	....	..	85	GS	0	0	.	.0	.0
611	1979 APR 13	07:38:52.60	35.846	-106.099	4.87	.29MDLA	....	..	23	WC	14	97	.	.0	.0
612	1979 APR 13	18:01:41.30	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
613	1979 APR 13	21:31:46.80	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
614	1979 APR 13	22:32:36.20	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
615	1979 APR 14	08:41:59.50	35.217	-106.820	.00	.40MDGS	....	..	80	GS	0	0	.	.0	.0
616	1979 APR 16	09:49:37.16	35.153	-106.824	8.26	.29MDLA	....	..	87	WC	13	231	.	.0	.0
617	1979 APR 17	05:49:21.61	35.146	-106.807	8.37	.07MDLA	....	..	86	WC	11	201	.	.0	.0
618	1979 APR 17	09:01:44.20	35.713	-106.696	.00	.30	....	..	34	NM	...	...	.	.....	.....
619	1979 APR 17	10:24:25.35	35.688	-106.678	8.01	-.53MDLA	....	..	34	WC	9	201	.	.0	.0
620	1979 APR 17	18:24:25.60	35.722	-106.692	.00	.30	....	..	33	NM	...	...	.	.....	.....
621	1979 APR 18	03:25:20.31	35.136	-106.804	9.02	1.47MDLA	....	..	87	WC	22	203	.	.0	.0
622	1979 APR 18	06:55:35.70	35.141	-106.816	9.40	.38MDLA	....	..	87	WC	20	202	.	.0	.0
623	1979 APR 18	13:13:36.82	35.133	-106.801	8.65	.10MDLA	....	..	88	WC	16	204	.	.0	.0
624	1979 APR 19	02:29:57.30	35.797	-106.483	.00	.30	....	..	13	NM	...	...	.	.....	.....
625	1979 APR 22	00:43:53.77	35.135	-106.802	10.12	.16MDLA	....	..	87	WC	17	203	.	.0	.0
626	1979 APR 24	05:31:15.70	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
627	1979 APR 24	12:21:41.50	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
628	1979 APR 24	12:59:46.10	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
629	1979 APR 25	05:48:24.30	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
630	1979 APR 26	03:21:55.53	35.131	-106.801	10.14	.19MDLA	....	..	88	WC	13	204	.	.0	.0
631	1979 APR 30	01:41:23.31	36.345	-106.750	6.46	.34MDLA	....	..	67	WC	10	153	.	.0	.0
632	1979 APR 30	01:44:15.07	36.357	-106.741	6.66	.65MDLA	....	..	68	WC	8	144	.	.0	.0

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Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
633	1979 APR 30	03:27:06.00	36.346	-106.722	.00	.50	....	..	66	NM	...	...	.	.....	.....
634	1979 APR 30	09:43:02.70	35.546	-107.215	.00	.70	....	..	84	NM	...	...	.	.....	.....
635	1979 APR 30	19:08:04.76	35.126	-106.798	10.22	.75MDLA	....	..	88	WC	16	205	.	.0	.0
636	1979 MAY 01	05:37:23.53	35.153	-106.822	10.82	.40MDLA	....	..	86	WC	14	226	.	.0	.0
637	1979 MAY 10	05:16:27.80	35.217	-106.820	.00	.40MDGS	....	..	80	GS	0	0	.	.0	.0
638	1979 MAY 10	09:26:52.20	35.217	-106.820	.00	.80MDGS	....	..	80	GS	0	0	.	.0	.0
639	1979 MAY 17	16:00:55.18	36.426	-106.697	8.78	.98MDLA	....	..	73	WC	16	140	.	.0	.0
640	1979 MAY 22	20:52:58.00	36.298	-105.709	.00	.50	....	..	78	NM	...	...	.	.....	.....
641	1979 JUN 01	03:48:59.35	36.655	-106.879	5.92	.69MDLA	....	..	103	LA	10	297	C	2.4	3.3
642	1979 JUN 02	14:41:08.50	36.645	-107.001	.00	1.30	....	..	108	NM	...	...	.	.....	.....
643	1979 JUN 05	05:26:09.40	36.432	-106.709	6.11	1.25MDLA	....	..	74	WC	15	176	.	.0	.0
644	1979 JUN 12	16:51:41.49	36.312	-106.452	6.76	1.30MDLA	....	..	54	WC	17	227	.	.0	.0
645	1979 JUN 13	02:22:51.02	35.784	-106.720	8.88	-.43MDLA	....	..	34	WC	8	167	.	.0	.0
646	1979 JUN 22	09:32:29.60	36.610	-106.730	.00	.70	....	..	93	NM	...	...	.	.....	.....
647	1979 JUN 25	12:17:26.20	36.250	-106.433	.00	1.00	....	..	47	NM	...	...	.	.....	.....
648	1979 JUN 28	22:40:37.60	35.658	-107.020	.00	....	....	..	64	NM	...	...	.	.....	.....
649	1979 JUN 28	23:12:39.37	36.198	-106.856	6.43	.57MDLA	....	..	61	WC	8	249	.	.0	.0
650	1979 JUL 08	15:55:04.30	35.112	-106.809	11.83	1.95MDLA	....	..	90	WC	14	208	.	.0	.0
651	1979 JUL 15	21:27:29.80	35.145	-106.814	.00	.80	....	..	87	NM	...	...	.	.....	.....
652	1979 JUL 21	06:41:24.10	35.341	-107.230	.00	.50	....	..	96	NM	...	...	.	.....	.....
653	1979 JUL 21	11:39:56.63	35.127	-106.805	10.52	.54MDLA	....	..	88	WC	18	205	.	.0	.0
654	1979 JUL 24	18:11:13.34	35.116	-106.799	9.26	.70MDLA	....	..	89	WC	16	207	.	.0	.0
655	1979 JUL 26	03:29:16.90	36.650	-106.750	.00	.70	....	..	98	NM	...	...	.	.....	.....
656	1979 JUL 30	13:38:18.55	35.140	-106.881	10.12	1.51MDLA	....	..	90	WC	22	202	.	.0	.0
657	1979 AUG 07	21:00:09.80	35.914	-106.767	.00	.80MDGS	....	..	39	GS	0	0	.	.0	.0
658	1979 AUG 12	13:03:50.30	36.346	-105.924	.00	.50	....	..	69	NM	...	...	.	.....	.....
659	1979 AUG 14	18:56:54.92	36.181	-106.855	.67	.97MDLA	....	..	60	WC	14	179	.	.0	.0
660	1979 AUG 15	04:24:40.18	35.114	-106.804	8.49	1.21MDLA	....	..	90	WC	20	208	.	.0	.0
661	1979 AUG 17	09:38:20.00	35.015	-105.616	.00	1.20	....	..	112	NM	...	...	.	.....	.....
662	1979 AUG 17	18:55:38.00	35.641	-106.984	.00	1.40	....	..	61	NM	...	...	.	.....	.....
663	1979 AUG 17	18:58:20.70	35.641	-106.984	.00	.30	....	..	61	NM	...	...	.	.....	.....
664	1979 AUG 17	20:44:07.15	35.636	-106.996	7.90	-.17MDLA	....	..	62	LA	8	299	C	2.0	3.3
665	1979 AUG 18	00:39:07.02	36.432	-106.585	6.21	.18MDLA	....	..	70	WC	10	197	.	.0	.0
666	1979 AUG 17	28:44:06.70	35.694	-107.056	.00	....	....	..	66	NM	...	...	.	.....	.....
667	1979 AUG 18	00:39:07.60	36.470	-106.670	.00	.50	....	..	77	NM	...	...	.	.....	.....
668	1979 AUG 20	11:09:33.04	36.524	-106.724	7.76	1.00MDLA	....	..	84	WC	13	215	.	.0	.0
669	1979 AUG 25	04:35:42.25	35.466	-107.105	12.80	1.33MDLA	....	..	79	WC	17	136	.	.0	.0
670	1979 AUG 25	04:37:02.36	35.465	-107.116	4.76	.44MDLA	....	..	80	WC	14	136	.	.0	.0
671	1979 AUG 26	15:37:15.18	36.542	-106.724	6.08	.58MDLA	....	..	86	WC	8	220	.	.0	.0
672	1979 AUG 26	22:53:05.19	36.541	-106.752	10.23	1.16MDLA	....	..	87	WC	10	231	.	.0	.0
673	1979 AUG 26	23:22:17.74	36.527	-106.709	6.35	.99MDLA	....	..	84	WC	12	208	.	.0	.0
674	1979 AUG 28	01:19:42.82	35.477	-107.117	5.96	.17MDLA	....	..	80	WC	9	142	.	.0	.0
675	1979 AUG 31	17:26:29.52	35.452	-107.101	7.72	1.49MDLA	....	..	80	WC	19	139	.	.0	.0
676	1979 AUG 31	18:51:33.64	35.521	-105.969	12.76	1.03MDLA	....	..	49	WC	13	184	.	.0	.0
677	1979 SEP 01	21:15:50.70	36.499	-106.540	10.72	.90MDLA	....	..	76	WC	15	210	.	.0	.0
678	1979 SEP 04	18:36:12.11	35.481	-106.251	.06	1.73MDLA	....	..	40	WC	11	133	.	.0	.0
679	1979 SEP 05	08:31:00.41	36.464	-105.514	11.36	.41MDLA	....	..	103	WC	11	243	.	.0	.0
680	1979 SEP 06	08:37:18.40	35.326	-107.250	.00	.70	....	..	99	NM	...	...	.	.....	.....
681	1979 SEP 20	18:45:30.70	35.799	-105.708	.00	.30	....	..	58	NM	...	...	.	.....	.....
682	1979 SEP 21	02:55:44.80	35.744	-106.100	4.56	....	....	..	24	WC	11	108	.	.0	.0
683	1979 SEP 21	10:43:00.77	35.747	-106.098	3.68	....	....	..	25	WC	14	131	.	.0	.0
684	1979 SEP 22	09:03:28.96	35.947	-106.221	1.34	....	....	..	17	WC	14	77	.	.0	.0
685	1979 SEP 22	23:04:19.00	36.647	-106.670	.00	.50	....	..	95	NM	...	...	.	.....	.....
686	1979 OCT 02	23:15:51.19	35.128	-106.813	9.14	1.06MDLA	....	..	89	WC	20	205	.	.0	.0
687	1979 OCT 05	19:25:45.00	36.100	-106.767	.00	.80	....	..	48	NM	...	...	.	.....	.....
688	1979 OCT 12	18:59:10.40	36.144	-106.721	.00	.70	....	..	48	NM	...	...	.	.....	.....
689	1979 OCT 13	05:23:54.10	35.740	-106.828	.00	.80	....	..	44	NM	...	...	.	.....	.....
690	1979 OCT 15	15:25:17.10	36.301	-105.853	.00	.80	....	..	69	NM	...	...	.	.....	.....
691	1979 OCT 19	00:07:24.00	36.411	-105.295	.00	.80	....	..	115	NM	...	...	.	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
692	1979 OCT 21	17:18:52.60	36.096	-106.740	.00	.70	....	..	46	NM	...	...	.	.....	.....
693	1979 OCT 26	15:39:11.90	35.660	-106.920	.00	....	....	..	55	NM	...	...	.	.....	.....
694	1979 OCT 28	05:55:36.50	35.914	-106.767	.00	....	....	..	39	NM	...	...	.	.....	.....
695	1979 OCT 28	08:22:34.35	35.916	-106.787	7.26	.62MDLA	....	..	41	WC	11	110	.	.0	.0
696	1979 OCT 28	16:41:19.60	36.002	-106.745	12.40	.80MDGS	....	..	40	GS	0	0	.	.0	.0
697	1979 OCT 29	04:05:49.89	36.444	-106.506	18.38	1.33MDLA	....	..	70	WC	17	137	.	.0	.0
698	1979 NOV 03	01:11:10.53	36.571	-106.754	9.21	1.74MDLA	....	..	90	WC	17	142	.	.0	.0
699	1979 NOV 03	06:10:48.60	36.547	-106.812	.00	.30	....	..	90	NM	...	...	.	.....	.....
700	1979 NOV 03	07:18:47.90	36.614	-106.761	.00	.30	....	..	95	NM	...	...	.	.....	.....
701	1979 NOV 03	18:24:41.67	35.513	-106.227	.52	1.82MDLA	....	..	37	LA	12	244	D	2.5	9.0
702	1979 NOV 03	18:24:41.77	35.530	-106.220	.00	1.87MDLA	....	..	35	WC	12	241	.	.0	.0
703	1979 NOV 06	02:15:35.51	36.076	-106.879	8.01	1.63MDLA	....	..	55	WC	20	158	.	.0	.0
704	1979 NOV 11	13:13:58.50	36.174	-106.573	44.50	....	....	..	43	GS	0	0	.	.0	.0
705	1979 NOV 11	13:28:45.10	35.881	-106.248	.00	1.30	....	..	11	NM	...	...	.	.....	.....
706	1979 NOV 11	18:37:17.00	36.598	-106.749	.00	1.30	....	..	92	NM	...	...	.	.....	.....
707	1979 NOV 13	06:42:02.50	36.367	-106.581	.00	.50	....	..	63	NM	...	...	.	.....	.....
708	1979 NOV 13	13:58:35.20	36.546	-106.711	.00	.70	....	..	86	NM	...	...	.	.....	.....
709	1979 NOV 13	21:31:27.64	36.304	-106.792	10.71	1.10MDLA	....	..	66	WC	20	154	.	.0	.0
710	1979 NOV 13	21:58:33.45	36.305	-106.784	9.81	1.17MDLA	....	..	66	WC	19	151	.	.0	.0
711	1979 NOV 14	08:43:31.08	35.781	-106.937	.33	1.18MDLA	....	..	53	WC	20	152	.	.0	.0
712	1979 NOV 15	21:40:43.49	36.082	-106.692	3.82	.55MDLA	....	..	42	WC	12	108	.	.0	.0
713	1979 NOV 19	02:56:38.09	36.087	-106.700	8.38	.60MDLA	....	..	43	WC	10	112	.	.0	.0
714	1979 NOV 23	04:14:22.40	36.450	-106.770	15.80	.40MDGS	....	..	78	GS	0	0	.	.0	.0
715	1979 NOV 23	09:40:08.40	36.720	-106.733	.00	1.00	....	..	105	NM	...	...	.	.....	.....
716	1979 NOV 23	10:15:59.90	36.641	-106.639	.00	.80	....	..	94	NM	...	...	.	.....	.....
717	1979 NOV 24	15:28:13.53	36.464	-106.739	5.38	.91MDLA	....	..	79	WC	14	197	.	.0	.0
718	1979 NOV 24	15:34:06.40	36.469	-106.720	.00	.50	....	..	78	NM	...	...	.	.....	.....
719	1979 NOV 26	10:11:03.29	36.331	-106.862	7.66	.98MDLA	....	..	72	WC	9	218	.	.0	.0
720	1979 NOV 29	06:34:42.30	36.735	-106.559	.00	.50	....	..	102	NM	...	...	.	.....	.....
721	1979 NOV 29	06:38:32.50	36.735	-106.559	.00	.70	....	..	102	NM	...	...	.	.....	.....
722	1979 DEC 15	01:18:11.70	36.250	-105.920	.00	.50	....	..	61	NM	...	...	.	.....	.....
723	1979 DEC 18	11:25:48.78	35.278	-106.946	66.17	.13MDLA	....	..	82	LA	7	205	D	8.6	9.3
724	1979 DEC 18	16:39:24.90	35.757	-106.673	3.85	.89MDLA	....	..	30	WC	12	186	.	.0	.0
725	1979 DEC 20	00:29:22.57	35.756	-106.678	3.84	.74MDLA	....	..	31	WC	14	187	.	.0	.0
726	1979 DEC 20	01:34:59.40	35.789	-106.685	.00	.30	....	..	31	NM	...	...	.	.....	.....
727	1979 DEC 20	04:47:08.50	35.914	-106.736	6.80	.80MDGS	....	..	36	GS	0	0	.	.0	.0
728	1979 DEC 20	05:22:22.00	35.930	-106.755	.00	.80MDGS	....	..	38	GS	0	0	.	.0	.0
729	1979 DEC 20	06:18:51.61	35.929	-106.755	4.98	.09MDLA	....	..	38	WC	8	116	.	.0	.0
730	1979 DEC 22	17:20:10.50	35.757	-106.680	.00	....	....	..	31	NM	...	...	.	.....	.....
731	1979 DEC 22	17:34:35.86	35.766	-106.690	13.28	-.31MDLA	....	..	32	WC	5	181	.	.0	.0
732	1979 DEC 23	23:50:47.02	35.127	-106.822	5.19	.40MDLA	....	..	89	WC	9	205	.	.0	.0
733	1979 DEC 24	13:03:39.30	36.614	-106.800	.00	.80	....	..	96	NM	...	...	.	.....	.....
734	1979 DEC 24	13:54:41.19	35.134	-106.802	6.37	1.17MDLA	....	..	87	WC	18	204	.	.0	.0
735	1979 DEC 24	14:07:01.23	35.132	-106.802	6.56	.55MDLA	....	..	88	WC	15	204	.	.0	.0
736	1979 DEC 28	04:49:02.04	36.306	-105.854	12.13	.40MDLA	....	..	69	WC	19	187	.	.0	.0
737	1979 DEC 28	06:48:05.60	36.420	-106.750	.00	.50	....	..	75	NM	...	...	.	.....	.....
738	1980 JAN 01	04:52:19.80	35.094	-106.796	5.00	.30	....	..	91	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
739	1980 JAN 05	05:51:02.20	36.140	-106.904	5.00	....	....	..	61	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
740	1980 JAN 05	13:29:53.10	36.183	-106.850	5.00	.50	....	..	60	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
741	1980 JAN 08	00:22:44.22	35.709	-106.824	8.28	.49MDLA	....	..	45	WC	15	216	.	.0	.0
742	1980 JAN 09	13:08:18.80	35.717	-106.933	5.00	....	....	..	54	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
743	1980 JAN 12	21:39:30.10	35.492	-106.547	5.00	.30	....	..	42	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
744	1980 JAN 31	03:59:29.31	35.412	-106.035	1.30	.12MDLA	....	..	54	LA	9	292	D	.6	8.5
745	1980 FEB 07	21:21:53.08	35.553	-106.819	4.68	1.13MDLA	....	..	52	WC	12	161	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
746	1980 FEB 09	20:06:46.74	36.595	-106.612	5.00	.30MDGS	....	..	88	GS	10	0	c	.0	.0
747	1980 FEB 10	21:06:23.53	36.447	-106.903	3.24	1.32MDLA	....	..	85	WC	16	256	.	.0	.0
748	1980 FEB 15	10:28:39.95	35.937	-106.887	5.00	.60MDGS	....	..	50	GS	6	0	b	.0	.0
749	1980 FEB 15	11:30:37.11	35.942	-106.919	7.05	.19MDLA	....	..	53	WC	10	241	.	.0	.0
750	1980 FEB 16	10:02:44.60	35.728	-106.878	4.00	.40	....	..	49	NM	...	...	.	.....	.....
751	1980 FEB 19	15:04:13.20	35.715	-106.431	8.15	....	....	..	15	WC	7	160	.	.0	.0
752	1980 FEB 21	11:13:10.26	36.378	-106.810	10.00	.60MDLA	....	..	74	LA	12	273	D	1.1	189.9
753	1980 FEB 25	00:54:09.80	36.673	-106.616	5.00	1.30	....	..	97	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
754	1980 FEB 26	22:14:05.74	35.391	-106.163	1.51	1.01MDLA	....	..	52	LA	8	291	D	6.2	26.1
755	1980 FEB 27	00:16:57.72	35.711	-106.758	9.68	-.26MDLA	....	..	39	WC	14	209	.	.0	.0
756	1980 FEB 28	11:14:56.84	36.451	-106.381	6.26	.32MDLA	....	..	69	WC	12	129	.	.0	.0
757	1980 MAR 02	15:26:00.20	36.466	-106.638	5.00	.50	....	..	75	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
758	1980 MAR 03	21:54:22.80	35.326	-106.044	5.00	....	....	..	62	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
759	1980 MAR 05	11:06:56.60	36.172	-106.806	5.00	....	....	..	56	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
760	1980 MAR 09	07:59:04.40	36.629	-106.553	5.00	.70	....	..	91	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
761	1980 MAR 14	23:44:25.90	35.249	-106.039	5.00	....	....	..	70	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
762	1980 MAR 15	10:09:30.70	36.622	-106.876	5.00	1.60	....	..	100	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
763	1980 MAR 15	17:53:17.84	35.601	-106.952	8.69	.79MDLA	....	..	60	WC	19	148	.	.0	.0
764	1980 MAR 16	14:46:01.42	35.620	-106.965	10.26	-.04MDLA	....	..	60	WC	11	151	.	.0	.0
765	1980 MAR 19	03:36:31.65	35.670	-106.459	4.48	.30 NM	....	..	20	WC	7	182	.	.0	.0
766	1980 MAR 25	23:42:58.20	35.290	-106.052	5.00	....	....	..	66	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
767	1980 MAR 29	06:02:25.65	35.672	-106.531	13.14	.50 NM	....	..	24	LA	5	314	C	1.8	2.1
768	1980 APR 01	02:23:03.81	36.110	-106.218	7.08	.40 NM	....	..	33	WC	8	156	.	.0	.0
769	1980 APR 03	10:04:05.40	36.638	-106.602	5.00	.60	....	..	92	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
770	1980 APR 05	06:44:51.02	35.587	-106.974	9.19	-.14MDLA	....	..	63	LA	10	286	C	.9	1.0
771	1980 APR 09	10:19:05.69	36.294	-105.882	9.46	.40 NM	....	..	67	WC	9	250	.	.0	.0
772	1980 APR 15	14:43:33.20	35.909	-106.696	2.70	1.60MDGS	....	..	32	GS	0	0	b	.0	.0
773	1980 APR 15	15:07:43.68	35.897	-106.647	7.40	1.60MDGS	....	..	28	GS	0	0	c	.0	.0
774	1980 APR 18	15:08:07.64	35.873	-106.774	8.00	.50MDGS	....	..	39	GS	0	0	a	.0	.0
775	1980 APR 18	15:25:54.30	35.881	-106.792	5.00	.80MDGS	....	..	40	GS	0	0	a	.0	.0
776	1980 APR 18	15:53:23.79	35.880	-106.777	5.13	.19MDLA	....	..	39	WC	14	133	.	.0	.0
777	1980 APR 21	03:13:04.78	35.770	-105.685	13.67	1.02MDLA	....	..	61	WC	16	263	.	.0	.0
778	1980 APR 23	07:25:23.70	35.869	-106.797	7.25	-.11MDLA	....	..	41	LA	10	296	C	1.1	1.3
779	1980 APR 23	07:26:39.56	35.895	-106.804	3.10	-.80MDGS	....	..	42	GS	0	0	b	.0	.0
780	1980 APR 23	07:27:49.65	35.894	-106.804	.80	1.10MDGS	....	..	42	GS	0	0	c	.0	.0
781	1980 APR 23	09:08:45.31	35.911	-106.789	3.80	.60MDGS	....	..	41	GS	0	0	b	.0	.0
782	1980 APR 23	18:34:33.24	35.861	-106.786	6.76	-.13MDLA	....	..	40	LA	9	329	C	1.6	2.4
783	1980 APR 24	05:12:28.44	35.786	-106.721	.04	.03MDLA	....	..	34	WC	11	148	.	.0	.0
784	1980 APR 24	12:12:08.10	35.886	-106.795	1.00	....	....	..	41	NM	...	...	.	.....	.....
785	1980 APR 24	19:11:57.97	35.876	-106.777	7.13	....	....	..	39	WC	12	132	.	.0	.0
786	1980 APR 24	19:12:33.48	35.874	-106.783	7.03	1.90MDLA	....	..	39	WC	12	135	.	.0	.0
787	1980 APR 24	22:30:33.13	35.874	-106.778	6.65	-.02MDLA	....	..	39	WC	12	133	.	.0	.0
788	1980 APR 27	08:49:14.72	35.877	-106.772	3.63	.55MDLA	....	..	38	WC	15	129	.	.0	.0
789	1980 APR 28	07:26:01.42	35.876	-106.785	6.73	-.28MDLA	....	..	40	WC	11	137	.	.0	.0
790	1980 APR 29	02:22:17.08	35.881	-106.673	2.80	....	....	..	30	GS	0	0	a	.0	.0
791	1980 APR 29	02:22:20.10	35.879	-106.676	3.00	....	....	..	30	NM	...	...	.	.....	.....
792	1980 MAY 01	02:49:58.40	35.584	-107.206	5.00	.80	....	..	82	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
793	1980 MAY 01	10:56:15.20	35.771	-106.062	5.00	.30	....	..	27	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
794	1980 MAY 06	00:49:59.98	35.623	-106.975	15.71	-.19MDLA	....	..	61	LA	13	284	C	1.2	1.5
795	1980 MAY 06	03:04:03.98	35.667	-106.987	17.25	-.34MDLA	....	..	60	WC	12	148	.	.0	.0
796	1980 MAY 06	11:48:32.82	35.641	-106.967	17.32	-.70MDLA	....	..	60	LA	12	294	C	.9	1.0
797	1980 MAY 06	12:01:02.87	35.623	-106.980	5.00	.80MDGS	....	..	61	GS	0	0	a	.0	.0
798	1980 MAY 13	01:10:53.77	35.591	-106.970	10.74	-.19MDLA	....	..	62	LA	9	295	C	.6	1.1
799	1980 MAY 16	07:47:10.06	35.868	-106.685	.80	.80MDGS	....	..	31	GS	0	0	c	.0	.0
800	1980 MAY 16	08:09:27.67	35.987	-106.133	5.09	1.05MDLA	....	..	26	WC	10	94	.	.0	.0
801	1980 MAY 16	09:11:18.76	35.600	-106.823	10.43	.48MDLA	....	..	50	WC	16	269	.	.0	.0
802	1980 MAY 19	07:06:27.51	35.890	-106.685	1.30	.50MDGS	....	..	31	GS	0	0	a	.0	.0
803	1980 MAY 20	03:03:29.43	35.854	-106.576	2.70	.20MDGS	....	..	21	GS	0	0	b	.0	.0
804	1980 MAY 20	23:55:19.29	35.877	-106.712	3.10	.50MDGS	....	..	33	GS	0	0	a	.0	.0
805	1980 MAY 23	03:51:14.40	36.586	-105.332	5.00	.60	....	..	124	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
806	1980 MAY 25	17:39:37.38	36.252	-106.223	7.70	.58MDLA	....	..	48	WC	9	151	.	.0	.0
807	1980 MAY 27	20:52:14.09	35.891	-106.794	6.00	.80MDGS	....	..	41	GS	0	0	c	.0	.0
808	1980 MAY 27	21:20:09.47	35.889	-106.790	5.00	1.20MDGS	....	..	40	GS	0	0	d	.0	.0
809	1980 JUN 02	12:41:47.09	35.756	-106.929	3.00	.20MDGS	....	..	53	GS	0	0	a	.0	.0
810	1980 JUN 03	18:45:33.10	36.480	-105.305	5.00	....	....	..	119	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
811	1980 JUN 07	00:55:44.46	35.886	-106.691	.00	.70MDGS	....	..	31	GS	0	0	a	.0	.0
812	1980 JUN 08	07:04:01.66	36.014	-106.135	4.14	.61MDLA	....	..	28	WC	9	94	.	.0	.0
813	1980 JUN 13	11:11:48.20	35.892	-106.670	3.30	.40MDGS	....	..	30	GS	0	0	a	.0	.0
814	1980 JUN 13	11:55:53.80	35.894	-106.677	4.00	....	....	..	30	NM	...	...	.	.....	.....
815	1980 JUN 13	12:00:01.48	35.879	-106.683	2.30	1.10MDGS	....	..	31	GS	0	0	b	.0	.0
816	1980 JUN 15	19:58:04.72	35.986	-106.155	8.28	.80 NM	....	..	25	WC	7	183	.	.0	.0
817	1980 JUN 20	08:14:16.80	36.000	-106.152	7.55	.40 NM	....	..	26	WC	7	98	.	.0	.0
818	1980 JUN 23	01:03:08.00	35.883	-106.794	1.00	.20	....	..	41	NM	...	...	.	.....	.....
819	1980 JUN 23	17:44:11.58	35.730	-106.659	8.10	.11MDLA	....	..	30	WC	12	200	.	.0	.0
820	1980 JUN 25	08:11:42.79	35.751	-106.942	.66	1.29MDLA	....	..	54	WC	18	144	.	.0	.0
821	1980 JUN 25	20:07:15.47	35.940	-105.970	8.37	1.59MDLA	....	..	36	WC	15	127	.	.0	.0
822	1980 JUN 27	00:32:47.25	35.950	-106.857	5.00	1.10MDGS	....	..	48	GS	0	0	c	.0	.0
823	1980 JUN 27	00:47:53.26	35.958	-106.829	5.00	1.20MDGS	....	..	45	GS	0	0	c	.0	.0
824	1980 JUN 27	01:44:29.85	35.945	-106.821	6.74	.54MDLA	....	..	44	WC	15	179	.	.0	.0
825	1980 JUN 28	23:04:10.30	35.980	-106.151	7.89	.10 NM	....	..	25	WC	5	90	.	.0	.0
826	1980 JUL 05	10:24:06.12	36.305	-106.063	5.89	.40 NM	....	..	59	WC	9	96	.	.0	.0
827	1980 JUL 07	18:02:33.00	35.240	-107.250	.00	.10	....	..	105	SJ	...	...	.	.....	.....
828	1980 JUL 10	09:11:47.12	35.042	-106.140	5.00	.30MDGS	....	..	89	GS	0	0	b	.0	.0
829	1980 JUL 13	04:14:19.00	36.719	-106.640	5.00	1.20	....	..	102	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
830	1980 JUL 13	05:16:50.45	36.749	-106.697	10.00	....	....	..	107	LA	4	295	D	.0	.0
831	1980 JUL 13	06:44:58.70	36.699	-106.641	5.00	1.30	....	..	100	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
832	1980 JUL 13	06:49:18.90	36.677	-106.648	5.00	.20	....	..	98	NM	...	...	.	.....	.....
833	1980 JUL 14	12:45:20.44	36.456	-106.562	10.16	.51MDLA	....	..	72	WC	18	146	.	.0	.0
834	1980 AUG 08	10:05:18.43	35.625	-106.622	9.41	.25MDLA	....	..	34	WC	14	233	.	.0	.0
835	1980 AUG 13	18:33:29.69	36.008	-106.774	4.33	1.09MDLA	....	..	43	WC	12	84	.	.0	.0
836	1980 AUG 22	13:33:11.84	35.741	-107.186	5.00	.40MDGS	....	..	76	GS	0	0	d	.0	.0
837	1980 AUG 23	17:21:37.70	36.461	-106.577	5.00	.30	....	..	73	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
838	1980 SEP 02	22:32:04.98	35.990	-106.127	2.99	.50 NM	....	..	27	WC	11	95	.	.0	.0
839	1980 SEP 06	12:55:37.79	36.282	-106.499	7.53	....	....	..	52	WC	10	147	.	.0	.0
840	1980 SEP 11	02:07:10.22	35.735	-106.914	.08	.57MDLA	....	..	52	WC	17	142	.	.0	.0
841	1980 SEP 11	09:57:08.34	35.884	-106.678	2.00	1.20MDGS	....	..	30	GS	0	0	a	.0	.0
842	1980 SEP 11	16:16:53.20	36.484	-105.257	5.00	1.10	....	..	122	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
843	1980 SEP 12	19:27:20.50	36.304	-106.610	5.00	.10	....	..	58	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
844	1980 SEP 12	22:38:20.86	36.291	-106.653	5.00	.20MDGS	....	..	58	GS	0	0	b	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
845	1980 SEP 12	22:40:36.10	36.485	-105.281	5.00	.70	....	..	121	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
846	1980 SEP 13	00:22:56.70	36.414	-105.618	5.00	....	....	..	92	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
847	1980 SEP 13	03:04:53.64	35.503	-107.205	5.00	.50MDGS	....	..	86	GS	0	0	b	.0	.0
848	1980 SEP 15	07:47:13.86	35.886	-106.626	6.60	1.00MDGS	....	..	26	GS	0	0	c	.0	.0
849	1980 SEP 15	09:14:16.08	35.907	-106.853	5.00	.60MDGS	....	..	46	GS	0	0	a	.0	.0
850	1980 SEP 18	15:42:22.20	36.013	-106.851	7.52	.26MDLA	....	..	50	WC	12	252	.	.0	.0
851	1980 SEP 20	21:14:44.10	36.265	-105.475	5.00	.40	....	..	92	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
852	1980 SEP 23	05:57:56.02	36.013	-106.847	7.38	.73MDLA	....	..	49	WC	14	251	.	.0	.0
853	1980 SEP 24	18:14:45.05	35.549	-106.821	4.58	1.03MDLA	....	..	53	WC	15	171	.	.0	.0
854	1980 SEP 25	10:40:19.30	36.066	-106.845	5.00	.60	....	..	52	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
855	1980 SEP 25	17:38:33.70	35.909	-106.702	1.00	1.20	....	..	33	NM	...	...	.	.....	.....
856	1980 SEP 25	18:31:09.50	35.882	-106.701	.00	.90	....	..	32	NM	...	...	.	.....	.....
857	1980 SEP 25	19:01:25.80	35.882	-106.737	1.00	.90	....	..	35	NM	...	...	.	.....	.....
858	1980 SEP 25	20:53:00.40	35.882	-106.722	1.00	1.10	....	..	34	NM	...	...	.	.....	.....
859	1980 SEP 25	22:07:31.09	35.876	-106.780	.80	.20MDGS	....	..	39	GS	0	0	d	.0	.0
860	1980 SEP 29	09:17:48.70	36.680	-106.672	5.00	.40	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
861	1980 SEP 29	11:58:53.40	36.697	-106.664	5.00	.70	....	..	100	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
862	1980 SEP 29	22:00:31.00	36.706	-106.614	5.00	.30	....	..	100	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
863	1980 OCT 08	19:56:47.30	36.476	-105.814	9.06	.83MDLA	....	..	86	WC	13	201	.	.0	.0
864	1980 OCT 11	20:31:41.00	36.530	-106.850	.00	2.20	....	..	90	SJ	...	...	.	.....	.....
865	1980 OCT 19	06:18:00.42	36.152	-106.170	4.52	....	....	..	39	WC	11	119	.	.0	.0
866	1980 OCT 19	07:24:29.47	36.153	-106.172	5.74	.20 NM	....	..	39	WC	12	119	.	.0	.0
867	1980 OCT 25	19:42:52.07	35.544	-107.164	5.00	....	....	..	80	GS	0	0	b	.0	.0
868	1980 OCT 25	19:42:52.29	35.540	-107.171	7.23	.33MDLA	....	..	81	WC	20	153	.	.0	.0
869	1980 OCT 26	10:29:13.83	35.893	-106.687	3.00	.80MDGS	....	..	31	GS	0	0	d	.0	.0
870	1980 OCT 27	11:33:07.38	35.969	-106.709	2.00	.70MDGS	....	..	36	GS	0	0	b	.0	.0
871	1980 OCT 28	12:32:02.13	35.967	-106.089	5.00	.40MDGS	....	..	28	GS	0	0	d	.0	.0
872	1980 NOV 13	19:49:05.51	35.687	-106.342	.03	.60 NM	....	..	16	WC	7	231	.	.0	.0
873	1980 NOV 16	21:32:09.20	35.873	-106.781	1.10	1.00MDGS	....	..	39	GS	0	0	a	.0	.0
874	1980 NOV 17	21:06:49.60	35.659	-106.333	1.47	.50 NM	....	..	19	WC	7	236	.	.0	.0
875	1980 NOV 18	13:21:13.94	35.886	-106.713	3.70	.60MDGS	....	..	33	GS	0	0	a	.0	.0
876	1980 NOV 18	14:20:52.49	35.851	-106.677	3.85	-.53MDLA	....	..	30	WC	8	129	.	.0	.0
877	1980 NOV 20	02:11:24.60	36.641	-106.796	5.00	.50	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
878	1980 NOV 22	00:16:27.97	36.351	-106.916	12.42	1.47MDLA	....	..	77	WC	19	207	.	.0	.0
879	1980 NOV 27	09:28:17.58	36.420	-105.468	10.12	1.08MDLA	....	..	103	WC	14	247	.	.0	.0
880	1980 NOV 29	08:19:48.97	36.407	-105.519	14.85	1.70MDLA	....	..	98	WC	17	240	.	.0	.0
881	1980 NOV 30	07:20:30.52	36.541	-106.649	15.22	.88MDLA	....	..	83	WC	21	195	.	.0	.0
882	1980 DEC 13	09:23:48.29	35.590	-107.213	5.00	.30MDGS	....	..	83	GS	0	0	c	.0	.0
883	1980 DEC 13	16:51:44.70	35.628	-107.225	5.00	....	....	..	82	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
884	1980 DEC 15	11:12:19.80	35.602	-107.236	5.00	.50	....	..	84	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
885	1980 DEC 15	20:57:59.60	35.021	-106.278	5.00	.10	....	..	90	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
886	1980 DEC 17	09:27:29.72	35.878	-106.679	3.00	.60MDGS	....	..	30	GS	0	0	a	.0	.0
887	1980 DEC 18	17:11:12.60	36.324	-106.144	8.55	.10 NM	....	..	58	WC	8	93	.	.0	.0
888	1980 DEC 23	02:02:57.14	35.742	-107.153	8.06	-.26MDLA	....	..	73	WC	8	194	.	.0	.0
889	1980 DEC 23	03:18:08.42	35.757	-106.861	5.00	.80MDGS	....	..	47	GS	0	0	b	.0	.0
890	1980 DEC 24	11:57:27.20	36.408	-106.841	11.00	.10	....	..	78	NM	...	...	.	.....	.....
891	1980 DEC 27	22:16:48.70	36.381	-106.840	4.00	.10	....	..	75	NM	...	...	.	.....	.....
892	1981 JAN 01	03:58:16.22	35.537	-106.686	5.00	1.20MDGS	....	..	45	GS	4	0	b	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
893	1981 JAN 06	13:39:12.88	35.960	-106.583	.96	-.31MDLA	....	..	26	LA	5	280	D	16.0	89.2
894	1981 JAN 10	06:25:58.50	35.605	-107.236	5.00	.20	....	..	84	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
895	1981 JAN 11	09:34:12.90	35.597	-107.232	5.00	.30	....	..	84	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
896	1981 JAN 11	17:24:00.56	36.314	-106.573	7.59	.27MDLA	....	..	57	WC	15	149	.	.0	.0
897	1981 FEB 12	04:51:18.90	36.742	-106.713	5.00	.80	....	..	106	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
898	1981 FEB 20	12:05:10.40	35.067	-106.445	5.00	.50	....	..	85	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
899	1981 FEB 23	13:41:38.12	36.037	-106.876	11.10	.25MDLA	....	..	53	WC	15	198	.	.0	.0
900	1981 FEB 28	08:49:46.74	36.240	-106.221	21.31	.20 NM	....	..	47	WC	8	147	.	.0	.0
901	1981 MAR 06	07:41:33.39	35.558	-107.006	8.80	-.52MDLA	....	..	67	WC	11	164	.	.0	.0
902	1981 MAR 08	02:21:21.70	36.335	-106.217	6.05	....	....	..	57	WC	13	180	.	.0	.0
903	1981 MAR 09	12:29:56.90	36.663	-106.643	5.00	.60	....	..	96	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATION WITHIN 10 KM OF EVENT													
904	1981 MAR 15	12:44:35.56	35.907	-106.493	7.10	.10 NM	....	..	15	WC	7	266	.	.0	.0
905	1981 MAR 20	13:57:40.26	36.285	-106.544	5.68	....	....	..	53	WC	10	143	.	.0	.0
906	1981 MAR 24	00:57:28.53	35.656	-106.952	5.00	.60MDGS	....	..	58	GS	3	0	c	.0	.0
907	1981 MAR 24	21:48:51.05	35.548	-106.835	8.18	.79MDLA	....	..	54	WC	11	184	.	.0	.0
908	1981 APR 01	02:17:38.00	35.340	-107.090	.00	.50	....	..	86	SJ	...	...	.	.....	.....
909	1981 APR 05	00:48:48.18	35.876	-106.820	5.00	.80MDGS	....	..	43	GS	5	0	b	.0	.0
910	1981 APR 05	00:48:55.70	35.889	-106.767	.00	.90	....	..	38	NM	...	...	.	.....	.....
911	1981 APR 05	04:14:14.78	35.872	-106.779	7.41	.48MDLA	....	..	39	WC	19	111	.	.0	.0
912	1981 APR 19	09:00:43.70	36.376	-106.375	5.00	.20MDGS	....	..	61	GS	3	0	b	.0	.0
913	1981 APR 20	14:44:57.67	35.870	-106.764	.00	.30MDGS	....	..	38	GS	7	0	a	.0	.0
914	1981 MAY 02	17:08:19.40	36.449	-106.597	5.00	....	....	..	72	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
915	1981 MAY 03	10:36:39.93	35.539	-106.239	7.33	.86MDLA	....	..	34	WC	10	239	.	.0	.0
916	1981 MAY 06	05:41:24.38	36.001	-106.762	8.80	.30MDGS	....	..	42	GS	5	0	d	.0	.0
917	1981 JUN 06	02:25:17.15	35.899	-106.729	24.90	.50MDGS	....	..	35	GS	4	0	c	.0	.0
918	1981 JUN 06	02:52:59.88	35.891	-106.765	5.00	1.30MDGS	....	..	38	GS	4	0	a	.0	.0
919	1981 JUN 15	12:28:03.43	35.709	-106.659	5.00	1.10MDGS	....	..	31	GS	4	0	b	.0	.0
920	1981 JUN 28	04:37:59.70	35.483	-106.796	5.00	.20MDGS	....	..	56	GS	4	0	b	.0	.0
921	1981 JUL 30	08:43:14.08	35.735	-106.671	5.00	.10MDGS	....	..	31	GS	4	0	a	.0	.0
922	1981 JUL 30	09:47:34.95	35.745	-106.654	5.00	1.30MDGS	....	..	29	GS	3	0	b	.0	.0
923	1981 AUG 03	05:11:42.81	35.693	-106.122	8.06	.57MDLA	....	..	26	WC	8	148	.	.0	.0
924	1981 AUG 04	21:27:19.50	36.573	-106.191	5.00	.10	....	..	84	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
925	1981 AUG 18	00:16:27.85	36.667	-106.698	10.28	1.18MDLA	....	..	98	LA	13	222	D	2.2	2.7
926	1981 AUG 27	11:49:57.53	35.895	-106.728	7.90	.40MDGS	....	..	35	GS	3	0	b	.0	.0
927	1981 SEP 09	21:41:49.10	36.594	-106.736	5.00	1.10	....	..	92	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
928	1981 SEP 10	05:52:53.34	35.723	-106.867	.80	.20MDGS	....	..	48	GS	5	0	c	.0	.0
929	1981 SEP 11	17:09:14.10	35.884	-106.746	1.00	1.10	....	..	36	NM	...	...	.	.....	.....
930	1981 SEP 11	18:46:07.50	35.868	-106.785	5.00	.50	....	..	40	NM	...	...	.	.....	.....
931	1981 SEP 11	20:26:60.00	35.861	-106.824	5.00	.50	....	..	43	NM	...	...	.	.....	.....
932	1981 SEP 11	21:25:41.30	35.855	-106.823	5.00	.30	....	..	43	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
933	1981 SEP 14	19:51:04.64	36.618	-106.758	5.00	1.00MDGS	....	..	95	GS	11	0	b	.0	.0
934	1981 SEP 16	04:04:56.10	36.010	-106.144	5.00	....	....	..	27	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
935	1981 SEP 21	04:19:04.12	36.519	-106.647	13.86	.86MDLA	....	..	81	WC	23	187	.	.0	.0
936	1981 SEP 26	02:15:59.46	36.514	-106.499	10.45	.53MDLA	....	..	77	WC	15	159	.	.0	.0
937	1981 OCT 01	07:40:22.82	35.527	-106.443	7.69	.87MDLA	....	..	35	WC	19	187	.	.0	.0
938	1981 OCT 16	11:26:03.40	35.274	-107.246	5.00	.40	....	..	102	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
939	1981 OCT 16	14:30:16.00	35.260	-107.240	.00	.90	....	..	103	SJ	...	...	.	.....	.....
940	1981 OCT 21	08:41:48.69	36.465	-106.668	10.61	1.72MDLA	....	..	76	WC	22	166	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
941	1981 OCT 26	03:28:51.12	35.704	-106.899	4.10	.40MDGS	....	..	52	GS	3	0	b	.0	.0
942	1981 NOV 01	08:14:25.45	36.657	-106.680	5.00	.60MDGS	....	..	96	GS	8	0	b	.0	.0
943	1981 NOV 02	06:22:41.21	35.454	-106.121	11.47	.62MDLA	....	..	47	WC	19	221	.	.0	.0
944	1981 NOV 03	09:01:40.81	36.418	-106.671	3.40	.10MDGS	....	..	71	GS	5	0	a	.0	.0
945	1981 NOV 05	06:40:03.40	35.382	-106.324	5.00	.70	....	..	50	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
946	1981 NOV 06	12:23:50.98	35.610	-107.226	5.00	.10MDGS	....	..	83	GS	3	0	d	.0	.0
947	1981 NOV 11	00:50:02.60	36.719	-106.718	5.00	1.50	....	..	104	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
948	1981 NOV 11	00:56:02.10	36.675	-106.697	5.00	.90	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
949	1981 NOV 24	06:51:19.38	35.764	-106.760	10.52	1.29MDLA	....	..	38	WC	16	125	.	.0	.0
950	1981 NOV 26	09:09:02.50	36.687	-106.697	5.00	.60	....	..	100	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
951	1981 NOV 29	18:21:04.90	35.511	-106.139	5.00	.10	....	..	40	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
952	1981 DEC 03	09:54:14.09	35.601	-106.885	5.00	.50MDGS	....	..	55	GS	3	0	c	.0	.0
953	1981 DEC 23	21:06:02.40	35.525	-105.657	5.00	.50	....	..	71	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
954	1981 DEC 25	08:16:02.40	36.290	-105.843	5.00	.20	....	..	68	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
955	1981 DEC 27	00:59:04.80	36.286	-107.109	5.00	1.10	....	..	85	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
956	1981 DEC 29	18:21:48.97	35.511	-106.139	5.00	.10MDGS	....	..	40	GS	4	0	d	.0	.0
957	1981 DEC 30	00:37:02.00	36.389	-106.901	5.00	.40	....	..	79	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
958	1981 DEC 31	18:14:03.50	36.097	-106.570	5.00	.30	....	..	36	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
959	1982 JAN 06	19:35:21.17	36.105	-106.556	5.00	.20MDGS	....	..	36	GS	6	0	c	.0	.0
960	1982 JAN 08	20:54:00.60	36.104	-106.566	5.00	.20	....	..	36	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
961	1982 JAN 11	04:13:23.14	35.631	-106.627	9.43	-.07MDLA	....	..	33	WC	12	215	.	.0	.0
962	1982 JAN 12	21:36:00.00	35.990	-106.588	5.00	.10	....	..	28	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
963	1982 FEB 18	06:03:11.48	35.779	-106.849	5.00	.40MDGS	....	..	45	GS	5	0	b	.0	.0
964	1982 FEB 22	10:47:03.20	35.419	-107.185	5.00	....	....	..	88	NM	...	...	.	.....	.....
965	1982 FEB 26	20:22:50.58	35.175	-106.767	7.91	.72MDLA	....	..	82	WC	10	230	.	.0	.0
966	1982 FEB 28	09:08:27.87	36.048	-106.937	4.70	.20MDGS	....	..	58	GS	2	0	b	.0	.0
967	1982 FEB 28	18:30:04.50	36.731	-106.765	5.00	1.70	....	..	107	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
968	1982 FEB 28	19:58:01.50	36.731	-106.806	5.00	1.20	....	..	108	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
969	1982 MAR 02	16:05:00.81	35.911	-105.287	5.00	....	....	..	96	GS	6	0	d	.0	.0
970	1982 MAR 02	16:05:21.23	35.891	-105.454	.28	2.56MDLA	....	..	81	LA	20	239	D	2.9	2.2
971	1982 MAR 02	16:14:00.60	36.629	-106.658	5.00	.90	....	..	93	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
972	1982 MAR 02	16:39:06.73	35.372	-107.022	10.00	.45MDLA	....	..	79	LA	16	302	D	2.6	362.1
973	1982 MAR 02	16:45:05.90	35.884	-105.328	5.00	.90	....	..	93	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
974	1982 MAR 04	09:44:16.85	35.868	-105.256	10.00	.86MDLA	....	..	99	LA	10	303	D	1.8	152.1
975	1982 MAR 05	02:03:05.20	36.731	-106.718	5.00	1.70	....	..	105	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
976	1982 MAR 06	03:47:02.60	36.611	-106.657	5.00	.90	....	..	91	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
977	1982 MAR 06	03:51:04.40	36.723	-106.716	5.00	1.30	....	..	104	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
978	1982 MAR 06	15:40:00.20	36.681	-106.692	5.00	2.20	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
979	1982 MAR 07	01:47:01.60	36.689	-106.654	5.00	1.10	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
980	1982 MAR 07	05:17:00.90	36.686	-106.670	5.00	1.10	....	..	99	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
981	1982 MAR 23	23:14:00.40	36.601	-106.651	5.00	1.00	....	..	90	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
982	1982 APR 06	11:53:21.87	36.293	-106.761	9.42	.30MDLA	....	..	63	WC	9	257	.	.0	.0
983	1982 APR 18	05:46:16.07	35.876	-105.276	10.00	.82MDLA	....	..	97	LA	12	302	D	1.1	176.5
984	1982 APR 19	07:34:46.75	36.316	-105.821	11.85	1.03MDLA	....	..	72	WC	11	193	.	.0	.0
985	1982 APR 24	04:12:07.24	35.723	-106.708	9.94	.30MDLA	....	..	34	WC	13	188	.	.0	.0
986	1982 APR 25	09:36:02.90	35.881	-106.865	5.00	.20MDGS	....	..	47	GS	3	0	c	.0	.0
987	1982 MAY 03	18:42:33.30	35.638	-106.939	5.00	.10MDGS	....	..	57	GS	3	0	c	.0	.0
988	1982 MAY 04	12:21:13.24	36.663	-106.650	5.00	1.40MDGS	....	..	96	GS	14	0	b	.0	.0
989	1982 MAY 05	21:13:45.14	36.497	-106.608	5.00	1.30MDGS	....	..	78	GS	5	0	d	.0	.0
990	1982 MAY 05	21:27:25.78	36.548	-106.624	5.00	1.20MDGS	....	..	83	GS	3	0	d	.0	.0
991	1982 MAY 06	01:53:43.71	36.672	-106.699	5.00	2.00MDGS	....	..	99	GS	11	0	b	.0	.0
992	1982 MAY 06	01:59:02.13	36.695	-106.700	5.00	1.30MDGS	....	..	101	GS	12	0	b	.0	.0
993	1982 MAY 16	12:08:48.90	36.653	-106.813	5.00	.70MDGS	....	..	100	GS	4	0	d	.0	.0
994	1982 MAY 16	13:08:34.63	36.622	-106.714	5.00	1.60MDGS	....	..	94	GS	10	0	b	.0	.0
995	1982 MAY 16	13:26:06.12	36.629	-106.714	5.00	1.10MDGS	....	..	94	GS	4	0	c	.0	.0
996	1982 MAY 16	16:16:53.40	36.670	-106.708	.00	2.70MLLAEQS	....	..	99	DG	...	...	.	.....	.....
997	1982 MAY 16	16:20:45.17	36.648	-106.715	5.00	1.50MDGS	....	..	96	GS	5	0	b	.0	.0
998	1982 MAY 16	17:39:56.11	36.599	-106.720	5.00	1.00MDGS	....	..	92	GS	3	0	c	.0	.0
999	1982 MAY 16	19:54:49.39	36.647	-106.696	5.00	1.30MDGS	....	..	96	GS	6	0	c	.0	.0
1000	1982 MAY 16	20:04:21.54	36.709	-106.738	5.00	1.80MDGS	....	..	104	GS	6	0	d	.0	.0
1001	1982 MAY 16	22:01:28.11	36.623	-106.705	5.00	1.30MDGS	....	..	94	GS	5	0	b	.0	.0
1002	1982 MAY 16	22:08:45.30	36.609	-106.707	5.00	1.00MDGS	....	..	92	GS	5	0	b	.0	.0
1003	1982 MAY 16	22:36:57.87	36.615	-106.736	5.00	.80MDGS	....	..	94	GS	4	0	b	.0	.0
1004	1982 MAY 16	23:30:29.04	36.658	-106.743	5.00	1.20MDGS	....	..	98	GS	4	0	d	.0	.0
1005	1982 MAY 16	23:34:15.69	36.660	-106.630	5.00	1.50MDGS	....	..	96	GS	6	0	b	.0	.0
1006	1982 MAY 16	23:47:57.08	36.739	-106.794	5.00	1.90MDGS	....	..	108	GS	6	0	d	.0	.0
1007	1982 MAY 17	00:07:48.59	36.647	-106.741	5.00	1.50MDGS	....	..	97	GS	6	0	d	.0	.0
1008	1982 MAY 17	00:32:12.01	36.645	-106.688	5.00	1.40MDGS	....	..	95	GS	5	0	c	.0	.0
1009	1982 MAY 17	00:33:28.21	36.569	-106.637	5.00	1.30MDGS	....	..	86	GS	6	0	c	.0	.0
1010	1982 MAY 17	00:49:34.52	36.639	-106.714	5.00	1.20MDGS	....	..	96	GS	4	0	c	.0	.0
1011	1982 MAY 17	01:04:52.68	36.656	-106.698	5.00	1.30MDGS	....	..	97	GS	5	0	c	.0	.0
1012	1982 MAY 17	01:20:13.43	36.658	-106.719	5.00	.80MDGS	....	..	98	GS	4	0	d	.0	.0
1013	1982 MAY 17	01:54:11.69	36.644	-106.698	5.00	1.60MDGS	....	..	96	GS	7	0	c	.0	.0
1014	1982 MAY 17	02:11:46.49	36.646	-106.568	5.00	1.20MDGS	....	..	93	GS	5	0	b	.0	.0
1015	1982 MAY 17	02:13:15.30	36.665	-106.770	5.00	.50MDGS	....	..	100	GS	4	0	d	.0	.0
1016	1982 MAY 17	02:28:21.57	36.572	-106.720	5.00	.80MDGS	....	..	89	GS	5	0	b	.0	.0
1017	1982 MAY 17	02:37:06.32	36.652	-106.717	5.00	2.00MDGS	....	..	97	GS	6	0	b	.0	.0
1018	1982 MAY 17	02:46:05.03	36.680	-106.771	.00	2.60MLLAEQS	....	..	102	DG	...	...	.	.....	.....
1019	1982 MAY 17	05:29:40.69	36.611	-106.687	5.00	.70MDGS	....	..	92	GS	5	0	b	.0	.0
1020	1982 MAY 17	10:36:41.65	36.628	-106.653	5.00	1.40MDGS	....	..	93	GS	6	0	b	.0	.0
1021	1982 MAY 17	11:36:43.61	36.628	-106.689	5.00	.90MDGS	....	..	94	GS	5	0	c	.0	.0
1022	1982 MAY 18	19:35:36.22	36.634	-106.702	5.00	1.30MDGS	....	..	95	GS	5	0	b	.0	.0
1023	1982 MAY 19	06:59:16.92	36.630	-106.650	5.00	1.70MDGS	....	..	93	GS	5	0	b	.0	.0
1024	1982 MAY 19	07:03:09.72	36.669	-106.714	5.00	1.40MDGS	....	..	99	GS	6	0	c	.0	.0
1025	1982 MAY 19	09:09:57.76	36.577	-106.643	5.00	1.50MDGS	....	..	87	GS	5	0	b	.0	.0
1026	1982 MAY 19	09:31:53.53	36.645	-106.693	5.00	1.10MDGS	....	..	96	GS	4	0	c	.0	.0
1027	1982 MAY 19	13:26:23.41	36.738	-106.852	5.00	1.10MDGS	....	..	110	GS	4	0	d	.0	.0
1028	1982 MAY 20	07:07:51.85	36.664	-106.737	2.30	1.10MDGS	....	..	99	GS	4	0	d	.0	.0
1029	1982 MAY 20	07:09:33.78	36.657	-106.731	5.00	1.10MDGS	....	..	98	GS	4	0	c	.0	.0
1030	1982 MAY 20	17:02:49.84	36.671	-106.718	5.00	1.40MDGS	....	..	99	GS	6	0	d	.0	.0
1031	1982 MAY 21	05:51:11.64	36.632	-106.643	5.00	1.20MDGS	....	..	93	GS	5	0	a	.0	.0
1032	1982 MAY 21	08:59:28.01	36.653	-106.728	5.00	1.30MDGS	....	..	97	GS	5	0	a	.0	.0
1033	1982 MAY 23	10:02:42.10	36.545	-106.804	5.00	.90MDGS	....	..	89	GS	5	0	a	.0	.0
1034	1982 MAY 24	00:48:33.78	36.671	-106.716	5.00	1.30MDGS	....	..	99	GS	6	0	a	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1035	1982 MAY 24	01:03:49.63	36.666	-106.718	5.00	1.30MDGS	....	..	98	GS	5	0	a	.0	.0
1036	1982 MAY 24	08:43:52.32	36.676	-106.713	5.00	1.50MDGS	....	..	99	GS	8	0	b	.0	.0
1037	1982 MAY 25	05:45:50.24	36.652	-106.708	5.00	1.00MDGS	....	..	97	GS	4	0	c	.0	.0
1038	1982 MAY 25	09:38:17.66	36.644	-106.693	5.00	.90MDGS	....	..	95	GS	4	0	b	.0	.0
1039	1982 MAY 25	18:50:42.69	35.337	-107.188	5.00	.50MDGS	....	..	94	GS	4	0	c	.0	.0
1040	1982 MAY 26	05:59:52.76	36.696	-106.712	5.00	1.50MDGS	....	..	101	GS	8	0	a	.0	.0
1041	1982 MAY 26	06:30:53.79	36.669	-106.551	5.00	1.50MDGS	....	..	95	GS	6	0	b	.0	.0
1042	1982 MAY 26	20:39:44.68	36.515	-106.723	4.58	1.77MDLA	....	..	83	WC	10	125	.	.0	.0
1043	1982 MAY 26	22:37:15.68	36.735	-106.910	5.00	1.90MDGS	....	..	112	GS	7	0	d	.0	.0
1044	1982 MAY 27	03:32:41.78	36.646	-106.728	.06	....	....	..	97	WC	11	172	.	.0	.0
1045	1982 MAY 27	06:23:31.42	36.653	-106.718	5.00	1.30MDGS	....	..	97	GS	8	0	a	.0	.0
1046	1982 MAY 27	06:31:18.64	36.563	-106.949	5.00	1.10MDGS	....	..	98	GS	7	0	d	.0	.0
1047	1982 MAY 27	08:41:47.21	36.738	-106.821	5.00	1.70MDGS	....	..	109	GS	8	0	c	.0	.0
1048	1982 MAY 27	16:26:09.62	36.494	-106.741	10.01	1.23MDLA	....	..	82	WC	8	129	.	.0	.0
1049	1982 MAY 28	02:41:09.72	35.689	-107.036	16.33	....	....	..	64	WC	9	202	.	.0	.0
1050	1982 MAY 29	07:24:50.57	36.655	-106.724	5.00	1.00MDGS	....	..	98	GS	4	0	a	.0	.0
1051	1982 MAY 29	07:28:49.38	36.666	-106.703	5.00	1.30MDGS	....	..	98	GS	4	0	a	.0	.0
1052	1982 MAY 29	09:30:36.23	36.650	-106.702	5.00	1.30MDGS	....	..	96	GS	5	0	a	.0	.0
1053	1982 MAY 30	00:07:44.00	36.239	-106.622	5.00	1.30MDGS	....	..	52	GS	5	0	b	.0	.0
1054	1982 MAY 30	03:27:52.81	36.671	-106.718	5.00	1.20MDGS	....	..	99	GS	9	0	a	.0	.0
1055	1982 MAY 31	09:37:08.50	35.100	-106.800	6.00	2.00ML GS	....	IV	91	SA	...	...	B	.....	.....
1056	1982 JUN 02	09:19:03.04	36.685	-106.671	5.00	1.80MDGS	....	..	99	GS	9	0	a	.0	.0
1057	1982 JUN 12	10:46:52.93	36.682	-106.739	5.00	1.20MDGS	....	..	101	GS	5	0	d	.0	.0
1058	1982 JUN 12	10:59:16.11	36.650	-106.714	5.00	2.00MDGS	....	..	97	GS	13	0	a	.0	.0
1059	1982 JUN 26	13:32:40.52	35.611	-106.798	9.05	.71MDLA	....	..	47	WC	9	270	.	.0	.0
1060	1982 JUN 29	08:42:17.03	36.707	-106.751	5.00	1.00MDGS	....	..	104	GS	5	0	b	.0	.0
1061	1982 JUN 29	11:43:25.80	36.675	-106.736	5.00	1.80MDGS	....	..	100	GS	12	0	a	.0	.0
1062	1982 JUN 29	11:51:02.71	36.742	-106.752	5.00	.80MDGS	....	..	107	GS	3	0	d	.0	.0
1063	1982 JUN 29	11:51:58.83	36.016	-106.279	5.00	.30MDGS	....	..	22	GS	3	0	d	.0	.0
1064	1982 JUN 29	11:54:48.61	36.500	-106.607	5.00	1.20MDGS	....	..	78	GS	4	0	d	.0	.0
1065	1982 JUN 29	11:57:23.91	36.657	-106.711	7.08	1.53MDLA	....	..	97	WC	10	124	.	.0	.0
1066	1982 JUN 29	12:25:54.38	36.698	-106.734	5.00	1.20MDGS	....	..	102	GS	4	0	d	.0	.0
1067	1982 JUN 29	13:33:43.00	36.737	-106.838	5.00	1.50MDGS	....	..	110	GS	7	0	c	.0	.0
1068	1982 JUN 30	05:30:51.67	36.646	-106.669	5.00	1.40MDGS	....	..	95	GS	11	0	a	.0	.0
1069	1982 JUL 02	01:19:38.04	36.663	-106.723	5.00	.80MDGS	....	..	98	GS	6	0	b	.0	.0
1070	1982 JUL 02	06:02:43.43	36.745	-106.755	5.00	1.20MDGS	....	..	108	GS	3	0	d	.0	.0
1071	1982 JUL 04	03:19:33.11	36.649	-106.655	5.00	2.00MDGS	....	..	95	GS	7	0	b	.0	.0
1072	1982 JUL 04	22:13:01.66	36.213	-105.859	4.60	1.30MDGS	....	..	61	GS	3	0	d	.0	.0
1073	1982 JUL 06	21:05:59.72	35.183	-107.201	5.00	1.30MDGS	....	..	105	GS	3	0	c	.0	.0
1074	1982 JUL 08	03:28:30.26	36.685	-106.767	5.00	1.10MDGS	....	..	102	GS	5	0	b	.0	.0
1075	1982 JUL 08	04:03:43.42	36.607	-106.661	5.00	1.60MDGS	....	..	91	GS	8	0	d	.0	.0
1076	1982 JUL 12	16:37:07.91	35.575	-107.120	8.27	2.61MDLA	....	..	75	WC	8	157	.	.0	.0
1077	1982 JUL 17	06:05:51.19	36.249	-106.623	5.00	1.10MDGS	....	..	53	GS	4	0	d	.0	.0
1078	1982 JUL 22	11:23:29.11	35.695	-106.941	.23	1.22MDLA	....	..	56	WC	14	146	.	.0	.0
1079	1982 JUL 22	12:46:23.99	35.695	-106.949	3.35	1.70MDLA	....	..	56	WC	24	146	.	.0	.0
1080	1982 JUL 22	13:16:52.59	35.778	-106.905	5.00	1.10MDGS	....	..	50	GS	4	0	d	.0	.0
1081	1982 JUL 22	20:51:01.22	35.457	-107.082	1.14	1.74MDLA	....	..	78	WC	6	205	.	.0	.0
1082	1982 JUL 23	21:37:00.75	35.721	-106.850	5.00	.60MDGS	....	..	47	GS	4	0	d	.0	.0
1083	1982 AUG 07	04:48:01.08	36.703	-106.688	12.23	2.93MDLA	....	..	102	WC	5	133	.	.0	.0
1084	1982 AUG 07	04:55:04.52	36.645	-106.726	5.00	1.40MDGS	....	..	97	GS	4	0	b	.0	.0
1085	1982 AUG 07	07:01:14.33	36.596	-106.646	5.00	2.00MDGS	....	..	89	GS	4	0	c	.0	.0
1086	1982 AUG 08	17:08:40.33	36.729	-106.672	8.90	2.52MDLA	....	..	104	WC	5	139	.	.0	.0
1087	1982 AUG 09	02:22:25.13	36.687	-106.689	7.87	1.83MDLA	....	..	100	WC	7	130	.	.0	.0
1088	1982 AUG 10	08:11:03.56	36.677	-106.697	.75	1.50MDLA	....	..	99	WC	6	128	.	.0	.0
1089	1982 AUG 11	10:03:39.79	36.659	-106.722	5.00	2.20MDGS	....	..	98	GS	11	0	a	.0	.0
1090	1982 AUG 14	18:56:08.89	35.038	-106.951	5.00	1.70MDGS	....	..	103	GS	11	0	a	.0	.0
1091	1982 AUG 18	23:01:37.57	35.792	-106.943	5.00	1.60MDGS	....	..	54	GS	3	0	d	.0	.0
1092	1982 AUG 19	01:52:41.12	36.463	-106.649	1.38	1.86MDLA	....	..	75	LA	18	96	D	1.5	4.7
1093	1982 AUG 19	05:18:31.40	36.052	-106.789	5.00	1.30MDGS	....	..	47	GS	6	0	b	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
1094	1982 SEP 03	03:27:07.64	35.986	-106.103	5.00	1.20MDGS	....	..	28	GS	9	0	d	.0	.0
1095	1982 SEP 07	07:02:24.05	36.723	-106.661	5.00	1.60MDGS	....	..	103	GS	4	0	c	.0	.0
1096	1982 SEP 25	21:00:00.90	36.647	-106.688	.00	2.60MLLAEQS	....	..	96	DG	...	...	.	.....	.....
1097	1982 OCT 06	23:15:01.60	35.157	-106.344	5.00	1.30	....	..	75	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED;NO STATION WITHIN 10 KM OF EVENT													
1098	1982 OCT 25	06:10:03.90	36.304	-106.223	5.00	1.00	....	..	54	NM	...	...	.	.....	.....
1099	1982 OCT 29	22:35:00.70	36.288	-106.650	5.00	.50	....	..	58	NM	...	...	.	.....	.....
1100	1982 NOV 02	23:54:05.70	35.021	-106.255	5.00	1.20	....	..	90	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1101	1982 NOV 06	14:03:17.10	36.627	-106.668	5.00	1.10	....	..	93	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1102	1982 NOV 08	15:37:17.40	36.656	-106.714	5.00	1.20	....	..	97	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1103	1982 NOV 09	02:00:33.50	36.641	-106.686	5.00	1.20	....	..	95	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1104	1982 NOV 13	09:21:02.50	36.652	-106.688	5.00	1.50	....	..	96	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1105	1982 NOV 13	09:24:06.20	36.706	-106.732	5.00	1.60	....	..	103	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1106	1982 NOV 13	09:42:47.60	36.689	-106.714	4.00	2.70	....	..	101	NM	...	...	.	.....	.....
1107	1982 NOV 13	09:57:55.60	36.148	-106.722	5.00	2.10	....	..	49	NM	...	...	.	.....	.....
		DEPTH CONST2AINED; NO STATIONS WITHIN 10 KM OF EVENT													
1108	1982 NOV 22	02:53:45.00	36.612	-106.634	5.00	1.00	....	..	90	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1109	1982 NOV 22	03:01:38.20	36.705	-106.950	5.00	.80	....	..	111	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1110	1982 DEC 02	07:48:46.70	35.685	-107.083	5.00	.40	....	..	68	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1111	1982 DEC 15	14:54:59.58	36.026	-106.852	8.13	.93MDLA	....	..	50	WC	10	191	.	.0	.0
1112	1982 DEC 16	04:08:03.68	35.691	-106.918	.51	.82MDLA	....	..	54	WC	16	148	.	.0	.0
1113	1982 DEC 18	01:21:43.22	35.488	-105.396	5.81	1.72MDLA	....	..	94	LA	8	309	D	5.9	6.3
1114	1982 DEC 22	23:00:57.00	35.411	-105.280	5.00	1.00	....	..	108	NM	...	...	.	.....	.....
		DEPTH CONSTRAINED; NO STATIONS WITHIN 10 KM OF EVENT													
1115	1982 DEC 24	19:08:45.28	35.214	-106.936	9.26	1.79MDLA	....	..	87	WC	11	216	.	.0	.0
1116	1982 DEC 30	02:24:12.99	36.506	-106.651	4.89	1.54MDLA	....	..	80	WC	7	217	.	.0	.0
1117	1983 JAN 01	15:15:19.10	35.772	-106.895	.00	.20	....	..	50	NM	...	...	C	.....	.....
1118	1983 JAN 06	00:44:53.90	36.746	-105.792	.00	1.60	....	..	113	NM	...	...	D	.....	.....
1119	1983 JAN 08	01:30:12.90	36.630	-106.696	.00	1.10	....	..	94	NM	...	...	B	.....	.....
1120	1983 JAN 12	14:50:39.70	35.061	-106.737	.00	1.70	....	..	92	NM	...	...	A	.....	.....
1121	1983 JAN 14	13:41:37.00	36.650	-106.797	.00	.80	....	..	99	NM	...	...	D	.....	.....
1122	1983 JAN 14	15:35:58.80	36.592	-106.653	.00	.60	....	..	89	NM	...	...	C	.....	.....
1123	1983 JAN 15	15:38:58.60	36.732	-106.750	.00	.80	....	..	106	NM	...	...	D	.....	.....
1124	1983 JAN 23	22:39:07.70	35.273	-107.128	.00	.40	....	..	94	NM	...	...	D	.....	.....
1125	1983 JAN 25	05:14:11.20	35.932	-106.773	.00	.50	....	..	40	NM	...	...	B	.....	.....
1126	1983 JAN 29	05:17:34.00	36.732	-106.747	.00	1.50	....	..	106	NM	...	...	C	.....	.....
1127	1983 FEB 01	03:54:51.90	36.590	-106.608	.00	1.40	....	..	87	NM	...	...	D	.....	.....
1128	1983 FEB 04	15:50:29.00	36.168	-107.174	.00	1.20	....	..	83	NM	...	...	D	.....	.....
1129	1983 FEB 04	18:14:38.80	35.916	-106.167	7.21	1.52MDLA	....	..	19	WC	8	219	.	.0	.0
1130	1983 FEB 11	04:19:20.18	35.930	-106.764	4.41	.49MDLA	....	..	39	WC	11	147	.	.0	.0
1131	1983 FEB 15	19:57:55.10	35.659	-105.768	.00	.30	....	..	56	NM	...	...	D	.....	.....
1132	1983 FEB 19	17:06:34.70	36.618	-106.683	.00	.80	....	..	92	NM	...	...	C	.....	.....
1133	1983 FEB 19	17:15:06.20	36.695	-106.724	.00	1.10	....	..	102	NM	...	...	D	.....	.....
1134	1983 FEB 24	21:23:56.30	35.112	-106.700	.00	1.60	....	..	86	NM	...	...	C	.....	.....
1135	1983 FEB 28	04:52:20.25	36.090	-106.227	.00	1.14MDLA	....	..	31	WC	8	134	.	.0	.0
1136	1983 MAR 02	20:41:22.90	35.127	-106.704	.00	1.40	....	..	84	NM	...	...	C	.....	.....
1137	1983 MAR 11	02:04:15.80	36.693	-106.741	.00	1.60	....	..	102	NM	...	...	C	.....	.....
1138	1983 MAR 15	04:28:43.86	36.077	-106.225	3.38	.99MDLA	....	..	30	WC	13	181	.	.0	.0
1139	1983 APR 05	17:40:34.61	36.076	-106.227	10.00	.65MDLA	....	..	29	LA	19	117	C	.4	122.6
1140	1983 APR 06	10:39:44.74	36.078	-106.225	2.45	1.10MDLA	....	..	30	WC	15	117	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1141	1983 APR 16	08:17:59.50	36.171	-106.128	.00	.50	....	..	43	NM	...	...	D	.....	.....
1142	1983 APR 17	04:04:51.70	35.419	-107.238	.00	.90	....	..	92	NM	...	...	B	.....	.....
1143	1983 APR 25	08:05:18.80	36.723	-106.132	.00	1.00	....	..	101	NM	...	...	B	.....	.....
1144	1983 MAY 20	15:51:03.39	35.520	-107.016	1.72	1.03MDLA	....	..	69	LA	5	324	D	8.4	121.2
1145	1983 MAY 26	17:17:50.60	36.625	-105.318	.00	2.50	....	..	128	NM	...	...	D	.....	.....
1146	1983 MAY 27	20:05:34.74	35.593	-106.918	.07	.54MDLA	....	..	58	LA	6	298	D	4.8	120.2
1147	1983 JUN 11	18:01:57.70	35.684	-105.534	.00	.90	....	..	76	NM	...	...	D	.....	.....
1148	1983 JUN 24	06:28:50.28	36.463	-106.670	10.49	....	....	..	76	WC	13	214	.	.0	.0
1149	1983 JUN 27	01:51:05.36	36.196	-106.875	.97	.51MDLA	....	..	62	WC	11	267	.	.0	.0
1150	1983 JUL 02	00:07:56.70	35.074	-106.170	.00	1.10	....	..	85	NM	...	...	C	.....	.....
1151	1983 JUL 08	09:49:14.43	35.919	-106.872	11.56	.35MDLA	....	..	48	WC	12	110	.	.0	.0
1152	1983 JUL 12	16:37:08.20	35.576	-107.110	5.00	2.50MD LA	....	..	74	SA	...	...	A	.....	.....
1153	1983 JUL 19	17:12:43.15	36.175	-106.848	5.62	.75MDLA	....	..	59	WC	9	262	.	.0	.0
1154	1983 JUL 20	10:11:53.36	36.347	-105.810	1.24	1.62MDLA	....	..	75	WC	15	196	.	.0	.0
1155	1983 JUL 24	10:14:16.70	36.639	-106.901	.00	1.00	....	..	103	NM	...	...	A	.....	.....
1156	1983 AUG 01	07:19:40.73	36.285	-105.824	7.87	1.11MDLA	....	..	69	LA	6	267	C	2.0	1.3
1157	1983 AUG 03	09:17:29.81	36.088	-106.903	8.15	1.49MDLA	....	..	58	WC	17	222	.	.0	.0
1158	1983 AUG 03	10:05:39.50	35.595	-107.241	.00	.50	....	..	85	NM	...	...	D	.....	.....
1159	1983 AUG 07	04:48:01.90	36.653	-106.699	5.00	2.70MD LA	....	..	97	SA	...	...	A	.....	.....
1160	1983 AUG 09	00:36:08.30	35.087	-106.014	.00	1.00	....	..	88	NM	...	...	C	.....	.....
1161	1983 AUG 11	15:09:22.29	36.343	-105.779	12.13	1.75MDLA	....	..	77	WC	12	200	.	.0	.0
1162	1983 AUG 14	14:45:02.45	35.813	-106.471	.12	1.79MDLA	....	..	11	WC	8	138	.	.0	.0
1163	1983 AUG 23	00:24:44.30	35.746	-105.991	.00	.80	....	..	34	NM	...	...	B	.....	.....
1164	1983 SEP 16	12:05:04.30	36.254	-106.193	.00	.90	....	..	49	NM	...	...	A	.....	.....
1165	1983 SEP 19	05:07:56.61	35.748	-106.098	5.26	1.08MDLA	....	..	25	WC	6	191	.	.0	.0
1166	1983 SEP 23	22:57:24.50	35.315	-106.516	.00	.90	....	..	59	NM	...	...	D	.....	.....
1167	1983 OCT 09	22:47:05.38	36.093	-106.536	1.85	1.73MDLA	....	..	34	WC	9	118	.	.0	.0
1168	1983 OCT 17	23:56:53.50	36.645	-105.505	.00	1.60	....	..	118	NM	...	...	C	.....	.....
1169	1983 OCT 23	17:51:33.80	36.269	-105.779	.00	.60	....	..	71	NM	...	...	D	.....	.....
1170	1983 OCT 23	18:36:35.50	36.267	-106.207	.00	.60	....	..	50	NM	...	...	A	.....	.....
1171	1983 OCT 29	03:57:07.34	35.159	-106.536	2.54	1.40 NM	....	..	76	WC	12	232	.	.0	.0
1172	1983 NOV 08	07:53:52.57	36.307	-105.798	10.00	1.46MDLA	....	..	73	LA	9	276	D	2.7	2.0
1173	1983 NOV 10	18:24:47.50	36.305	-105.812	.00	.70	....	..	72	NM	...	...	B	.....	.....
1174	1983 NOV 16	10:15:25.01	35.079	-105.998	10.00	1.50MDLA	....	..	89	LA	6	301	D	3.0	57.8
1175	1983 NOV 28	17:31:12.61	36.512	-105.967	13.95	1.67MDLA	....	..	83	WC	9	175	.	.0	.0
1176	1983 DEC 02	22:10:00.33	35.257	-106.656	.48	.88MDLA	....	..	69	WC	5	286	.	.0	.0
1177	1983 DEC 02	22:44:08.57	35.312	-106.467	11.59	1.68MDLA	....	..	58	WC	6	217	.	.0	.0
1178	1983 DEC 28	04:56:15.30	36.317	-105.781	.00	.70	....	..	74	NM	...	...	B	.....	.....
1179	1984 JAN 28	20:45:45.41	35.498	-106.233	8.89	2.14MDLA	....	..	38	WC	6	240	.	.0	.0
1180	1984 JAN 29	04:28:12.10	35.000	-106.750	.00	.80	....	..	99	NM	...	...	B	.....	.....
1181	1984 FEB 04	11:10:20.50	36.415	-105.310	.00	1.10	....	..	114	NM	...	...	B	.....	.....
1182	1984 FEB 05	09:05:24.37	36.006	-106.736	9.68	1.48MDLA	....	..	40	WC	12	204	.	.0	.0
1183	1984 FEB 16	18:50:48.80	35.085	-106.690	.00	1.40	....	..	88	NM	...	...	B	.....	.....
1184	1984 MAR 15	12:50:06.70	36.121	-106.215	.00	.90	....	..	35	NM	...	...	D	.....	.....
1185	1984 MAR 24	21:12:10.60	36.174	-106.726	.00	.80	....	..	51	NM	...	...	D	.....	.....
1186	1984 APR 18	19:44:03.88	35.964	-106.273	8.93	1.80 NM	....	..	16	WC	7	155	.	.0	.0
1187	1984 APR 20	14:12:01.70	35.870	-106.768	.00	.60	....	..	38	NM	...	...	B	.....	.....
1188	1984 APR 20	14:17:43.60	35.849	-106.743	.00	.90	....	..	36	NM	...	...	B	.....	.....
1189	1984 APR 24	07:03:15.70	35.926	-106.254	.00	1.80	....	..	14	NM	...	...	A	.....	.....
1190	1984 MAY 06	04:47:59.40	35.072	-106.698	.00	.80	....	..	90	NM	...	...	B	.....	.....
1191	1984 MAY 26	19:33:03.10	36.495	-106.495	.00	1.90	....	..	75	NM	...	...	A	.....	.....
1192	1984 JUN 04	02:54:18.70	36.684	-106.453	.00	1.90	....	..	95	NM	...	...	B	.....	.....
1193	1984 JUN 08	04:55:15.10	35.508	-106.114	.00	.20	....	..	42	NM	...	...	B	.....	.....
1194	1984 JUN 10	05:17:57.50	36.136	-106.786	.00	1.00	....	..	52	NM	...	...	C	.....	.....
1195	1984 JUN 30	12:02:52.80	36.545	-106.219	5.64	1.75MDLA	....	..	80	WC	11	134	.	.0	.0
1196	1984 JUL 07	20:58:05.70	36.330	-106.585	.00	.50	....	..	59	NM	...	...	C	.....	.....
1197	1984 JUL 09	19:12:32.70	35.442	-105.543	.00	1.00	....	..	85	NM	...	...	B	.....	.....
1198	1984 JUL 11	07:45:15.58	36.305	-106.232	10.00	.43MDLA	....	..	54	LA	8	215	D	1.9	332.3
1199	1984 JUL 15	07:10:46.30	36.662	-106.618	.00	1.30	....	..	95	NM	...	...	B	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1200	1984 JUL 15	07:35:11.50	36.684	-106.653	.00	1.40	....	..	99	NM	...	...	B	.....	.....
1201	1984 JUL 18	18:16:20.90	36.201	-106.852	.00	.50	....	..	61	NM	...	...	B	.....	.....
1202	1984 JUL 19	16:50:20.52	36.058	-106.159	3.39	.83MDLA	....	..	31	WC	6	136	.	.0	.0
1203	1984 JUL 20	22:27:38.39	35.436	-105.527	10.00	1.12MDLA	....	..	86	LA	8	311	D	3.5	316.3
1204	1984 JUL 27	19:02:22.35	36.208	-106.940	10.00	1.04MDLA	....	..	68	LA	5	287	D	1.4	39.8
1205	1984 AUG 08	23:22:58.60	35.165	-106.129	.00	1.50	....	..	76	NM	...	...	D	.....	.....
1206	1984 AUG 12	00:43:03.10	35.342	-105.430	.00	.70	....	..	99	NM	...	...	D	.....	.....
1207	1984 AUG 12	09:56:35.50	36.293	-106.074	.00	.30	....	..	57	NM	...	...	C	.....	.....
1208	1984 AUG 19	11:32:34.23	35.619	-106.868	7.94	1.11MDLA	....	..	52	WC	9	171	.	.0	.0
1209	1984 SEP 22	05:36:45.00	36.256	-106.138	.00	.90	....	..	51	NM	...	...	B	.....	.....
1210	1984 SEP 24	01:33:29.00	36.642	-106.631	.00	1.40	....	..	94	NM	...	...	B	.....	.....
1211	1984 SEP 27	04:05:27.23	36.168	-106.882	3.26	1.82MDLA	....	..	61	WC	8	236	.	.0	.0
1212	1984 OCT 13	21:24:29.90	35.757	-106.029	.00	1.30	....	..	30	NM	...	...	C	.....	.....
1213	1984 OCT 29	23:40:24.80	35.662	-106.464	.00	1.00	....	..	21	NM	...	...	D	.....	.....
1214	1984 NOV 07	03:21:45.81	36.144	-106.268	11.22	.09MDLA	....	..	36	WC	6	170	.	.0	.0
1215	1984 NOV 13	08:20:02.90	36.558	-106.719	.00	.70	....	..	87	NM	...	...	D	.....	.....
1216	1984 NOV 18	14:14:13.11	35.793	-106.413	3.12	.90 NM	....	..	7	WC	9	240	.	.0	.0
1217	1984 NOV 20	00:48:23.97	35.783	-106.415	1.27	1.10MDLA	....	..	8	WC	7	242	.	.0	.0
1218	1984 NOV 20	01:21:42.46	35.792	-106.417	3.41	.69MDLA	....	..	7	WC	12	240	.	.0	.0
1219	1984 NOV 22	23:12:42.60	36.601	-106.654	.00	1.10	....	..	90	NM	...	...	C	.....	.....
1220	1984 DEC 10	09:07:58.40	35.769	-106.421	.00	.80	....	..	9	NM	...	...	B	.....	.....
1221	1984 DEC 25	14:29:36.90	36.571	-106.567	.00	1.00	....	..	85	NM	...	...	D	.....	.....
1222	1985 JAN 01	19:33:50.15	36.031	-106.913	1.30	.50MDGS	....	..	56	GS	3	0	c	.0	.0
1223	1985 JAN 01	19:41:19.89	36.040	-106.909	1.20	.40MDGS	....	..	56	GS	3	0	c	.0	.0
1224	1985 JAN 01	19:46:01.32	36.016	-106.857	.00	.50MDGS	....	..	50	GS	3	0	c	.0	.0
1225	1985 JAN 01	20:18:11.36	36.052	-106.987	1.40	.40MDGS	....	..	63	GS	3	0	d	.0	.0
1226	1985 JAN 02	12:43:19.94	35.795	-106.935	6.46	1.22MDLA	....	..	53	LA	7	154	C	1.7	3.1
1227	1985 JAN 03	13:38:03.50	35.827	-106.955	5.00	.90MDGS	....	..	55	GS	3	0	b	.0	.0
1228	1985 JAN 03	16:31:24.70	35.809	-106.960	7.67	1.34MDLA	....	..	55	WC	6	162	.	.0	.0
1229	1985 JAN 06	21:02:30.93	35.842	-106.741	7.48	2.51MDLA	....	..	35	WC	5	125	.	.0	.0
1230	1985 JAN 26	11:50:56.90	36.057	-105.942	5.00	.40MDGS	....	..	45	GS	3	0	c	.0	.0
1231	1985 JAN 27	09:08:21.01	35.405	-106.229	5.00	.20MDGS	....	..	48	GS	3	0	d	.0	.0
1232	1985 JAN 27	19:39:12.82	36.438	-106.826	10.11	1.07MDLA	....	..	80	WC	6	208	.	.0	.0
1233	1985 FEB 01	17:06:43.52	35.584	-107.121	5.03	1.34MDLA	....	..	75	WC	8	158	.	.0	.0
1234	1985 FEB 16	05:13:48.08	36.104	-106.975	5.00	1.00MDGS	....	..	64	GS	3	0	d	.0	.0
1235	1985 FEB 17	00:37:32.69	36.252	-107.020	5.00	1.50MDGS	....	..	76	GS	5	0	b	.0	.0
1236	1985 MAR 13	01:23:10.75	36.345	-105.821	5.00	.40MDGS	....	..	74	GS	4	0	d	.0	.0
1237	1985 APR 07	19:01:46.87	36.122	-106.820	13.63	....	....	..	53	WC	11	184	.	.0	.0
1238	1985 APR 17	17:36:58.38	36.323	-106.850	5.00	.30MDGS	....	..	71	GS	5	0	c	.0	.0
1239	1985 APR 25	16:53:43.39	35.499	-106.844	8.12	.83MDLA	....	..	58	WC	9	192	.	.0	.0
1240	1985 MAY 01	18:46:47.10	36.017	-106.410	4.05	.93MDLA	....	..	21	WC	9	147	.	.0	.0
1241	1985 MAY 14	21:49:28.37	35.792	-106.008	5.00	.70MDGS	....	..	31	GS	3	0	b	.0	.0
1242	1985 MAY 15	23:11:51.56	35.329	-105.979	7.62	.57MDLA	....	..	65	WC	7	254	.	.0	.0
1243	1985 MAY 30	18:46:30.81	35.644	-106.556	25.86	1.46MDLA	....	..	28	WC	8	189	.	.0	.0
1244	1985 JUN 19	21:05:09.85	36.267	-106.235	14.31	1.74MDLA	....	..	50	WC	8	184	.	.0	.0
1245	1985 JUN 25	00:39:00.95	35.028	-106.141	5.00	1.40MDGS	....	..	91	GS	4	0	c	.0	.0
1246	1985 JUN 29	10:45:45.12	36.251	-106.022	5.00	1.00MDGS	....	..	55	GS	3	0	c	.0	.0
1247	1985 JUN 29	12:16:05.75	36.451	-105.779	5.00	.70MDGS	....	..	86	GS	3	0	b	.0	.0
1248	1985 JUL 01	05:27:19.77	36.564	-106.242	4.46	....	....	..	82	WC	7	170	.	.0	.0
1249	1985 JUL 13	16:15:30.70	36.250	-106.436	5.63	.90MDLA	....	..	47	WC	12	154	.	.0	.0
1250	1985 JUL 16	06:18:06.00	35.051	-106.555	5.00	1.60MDGLD	....	..	88	PE	1	...	.	.....	.....
1251	1985 JUL 17	06:23:18.95	35.164	-106.542	5.00	1.90MDGLD	....	..	76	PE	1	...	.	.....	.....
1252	1985 JUL 18	20:59:09.65	35.134	-106.481	5.00	.80MDGS	....	..	78	GS	10	0	b	.0	.0
1253	1985 JUL 18	21:08:59.12	35.132	-106.481	5.00	1.40MDGS	....	..	78	GS	13	0	b	.0	.0
1254	1985 JUL 30	16:02:16.73	36.444	-107.029	5.00	2.10MDGS	....	..	91	GS	3	0	c	.0	.0
1255	1986 FEB 01	01:22:27.42	35.471	-106.243	.33	.38MDGS	....	..	41	GS	4	310	.	3.3	99.9
1256	1986 FEB 04	22:30:01.34	35.080	-106.673	.43	.30MDGS	....	..	88	GS	6	344	.	.3	41.3
1257	1986 FEB 11	06:10:40.14	35.676	-106.790	36.05	.43MDGS	....	..	43	GS	6	342	.	7.2	4.2
1258	1986 MAR 05	08:55:24.52	35.472	-106.373	42.45	.43MDGS	....	..	40	GS	6	336	.	13.6	6.3

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1259	1986 MAR 12	18:15:01.78	36.392	-106.604	10.00	.46MDLA	....	..	66	LA	6	298	D	4.6	480.4
1260	1986 MAR 18	18:03:54.53	36.410	-106.683	10.00	.86MDLA	....	..	71	LA	8	303	D	2.7	318.9
1261	1986 APR 02	16:58:13.97	36.074	-106.400	1.39	.72MDLA	....	..	27	WC	9	247	.	.0	.0
1262	1986 APR 28	23:28:30.52	35.483	-106.781	10.00	2.20MDLA	....	..	55	LA	9	346	D	2.6	116.2
1263	1986 MAY 17	15:25:00.03	35.729	-106.147	.00	.92MDLA	....	..	22	WC	5	242	.	.0	.0
1264	1986 JUN 04	05:43:15.99	36.014	-105.491	10.00	1.89MDLA	....	..	80	LA	7	279	D	6.1	349.8
1265	1986 JUN 07	11:09:09.38	36.350	-105.786	10.97	.58MDLA	....	..	77	WC	7	259	.	.0	.0
1266	1986 JUN 26	23:00:45.71	36.638	-106.357	.43	.35MDGS	....	..	90	GS	4	308	.	.2	18.8
1267	1986 JUL 04	05:49:25.72	36.134	-106.167	10.00	.46MDLA	....	..	38	WC	8	207	.	.0	.0
1268	1986 JUL 08	05:38:23.40	36.395	-106.696	10.00	.57MDLA	....	..	70	LA	9	303	D	2.0	233.2
1269	1986 JUL 10	17:52:54.43	36.327	-106.490	10.00	.65MDLA	....	..	57	LA	5	285	D	3.2	267.4
1270	1986 JUL 16	17:35:09.61	36.329	-105.786	9.28	1.30MDLA	....	..	75	WC	8	243	.	.0	.0
1271	1986 JUL 16	17:47:04.28	35.948	-106.408	2.91	.18MDLA	....	..	14	LA	4	296	C	.0	.0
1272	1986 SEP 18	04:20:04.85	36.582	-106.668	27.93	.44MDGS	....	..	88	GS	7	309	.	2.3	6.9
1273	1986 OCT 08	03:44:56.38	35.218	-106.259	60.36	.72MDGS	....	..	68	GS	7	337	.	15.4	11.2
1274	1986 DEC 17	17:57:00.59	35.032	-106.850	10.00	1.33MDLA	....	..	99	LA	12	354	D	10.3	281.2
1275	1987 JAN 03	16:44:42.41	36.019	-106.321	10.00	1.03MDGS	....	..	21	GS	10	329	.	2.8	2.3
1276	1987 JAN 28	13:11:49.18	36.039	-106.276	9.47	.13MDLA	....	..	24	WC	8	208	.	.0	.0
1277	1987 FEB 25	17:22:49.76	36.742	-106.413	.99	1.00MDGS	....	..	101	GS	5	311	.	.1	7.3
1278	1987 FEB 28	19:36:49.25	35.326	-107.168	30.46	.38MDGS	....	..	93	GS	7	350	.	6.6	6.3
1279	1987 MAR 11	06:08:43.40	35.942	-106.263	8.99	-.15MDLA	....	..	15	WC	6	194	.	.0	.0
1280	1987 MAR 28	17:16:09.81	35.275	-106.797	10.00	1.66MDLA	....	..	74	LA	6	348	D	7.9	198.5
1281	1987 APR 04	14:15:08.54	36.460	-105.958	.88	1.44MDLA	....	..	78	LA	5	322	D	82.8	999.9
1282	1987 APR 18	07:50:12.33	36.343	-105.798	12.24	1.37MDLA	....	..	76	WC	7	254	.	.0	.0
1283	1987 APR 23	19:45:16.92	36.314	-106.509	11.18	.18MDGS	....	..	56	GS	5	285	.	.8	2.6
1284	1987 APR 25	08:17:45.36	35.217	-105.700	10.00	1.17MDLA	....	..	90	LA	12	313	D	1.8	186.9
1285	1987 MAY 29	02:44:12.20	35.759	-106.851	18.11	1.29MDLA	....	..	46	LA	5	357	D	219.5	119.1
1286	1987 JUL 01	17:04:08.67	36.086	-106.112	38.96	.59MDGS	....	..	36	GS	8	176	.	8.2	2.3
1287	1987 JUL 07	05:37:50.49	36.729	-105.396	.75	.22MDGS	....	..	132	GS	4	353	.	21.2	99.9
1288	1987 JUL 08	09:49:11.62	35.700	-106.607	19.64	-.13MDLA	....	..	27	LA	7	334	D	14.7	15.2
1289	1987 JUL 09	01:47:06.60	36.305	-106.663	3.01	.22MDGS	....	..	60	GS	10	296	.	11.0	99.9
1290	1987 JUL 28	04:35:36.50	36.370	-105.912	6.05	.43MDLA	....	..	72	LA	10	323	D	7.4	7.5
1291	1987 SEP 03	17:48:59.17	36.470	-106.443	7.87	.72MDLA	....	..	72	WC	9	217	.	.0	.0
1292	1987 SEP 12	13:34:24.41	36.742	-105.821	12.58	.69MDGS	....	..	112	GS	8	255	.	1.6	4.4
1293	1987 SEP 22	19:29:05.94	36.173	-106.765	9.85	.54MDGS	....	..	53	GS	8	255	.	5.2	28.8
1294	1987 SEP 22	19:29:06.65	35.997	-106.601	36.88	.54MDLA	....	..	29	WC	7	240	.	.0	.0
1295	1987 OCT 11	13:02:51.48	36.589	-106.523	8.72	.69MDLA	....	..	86	WC	9	246	.	.0	.0
1296	1987 OCT 14	07:22:15.31	36.386	-106.795	10.34	.63MDLA	....	..	74	WC	8	261	.	.0	.0
1297	1987 OCT 23	17:49:19.51	35.945	-107.226	2.45	.85MDGS	....	..	80	GS	6	300	.	128.2	99.9
1298	1987 OCT 31	04:33:23.40	36.583	-106.466	9.34	.29MDLA	....	..	84	WC	7	236	.	.0	.0
1299	1987 DEC 09	14:24:02.98	35.779	-105.575	10.00	.65MDLA	....	..	70	LA	5	276	D	5.7	345.9
1300	1987 DEC 19	09:18:14.52	36.283	-106.269	12.41	.22MDLA	....	..	51	WC	6	261	.	.0	.0
1301	1988 JAN 12	23:23:30.90	35.034	-105.771	105.60	1.36MDGS	....	..	103	GS	8	322	.	6.8	6.2
1302	1988 JAN 13	03:51:31.28	35.491	-106.092	42.18	.57MDGS	....	..	44	GS	6	296	.	31.5	24.9
1303	1988 JAN 15	06:10:18.24	36.561	-106.459	10.00	1.19MDLA	....	..	82	LA	10	301	D	2.0	259.7
1304	1988 FEB 24	17:20:50.63	36.347	-105.787	8.48	1.14MDLA	....	..	77	WC	16	177	.	.0	.0
1305	1988 MAR 09	20:11:36.60	35.993	-106.823	8.81	1.98MDLA	....	..	46	LA	9	306	C	2.0	2.5
1306	1988 MAR 21	10:53:17.03	35.591	-107.207	.57	2.00MDGS	....	..	82	GS	16	340	.	.3	20.4
1307	1988 APR 08	18:41:03.71	35.991	-106.865	6.52	1.23MDLA	....	..	50	LA	8	274	C	1.8	2.1
1308	1988 APR 28	23:09:21.88	35.949	-106.676	16.92	1.28MDLA	....	..	32	LA	7	294	D	4.4	7.4
1309	1988 JUN 16	22:38:20.92	35.548	-106.291	220.85	2.93MDLA	....	..	32	GS	7	321	.	3.0	.5
1310	1988 JUN 24	11:47:14.41	36.385	-106.671	14.39	1.30MDGS	....	..	68	GS	7	301	.	7.1	29.4
1311	1988 JUN 24	12:14:19.25	36.385	-106.655	13.70	.86MDGS	....	..	67	GS	6	300	.	3.8	16.5
1312	1988 JUN 24	13:09:38.46	36.388	-106.663	10.11	.98MDGS	....	..	68	GS	6	300	.	3.5	20.0
1313	1988 JUN 24	13:47:05.98	36.361	-106.649	32.52	1.41MDGS	....	..	65	GS	7	298	.	9.6	15.7
1314	1988 JUL 21	12:53:49.20	35.712	-106.050	15.11	.87MDLA	....	..	30	WC	10	269	.	.0	.0
1315	1988 AUG 03	03:59:23.89	36.325	-106.369	35.66	2.09MDLA	....	..	55	LA	10	348	D	9.9	9.4
1316	1988 AUG 12	05:57:20.74	35.667	-106.267	2.10	.25MDGS	....	..	20	GS	6	306	.	6.2	28.5
1317	1988 AUG 16	23:36:41.45	35.075	-105.984	23.39	1.54MDGS	....	..	90	GS	8	324	.	5.8	19.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1318	1988 SEP 01	00:14:39.06	35.104	-105.963	46.55	1.63MDGS	....	..	88	GS	6	333	.	3.2	4.9
1319	1988 SEP 01	05:36:14.67	35.441	-106.312	35.21	1.10MDLA	....	..	43	LA	8	318	D	7.8	3.1
1320	1988 SEP 02	20:25:18.84	35.848	-105.746	5.00	1.72MDGS	....	..	55	GS	3	349	.	55.5	21.6
1321	1988 DEC 07	22:08:45.88	36.122	-106.742	10.21	.83MDLA	....	..	48	WC	8	253	.	.0	.0
1322	1988 DEC 25	07:52:33.93	35.118	-105.957	.00	2.80MDSNM	....	..	87	PE	14	...	.	.....	.....
1323	1989 MAR 01	08:26:59.68	36.133	-106.678	6.95	.13MDLA	....	..	45	WC	8	244	.	.0	.0
1324	1989 MAR 22	04:20:07.29	36.332	-105.769	15.10	.17MDLA	....	..	76	WC	7	177	.	.0	.0
1325	1989 MAR 23	21:49:06.49	35.787	-106.201	10.00	1.05MDLA	....	..	14	LA	5	296	D	26.8	30.0
1326	1989 APR 06	07:18:01.10	35.641	-106.806	13.49	.65MDLA	....	..	46	LA	8	309	C	2.3	4.8
1327	1989 MAY 27	09:58:34.78	36.408	-105.796	13.56	1.25MDLA	....	..	81	LA	10	349	D	5.7	2.1
1328	1989 JUN 22	00:10:36.71	35.897	-106.345	17.25	.77MDLA	....	..	7	LA	5	214	D	5.9	3.5
1329	1989 JUN 23	22:41:11.25	35.786	-106.230	.32	1.16MDLA	....	..	12	LA	4	293	D	.0	.0
1330	1989 JUN 30	21:54:32.32	36.611	-106.277	.61	.77MDGS	....	..	87	GS	4	312	.	.9	29.6
1331	1989 JUL 22	04:58:35.00	36.437	-105.972	1.67	.54MDLA	....	..	75	LA	4	283	D	.0	.0
1332	1989 JUL 26	01:43:10.78	36.153	-106.250	27.31	.21MDLA	....	..	37	WC	6	228	.	.0	.0
1333	1989 SEP 07	05:34:21.83	36.242	-106.975	10.00	.93MDLA	....	..	73	LA	7	313	D	2.8	222.4
1334	1989 SEP 21	23:45:06.87	36.330	-106.475	10.00	.85MDLA	....	..	57	LA	4	350	C	.0	.0
1335	1989 OCT 20	18:39:05.23	35.759	-106.371	10.00	....	....	..	8	GS	6	255	D	109.6	6.8
1336	1989 OCT 26	20:43:51.97	35.865	-106.510	41.90	....	....	..	15	LA	6	349	D	17.7	8.2
1337	1989 OCT 27	22:11:19.98	35.653	-106.842	10.00	....	....	..	49	GS	6	358	D	94.3	266.3
1338	1989 NOV 05	10:11:50.37	36.285	-105.912	10.00	1.38MDGS	....	..	64	GS	7	286	D	225.3	6.6
1339	1990 MAR 08	07:50:33.95	35.766	-106.534	6.02	.47MDLA	....	..	18	LA	6	317	D	3.2	5.4
1340	1990 APR 27	22:31:33.21	35.678	-105.431	10.00	.93MDGS	....	..	85	GS	9	350	D	29.9	194.3
1341	1990 MAY 10	11:45:31.94	35.897	-106.345	10.00	1.26MDGS	....	..	7	GS	7	313	D	28.6	34.9
1342	1990 MAY 13	03:15:31.67	36.375	-106.920	10.00	1.29MDLA	....	..	79	LA	9	352	D	13.7	331.8
1343	1990 JUL 01	16:55:57.85	35.913	-106.196	16.16	.99MDLA	....	..	17	LA	10	293	C	1.4	.7
1344	1990 JUL 01	17:20:17.66	35.913	-106.211	13.63	.95MDLA	....	..	16	LA	9	288	C	1.6	1.4
1345	1990 JUL 05	07:27:18.37	35.926	-106.176	14.88	1.46MDLA	....	..	19	LA	9	302	C	1.1	1.0
1346	1990 JUL 14	21:27:23.25	36.152	-106.713	18.26	1.07MDLA	....	..	48	LA	9	344	D	4.4	9.7
1347	1990 JUL 29	14:52:49.60	35.926	-106.182	16.21	1.00MDLA	....	..	19	LA	9	300	C	.9	.8
1348	1990 SEP 03	23:05:19.54	35.805	-106.151	13.71	1.03MDLA	....	..	18	LA	10	311	C	1.7	1.0
1349	1990 SEP 13	19:26:59.43	35.930	-105.785	37.57	1.38MDLA	....	..	52	LA	6	349	D	12.0	9.8
1350	1991 FEB 04	03:31:00.00	35.936	-106.312	3.70	2.00MDLA	....	..	12	LA	...	...	.	.....	.....
1351	1991 FEB 04	05:13:00.00	35.932	-106.312	2.40	2.00MDLA	....	..	12	LA	...	...	.	.....	.....

APPENDIX B
HISTORICAL EARTHQUAKE CATALOGUE FOR THE RIO GRANDE RIFT USED IN RECURRENCE

159 Events Selected Searched: 25 OCT 1994 File: rec.rst By: jdjb

SOURCE DATABASE:
Root name: rec

Created: 11 APR 1994 14:21
By: jdjb
Original file: rec.dmp Type: ASCII Dump
Hypoctr rec: 159
Comment rec: 0
Time span: 1918 05 28 11:30:00.00 -> 1988 06 16 22:38:20.92

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31 Mag 1: -9.99 -> 9.99 Type: All
Lat: -90.000 -> 90.000 Mag 2: -9.99 -> 9.99 Type: None
Long: -180.000 -> 180.000 Intensity: 0 -> 12 Mode: 0
Depth: .00 -> 999.00 Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1	1918 MAY 28	11:30:00.00	35.450	-106.100	.00	5.25MLOL	.00	VII	48	AS	...	...	.	.....	.....
2	1931 FEB 05	04:48:00.00	35.100	-106.600	.00	4.50MLAS	.00	VI	84	SA	...	...	.	.....	.....
3	1952 AUG 17	10:45:00.00	35.500	-106.200	.00	4.00MLAS	.00	V	39	AS	...	...	.	.....	.....
4	1954 NOV 03	20:39:00.00	35.100	-106.700	.00	4.00MLSF	.00	V	87	AS	...	...	.	.....	.....
5	1955 AUG 12	16:20:00.00	35.700	-106.000	.00	4.00MLSF	.00	V	35	SA	...	...	.	.....	.....
6	1970 NOV 28	07:40:11.80	35.100	-106.610	9.00	3.80MLGS	4.50mbNEIC	VI	84	SA	...	...	.	.....	.....
7	1971 JAN 04	13:15:00.00	35.000	-106.700	.00	3.80MLSF	.00	V	97	SA	...	...	F	.....	.....
8	1973 MAR 17	07:43:05.50	36.090	-106.170	6.00	2.40MLNMI	4.50mbNEIC	III	33	SA	...	...	C	.....	.....
9	1973 OCT 13	03:56:02.70	35.867	-106.333	.00	1.50ML	.00	..	4	CN	...	...	.	.....	.....
10	1973 NOV 25	16:45:20.90	35.600	-105.883	20.00	1.70ML	.00	..	49	CN	...	...	.	.....	.....
11	1973 DEC 24	15:06:11.49	35.452	-106.101	10.36	1.98MDLA	.00	..	48	LA	10	324	D	1.6	7.6
12	1974 JAN 17	23:04:20.10	36.188	-106.193	1.54	2.07MDLA	.00	..	42	WC	10	268	.	.0	.0
13	1974 MAR 04	06:55:01.00	36.150	-106.233	.00	1.70ML	.00	..	37	CN	...	...	.	.....	.....
14	1974 APR 02	11:06:53.73	36.215	-106.194	2.53	1.65MDLA	.00	..	45	WC	11	267	.	.0	.0
15	1974 APR 30	02:47:20.70	36.750	-105.783	.00	1.80ML	.00	..	114	CN	...	...	.	.....	.....
16	1974 JUN 20	17:31:16.90	36.717	-105.883	.00	1.50ML	.00	..	107	CN	...	...	.	.....	.....
17	1974 JUN 22	09:53:42.80	35.083	-106.700	.00	2.40ML	.00	..	89	CN	...	...	.	.....	.....
18	1974 OCT 18	04:30:57.30	35.083	-106.817	.00	2.30ML	.00	..	93	CN	...	...	.	.....	.....
19	1974 DEC 30	12:11:22.10	35.017	-106.700	.00	1.50ML	.00	..	96	CN	...	...	.	.....	.....
20	1975 FEB 09	09:12:35.70	36.183	-106.233	26.00	2.00ML	.00	..	41	CN	...	...	.	.....	.....
21	1975 SEP 04	06:25:24.10	35.217	-106.450	.00	1.50ML	.00	..	69	CN	...	...	.	.....	.....
22	1975 SEP 06	03:46:49.99	36.187	-106.175	3.85	2.30MLCN	.00	..	43	WC	10	268	.	.0	.0
23	1975 SEP 10	01:01:48.20	36.733	-105.667	.00	2.00ML	.00	..	118	CN	...	...	.	.....	.....
24	1975 SEP 15	07:19:53.97	36.210	-106.167	.69	1.10MLCN	.00	..	45	LA	7	304	D	1.8	44.9
25	1975 SEP 25	03:39:02.53	36.226	-106.202	9.57	1.00MLCN	.00	..	46	LA	8	312	D	2.6	1.7
26	1975 DEC 03	13:41:32.10	35.798	-106.176	2.22	1.44MDLA	.00	..	16	WC	9	166	.	.0	.0
27	1976 APR 11	07:44:01.96	36.293	-106.152	4.05	1.94MDLA	.00	..	54	WC	15	172	.	.0	.0
28	1976 MAY 22	14:04:58.64	36.345	-105.782	12.21	1.04MDLA	.00	..	77	WC	12	200	.	.0	.0
29	1976 JUN 08	03:57:17.45	36.116	-106.257	8.80	.80 CA	.00	..	33	LA	5	315	C	.3	.4
30	1976 JUN 26	12:55:39.04	36.168	-106.207	2.55	2.00 CA	.00	..	40	WC	11	244	.	.0	.0
31	1976 JUL 05	12:39:19.42	36.157	-106.236	3.23	2.30 CA	.00	..	38	WC	11	121	.	.0	.0
32	1976 OCT 02	00:13:28.32	36.218	-106.173	13.21	.70 CA	.00	..	46	LA	5	305	D	4.6	3.9
33	1976 OCT 08	15:44:50.80	35.033	-106.883	.00	1.70	.00	..	101	CA	...	...	.	.....	.....
34	1976 OCT 24	07:15:29.69	36.004	-106.273	9.87	.50 CA	.00	..	21	WC	6	151	.	.0	.0
35	1976 NOV 11	10:00:08.82	36.007	-106.142	6.27	1.00 CA	.00	..	27	WC	11	104	.	.0	.0
36	1976 DEC 17	10:41:50.16	36.011	-106.136	4.93	1.40 CA	.00	..	28	WC	10	108	.	.0	.0
37	1977 JAN 05	03:19:15.60	35.067	-106.617	.00	.50	.00	..	88	CA	...	...	.	.....	.....

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
38	1977 JAN 09	13:03:00.58	35.961	-106.188	.91	1.30 CA	.00	..	21	LA	6	148	C	1.6	31.0
39	1977 JAN 20	23:26:47.43	36.272	-106.295	5.48	1.40MDLA	.00	..	49	WC	12	156	.	.0	.0
40	1977 APR 03	19:26:49.25	36.140	-106.220	.12	2.32MDLA	.00	..	36	WC	13	75	.	.0	.0
41	1977 APR 09	11:08:02.31	35.759	-106.435	10.00	1.30 CA	.00	..	11	LA	6	261	D	5.4	4.1
42	1977 APR 24	11:37:38.40	36.341	-105.834	13.37	.74MDLA	.00	..	73	LA	12	287	C	1.8	1.6
43	1977 APR 26	12:01:43.79	36.107	-106.253	.66	.86MDLA	.00	..	32	WC	11	231	.	.0	.0
44	1977 MAY 05	00:33:37.00	35.550	-106.833	.00	1.50	.00	..	54	CA	...	...	.	.....	.....
45	1977 MAY 13	08:19:46.30	35.598	-106.695	.00	1.00MDGS	.00	..	40	GS	0	0	.	.0	.0
46	1977 JUN 03	18:41:25.24	35.738	-106.264	1.21	1.36MDLA	.00	..	13	WC	6	123	.	.0	.0
47	1977 JUN 07	01:58:12.10	36.717	-105.617	.00	1.00	.00	..	118	CA	...	...	.	.....	.....
48	1977 JUL 28	07:44:29.92	35.849	-106.185	3.47	1.14MDLA	.00	..	15	WC	9	147	.	.0	.0
49	1977 JUL 31	14:21:38.00	35.370	-106.110	10.00	1.60	.00	..	55	JA	...	...	.	.....	.....
50	1977 AUG 11	04:24:53.46	35.834	-106.189	4.87	.68MDLA	.00	..	15	WC	9	143	.	.0	.0
51	1977 AUG 21	05:43:25.70	35.667	-106.067	.00	.70	.00	..	31	CA	...	...	.	.....	.....
52	1977 OCT 02	20:54:35.70	35.517	-106.867	.00	.80	.00	..	58	CA	...	...	.	.....	.....
53	1977 DEC 02	12:10:07.39	36.185	-106.300	2.72	.91MDLA	.00	..	40	WC	8	245	.	.0	.0
54	1977 DEC 14	16:41:39.90	36.119	-106.218	9.60	.80MDGS	.00	..	34	GS	0	0	.	.0	.0
55	1977 DEC 24	19:28:23.10	35.451	-106.148	13.00	1.30	.00	..	46	CA	...	...	.	.....	.....
56	1978 MAR 14	10:43:22.81	36.065	-106.220	4.90	1.57MDLA	.00	..	29	WC	14	124	.	.0	.0
57	1978 APR 12	09:07:04.60	36.240	-106.360	.00	1.30MDGS	.00	..	46	GS	0	0	.	.0	.0
58	1978 APR 23	17:41:07.90	35.416	-106.216	6.00	.80	.00	..	48	CA	...	...	.	.....	.....
59	1978 JUL 17	17:05:11.40	35.432	-106.171	.00	1.20	.00	..	47	NM	...	...	.	.....	.....
60	1978 AUG 05	23:08:05.39	35.472	-106.201	3.94	1.97MDLA	.00	..	42	WC	11	162	.	.0	.0
61	1978 AUG 31	04:02:30.00	35.084	-106.553	.00	.50	.00	..	85	NM	...	...	.	.....	.....
62	1978 SEP 26	15:32:21.90	36.328	-105.647	11.23	.79MDLA	.00	..	84	LA	13	293	C	1.8	4.0
63	1978 SEP 29	09:38:39.20	35.110	-106.804	7.38	2.18MDLA	.00	..	90	WC	21	208	.	.0	.0
64	1978 OCT 25	08:37:35.00	35.950	-106.250	.00	.50	.00	..	16	NM	...	...	.	.....	.....
65	1978 NOV 15	23:43:06.87	36.150	-106.192	6.54	1.26MDLA	.00	..	38	WC	16	78	.	.0	.0
66	1978 NOV 28	05:25:39.56	35.201	-106.709	5.58	1.92MDLA	.00	..	77	WC	16	269	.	.0	.0
67	1978 DEC 03	03:59:23.29	35.637	-106.815	6.20	.62MDLA	.00	..	47	WC	14	154	.	.0	.0
68	1978 DEC 07	20:27:23.38	35.138	-106.818	10.08	1.14MDLA	.00	..	88	WC	21	203	.	.0	.0
69	1978 DEC 15	18:59:31.33	35.151	-106.825	10.08	.94MDLA	.00	..	87	WC	17	200	.	.0	.0
70	1978 DEC 31	14:09:53.98	36.112	-106.167	12.17	1.10 NM	.00	..	35	WC	7	167	.	.0	.0
71	1979 JAN 05	22:48:37.80	35.228	-106.854	.00	.70	.00	..	81	NM	...	...	.	.....	.....
72	1979 JAN 30	15:57:42.70	35.243	-106.825	.00	1.70	.00	..	78	NM	...	...	.	.....	.....
73	1979 FEB 06	23:09:16.81	36.019	-106.264	.00	.50 NM	.00	..	22	WC	6	222	.	.0	.0
74	1979 FEB 13	15:21:08.73	35.107	-106.798	8.37	1.67MDLA	.00	..	90	WC	17	209	.	.0	.0
75	1979 MAR 01	11:15:00.65	36.149	-106.174	3.36	.70 NM	.00	..	39	WC	9	118	.	.0	.0
76	1979 MAR 05	13:00:05.62	36.312	-106.200	5.21	2.66MDLA	.00	..	55	WC	19	88	.	.0	.0
77	1979 MAR 07	15:08:23.40	35.564	-106.119	.00	1.10	.00	..	36	NM	...	...	.	.....	.....
78	1979 MAR 09	18:07:59.60	35.120	-106.399	.00	1.00	.00	..	79	NM	...	...	.	.....	.....
79	1979 MAR 10	13:53:24.47	35.115	-106.800	6.44	2.19MDLA	.00	..	89	WC	21	207	.	.0	.0
80	1979 MAR 12	21:00:45.04	35.850	-106.207	9.28	1.50 NM	.00	..	13	WC	15	71	.	.0	.0
81	1979 MAR 17	11:25:59.48	36.319	-106.193	7.10	1.69MDLA	.00	..	56	WC	21	88	.	.0	.0
82	1979 MAR 30	10:41:55.17	35.112	-106.796	7.05	2.58MDLA	.00	..	89	WC	18	208	.	.0	.0
83	1979 APR 04	00:44:17.20	35.135	-106.813	.00	1.00	.00	..	88	NM	...	...	.	.....	.....
84	1979 APR 07	08:17:06.73	35.680	-106.656	11.17	1.56MDLA	.00	..	32	WC	20	124	.	.0	.0
85	1979 APR 07	23:40:53.41	35.124	-106.812	10.53	1.35MDLA	.00	..	89	WC	19	230	.	.0	.0
86	1979 APR 24	05:31:15.70	35.217	-106.820	.00	.80MDGS	.00	..	80	GS	0	0	.	.0	.0
87	1979 APR 25	05:48:24.30	35.217	-106.820	.00	.80MDGS	.00	..	80	GS	0	0	.	.0	.0
88	1979 MAY 10	09:26:52.20	35.217	-106.820	.00	.80MDGS	.00	..	80	GS	0	0	.	.0	.0
89	1979 MAY 22	20:52:58.00	36.298	-105.709	.00	.50	.00	..	78	NM	...	...	.	.....	.....
90	1979 JUL 08	15:55:04.30	35.112	-106.809	11.83	1.95MDLA	.00	..	90	WC	14	208	.	.0	.0
91	1979 JUL 15	21:27:29.80	35.145	-106.814	.00	.80	.00	..	87	NM	...	...	.	.....	.....
92	1979 JUL 30	13:38:18.55	35.140	-106.881	10.12	1.51MDLA	.00	..	90	WC	22	202	.	.0	.0
93	1979 AUG 15	04:24:40.18	35.114	-106.804	8.49	1.21MDLA	.00	..	90	WC	20	208	.	.0	.0
94	1979 AUG 31	18:51:33.64	35.521	-105.969	12.76	1.03MDLA	.00	..	49	WC	13	184	.	.0	.0
95	1979 SEP 04	18:36:12.11	35.481	-106.251	.06	1.73MDLA	.00	..	40	WC	11	133	.	.0	.0
96	1979 OCT 02	23:15:51.19	35.128	-106.813	9.14	1.06MDLA	.00	..	89	WC	20	205	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
97	1979 OCT 15	15:25:17.10	36.301	-105.853	.00	.80	.00	..	69	NM	...	...	.	.....	.....
98	1979 NOV 03	18:24:41.77	35.530	-106.220	.00	1.87MDLA	.00	..	35	WC	12	241	.	.0	.0
99	1979 NOV 11	13:28:45.10	35.881	-106.248	.00	1.30	.00	..	11	NM	...	...	.	.....	.....
100	1979 DEC 18	16:39:24.90	35.757	-106.673	3.85	.89MDLA	.00	..	30	WC	12	186	.	.0	.0
101	1979 DEC 24	13:54:41.19	35.134	-106.802	6.37	1.17MDLA	.00	..	87	WC	18	204	.	.0	.0
102	1980 FEB 07	21:21:53.08	35.553	-106.819	4.68	1.13MDLA	.00	..	52	WC	12	161	.	.0	.0
103	1980 FEB 26	22:14:05.74	35.391	-106.163	1.51	1.01MDLA	.00	..	52	LA	8	291	D	6.2	26.1
104	1980 MAR 29	06:02:25.65	35.672	-106.531	13.14	.50 NM	.00	..	24	LA	5	314	C	1.8	2.1
105	1980 MAY 16	08:09:27.67	35.987	-106.133	5.09	1.05MDLA	.00	..	26	WC	10	94	.	.0	.0
106	1980 MAY 25	17:39:37.38	36.252	-106.223	7.70	.58MDLA	.00	..	48	WC	9	151	.	.0	.0
107	1980 JUN 08	07:04:01.66	36.014	-106.135	4.14	.61MDLA	.00	..	28	WC	9	94	.	.0	.0
108	1980 JUN 15	19:58:04.72	35.986	-106.155	8.28	.80 NM	.00	..	25	WC	7	183	.	.0	.0
109	1980 JUN 25	20:07:15.47	35.940	-105.970	8.37	1.59MDLA	.00	..	36	WC	15	127	.	.0	.0
110	1980 SEP 02	22:32:04.98	35.990	-106.127	2.99	.50 NM	.00	..	27	WC	11	95	.	.0	.0
111	1980 SEP 24	18:14:45.05	35.549	-106.821	4.58	1.03MDLA	.00	..	53	WC	15	171	.	.0	.0
112	1980 OCT 08	19:56:47.30	36.476	-105.814	9.06	.83MDLA	.00	..	86	WC	13	201	.	.0	.0
113	1980 NOV 13	19:49:05.51	35.687	-106.342	.03	.60 NM	.00	..	16	WC	7	231	.	.0	.0
114	1981 JAN 01	03:58:16.22	35.537	-106.686	5.00	1.20MDGS	.00	..	45	GS	4	0	b	.0	.0
115	1981 FEB 20	12:05:10.40	35.067	-106.445	5.00	.50	.00	..	85	NM	...	...	.	.....	.....
116	1981 MAR 24	21:48:51.05	35.548	-106.835	8.18	.79MDLA	.00	..	54	WC	11	184	.	.0	.0
117	1981 MAY 03	10:36:39.93	35.539	-106.239	7.33	.86MDLA	.00	..	34	WC	10	239	.	.0	.0
118	1981 JUN 15	12:28:03.43	35.709	-106.659	5.00	1.10MDGS	.00	..	31	GS	4	0	b	.0	.0
119	1981 JUL 30	09:47:34.95	35.745	-106.654	5.00	1.30MDGS	.00	..	29	GS	3	0	b	.0	.0
120	1981 AUG 03	05:11:42.81	35.693	-106.122	8.06	.57MDLA	.00	..	26	WC	8	148	.	.0	.0
121	1981 OCT 01	07:40:22.82	35.527	-106.443	7.69	.87MDLA	.00	..	35	WC	19	187	.	.0	.0
122	1981 NOV 02	06:22:41.21	35.454	-106.121	11.47	.62MDLA	.00	..	47	WC	19	221	.	.0	.0
123	1981 NOV 05	06:40:03.40	35.382	-106.324	5.00	.70	.00	..	50	NM	...	...	.	.....	.....
124	1982 FEB 26	20:22:50.58	35.175	-106.767	7.91	.72MDLA	.00	..	82	WC	10	230	.	.0	.0
125	1982 APR 19	07:34:46.75	36.316	-105.821	11.85	1.03MDLA	.00	..	72	WC	11	193	.	.0	.0
126	1982 MAY 31	09:37:08.50	35.100	-106.800	6.00	2.00ML GS	.00	IV	91	SA	...	...	B	.....	.....
127	1982 JUN 26	13:32:40.52	35.611	-106.798	9.05	.71MDLA	.00	..	47	WC	9	270	.	.0	.0
128	1982 AUG 14	18:56:08.89	35.038	-106.951	5.00	1.70MDGS	.00	..	103	GS	11	0	a	.0	.0
129	1982 SEP 03	03:27:07.64	35.986	-106.103	5.00	1.20MDGS	.00	..	28	GS	9	0	d	.0	.0
130	1982 OCT 06	23:15:01.60	35.157	-106.344	5.00	1.30	.00	..	75	NM	...	...	.	.....	.....
131	1982 OCT 25	06:10:03.90	36.304	-106.223	5.00	1.00	.00	..	54	NM	...	...	.	.....	.....
132	1982 DEC 24	19:08:45.28	35.214	-106.936	9.26	1.79MDLA	.00	..	87	WC	11	216	.	.0	.0
133	1983 JAN 06	00:44:53.90	36.746	-105.792	.00	1.60	.00	..	113	NM	...	...	D	.....	.....
134	1983 JAN 12	14:50:39.70	35.061	-106.737	.00	1.70	.00	..	92	NM	...	...	A	.....	.....
135	1983 FEB 04	18:14:38.80	35.916	-106.167	7.21	1.52MDLA	.00	..	19	WC	8	219	.	.0	.0
136	1983 FEB 24	21:23:56.30	35.112	-106.700	.00	1.60	.00	..	86	NM	...	...	C	.....	.....
137	1983 FEB 28	04:52:20.25	36.090	-106.227	.00	1.14MDLA	.00	..	31	WC	8	134	.	.0	.0
138	1983 MAR 15	04:28:43.86	36.077	-106.225	3.38	.99MDLA	.00	..	30	WC	13	181	.	.0	.0
139	1983 APR 06	10:39:44.74	36.078	-106.225	2.45	1.10MDLA	.00	..	30	WC	15	117	.	.0	.0
140	1983 APR 16	08:17:59.50	36.171	-106.128	.00	.50	.00	..	43	NM	...	...	D	.....	.....
141	1983 JUL 20	10:11:53.36	36.347	-105.810	1.24	1.62MDLA	.00	..	75	WC	15	196	.	.0	.0
142	1983 AUG 01	07:19:40.73	36.285	-105.824	7.87	1.11MDLA	.00	..	69	LA	6	267	C	2.0	1.3
143	1983 AUG 11	15:09:22.29	36.343	-105.779	12.13	1.75MDLA	.00	..	77	WC	12	200	.	.0	.0
144	1983 AUG 14	14:45:02.45	35.813	-106.471	.12	1.79MDLA	.00	..	11	WC	8	138	.	.0	.0
145	1983 AUG 23	00:24:44.30	35.746	-105.991	.00	.80	.00	..	34	NM	...	...	B	.....	.....
146	1983 SEP 16	12:05:04.30	36.254	-106.193	.00	.90	.00	..	49	NM	...	...	A	.....	.....
147	1983 SEP 19	05:07:56.61	35.748	-106.098	5.26	1.08MDLA	.00	..	25	WC	6	191	.	.0	.0
148	1983 SEP 23	22:57:24.50	35.315	-106.516	.00	.90	.00	..	59	NM	...	...	D	.....	.....
149	1983 OCT 09	22:47:05.38	36.093	-106.536	1.85	1.73MDLA	.00	..	34	WC	9	118	.	.0	.0
150	1983 OCT 23	17:51:33.80	36.269	-105.779	.00	.60	.00	..	71	NM	...	...	D	.....	.....
151	1983 OCT 23	18:36:35.50	36.267	-106.207	.00	.60	.00	..	50	NM	...	...	A	.....	.....
152	1983 OCT 29	03:57:07.34	35.159	-106.536	2.54	1.40 NM	.00	..	76	WC	12	232	.	.0	.0
153	1983 NOV 08	07:53:52.57	36.307	-105.798	10.00	1.46MDLA	.00	..	73	LA	9	276	D	2.7	2.0
154	1983 DEC 02	22:10:00.33	35.257	-106.656	.48	.88MDLA	.00	..	69	WC	5	286	.	.0	.0
155	1983 DEC 02	22:44:08.57	35.312	-106.467	11.59	1.68MDLA	.00	..	58	WC	6	217	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
156	1983 DEC 28	04:56:15.30	36.317	-105.781	.00	.70	.00	..	74	NM	...	...	B	.....	.....
157	1984 JAN 28	20:45:45.41	35.498	-106.233	8.89	2.14MDLA	.00	..	38	WC	6	240	.	.0	.0
158	1984 APR 18	19:44:03.88	35.964	-106.273	8.93	1.80 NM	.00	..	16	WC	7	155	.	.0	.0
159	1988 JUN 16	22:38:20.92	35.548	-106.291	220.85	2.93MDLA	.00	..	32	GS	7	321	.	3.0	.5

APPENDIX C
HISTORICAL EARTHQUAKE CATALOGUE FOR THE COLORADO PLATEAU TRANSITION ZONE USED IN RECURRENCE

EARTHQUAKE DATABASE SEARCH

183 Events Selected   Searched: 25 OCT 1994   File: rec.rst   By: jdjb

SOURCE DATABASE:
Root name: rec

Created: 11 APR 1994 13:50
By: jdjb
Original file: rec.dmp   Type: ASCII Dump
Hypoctr rec: 183
Comment rec: 0
Time span: 1974 01 04 23:29:31.60 -> 1985 07 30 16:02:16.73

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31   Mag 1: -9.99 -> 9.99   Type: All
Lat: -90.000 -> 90.000   Mag 2: -9.99 -> 9.99   Type: None
Long: -180.000 -> 180.000   Intensity: 0 -> 12   Mode: 0
Depth: .00 -> 999.00   Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
1	1974 JAN 04	23:29:31.60	35.800	-106.900	.00	1.70ML	.00	..	50	CN	...	...	.	.....	.....
2	1974 MAR 23	10:44:15.00	36.500	-107.083	32.00	2.40ML	.00	..	99	CN	...	...	.	.....	.....
3	1974 JUN 05	18:18:08.90	36.267	-106.667	.00	1.70ML	.00	..	56	CN	...	...	.	.....	.....
4	1974 OCT 15	12:47:38.80	35.250	-107.083	.00	2.60ML	.00	..	93	CN	...	...	.	.....	.....
5	1974 DEC 29	01:11:54.00	35.367	-107.100	.00	1.70ML	.00	..	85	CN	...	...	.	.....	.....
6	1975 MAR 13	11:01:05.30	36.567	-106.917	26.00	1.70ML	.00	..	96	CN	...	...	.	.....	.....
7	1975 MAY 21	04:46:59.00	36.746	-106.662	.00	2.00MDGS	.00	..	105	GS	0	0	.	.0	.0
8	1975 SEP 18	01:48:17.08	36.046	-106.856	15.85	1.11MDLA	.00	..	52	LA	8	322	C	1.7	4.9
9	1975 SEP 29	11:09:41.90	36.037	-106.862	7.39	3.04MDLA	.00	..	52	LA	7	315	D	8.8	2.4
10	1976 JAN 01	23:44:28.20	36.050	-106.893	7.39	1.21MDLA	.00	..	55	LA	13	318	C	1.5	1.9
11	1976 JAN 22	20:12:46.14	36.422	-106.546	10.00	1.30MDLA	.00	..	68	LA	13	280	D	.9	101.1
12	1976 APR 17	02:40:33.41	36.050	-107.091	16.64	.51MDLA	.00	..	71	LA	8	334	D	3.2	4.2
13	1976 APR 17	06:46:21.10	36.460	-106.286	10.00	.96MDLA	.00	..	70	LA	12	322	D	1.8	247.6
14	1976 MAY 02	00:32:35.71	36.402	-106.762	9.41	2.69MDLA	.00	..	73	WC	9	201	.	.0	.0
15	1976 MAY 10	07:55:37.00	35.500	-107.250	.00	.70	.00	..	89	CA	...	...	.	.....	.....
16	1976 MAY 15	11:23:27.00	35.610	-106.930	.00	1.00	.00	..	58	JA	...	...	.	.....	.....
17	1976 JUL 12	21:44:26.90	35.817	-107.083	.00	.80	.00	..	66	CA	...	...	.	.....	.....
18	1976 AUG 08	18:05:47.90	36.750	-106.517	.00	.70	.00	..	103	CA	...	...	.	.....	.....
19	1976 SEP 01	11:26:24.40	35.267	-107.217	.00	.80	.00	..	100	CA	...	...	.	.....	.....
20	1976 SEP 12	18:59:02.60	35.400	-107.250	.00	1.80	.00	..	94	CA	...	...	.	.....	.....
21	1976 OCT 08	20:18:13.20	36.150	-106.833	.00	.70	.00	..	56	CA	...	...	.	.....	.....
22	1976 NOV 02	20:23:59.80	35.500	-106.917	.00	.70	.00	..	63	CA	...	...	.	.....	.....
23	1976 NOV 03	21:05:00.36	35.332	-107.230	8.54	1.09MDLA	.00	..	97	WC	13	184	.	.0	.0
24	1977 APR 07	13:13:03.50	35.467	-107.217	.00	.70	.00	..	88	CA	...	...	.	.....	.....
25	1977 APR 11	16:45:35.89	35.659	-107.043	9.24	.80 CA	.00	..	65	WC	16	190	.	.0	.0
26	1977 MAY 27	06:19:05.60	36.550	-106.500	.00	.80	.00	..	81	CA	...	...	.	.....	.....
27	1977 MAY 29	05:10:42.50	35.533	-107.050	.00	1.30	.00	..	71	CA	...	...	.	.....	.....
28	1977 JUL 02	01:24:41.17	36.231	-107.219	9.16	1.87MDLA	.00	..	90	WC	13	219	.	.0	.0
29	1977 AUG 05	16:06:26.20	35.333	-107.233	.00	.70	.00	..	97	CA	...	...	.	.....	.....
30	1977 AUG 10	19:11:06.90	35.550	-106.867	.00	1.10	.00	..	56	CA	...	...	.	.....	.....
31	1977 AUG 22	15:10:56.20	35.617	-107.233	.00	2.00	.00	..	83	CA	...	...	.	.....	.....
32	1977 AUG 29	07:13:38.43	35.541	-107.101	10.16	1.78MDLA	.00	..	75	WC	12	172	.	.0	.0
33	1977 AUG 29	22:17:08.51	36.354	-106.644	17.12	1.23MDLA	.00	..	64	WC	17	189	.	.0	.0
34	1977 OCT 02	14:38:35.70	35.800	-106.951	8.46	.85MDLA	.00	..	54	WC	15	159	.	.0	.0
35	1977 OCT 04	20:57:42.24	36.181	-106.866	4.14	1.65MDLA	.00	..	61	WC	14	168	.	.0	.0
36	1977 OCT 13	19:28:17.24	36.073	-106.956	5.66	.94MDLA	.00	..	61	WC	16	175	.	.0	.0
37	1977 NOV 11	11:26:55.27	35.430	-107.167	9.65	.95MDLA	.00	..	86	WC	14	105	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
38	1977 NOV 17	13:02:28.88	35.520	-107.085	5.56	.61MDLA	.00	..	75	WC	8	171	.	.0	.0
39	1977 DEC 10	06:58:57.30	35.730	-106.930	.00	.80MDGS	.00	..	54	GS	0	0	.	.0	.0
40	1978 JAN 30	02:53:01.40	35.874	-106.843	8.47	.87MDLA	.00	..	45	WC	17	166	.	.0	.0
41	1978 FEB 13	09:48:00.40	36.007	-106.845	4.80	.80MDGS	.00	..	49	GS	0	0	.	.0	.0
42	1978 FEB 13	18:57:38.91	35.736	-107.197	10.74	1.51MDLA	.00	..	77	WC	15	172	.	.0	.0
43	1978 FEB 14	16:49:04.46	36.297	-106.927	10.47	1.35MDLA	.00	..	73	WC	14	196	.	.0	.0
44	1978 APR 16	08:38:14.45	36.473	-107.133	10.00	1.21MDLA	.00	..	100	LA	12	236	D	2.3	383.0
45	1978 APR 23	23:25:35.75	35.659	-106.974	5.41	1.27MDLA	.00	..	60	WC	16	135	.	.0	.0
46	1978 APR 30	00:32:00.10	36.645	-106.530	8.00	.70	.00	..	92	CA	...	...	.	.....	.....
47	1978 MAY 02	00:03:27.73	35.870	-106.837	4.38	.56MDLA	.00	..	44	WC	16	132	.	.0	.0
48	1978 MAY 28	05:04:06.63	36.356	-106.810	5.40	.64MDLA	.00	..	72	WC	9	171	.	.0	.0
49	1978 JUN 29	04:44:50.20	36.616	-106.440	25.00	.80	.00	..	88	CA	...	...	.	.....	.....
50	1978 JUL 03	15:13:47.60	35.561	-107.250	.00	.50	.00	..	87	NM	...	...	.	.....	.....
51	1978 JUL 09	13:30:18.40	36.659	-106.610	.00	1.30	.00	..	95	NM	...	...	.	.....	.....
52	1978 AUG 15	06:55:00.60	36.705	-106.575	.00	1.20	.00	..	99	NM	...	...	.	.....	.....
53	1978 SEP 25	01:44:31.13	35.735	-106.764	6.84	1.85MDLA	.00	..	39	WC	16	99	.	.0	.0
54	1978 OCT 03	12:29:27.40	35.584	-107.224	.00	.80	.00	..	84	NM	...	...	.	.....	.....
55	1978 OCT 07	23:13:18.76	36.091	-106.814	5.26	.88MDLA	.00	..	51	WC	16	151	.	.0	.0
56	1978 OCT 11	15:41:32.70	36.420	-106.920	.00	.50	.00	..	83	NM	...	...	.	.....	.....
57	1978 OCT 30	03:59:27.72	36.506	-106.549	9.25	1.14MDLA	.00	..	77	WC	17	127	.	.0	.0
58	1979 JAN 14	01:43:18.28	35.685	-107.154	10.57	1.20MDLA	.00	..	74	WC	22	162	.	.0	.0
59	1979 JAN 17	11:32:25.41	36.285	-106.811	7.08	1.54MDLA	.00	..	65	WC	22	82	.	.0	.0
60	1979 JAN 18	09:31:36.94	36.584	-106.563	8.32	1.72MDLA	.00	..	86	WC	22	138	.	.0	.0
61	1979 JAN 18	10:34:17.00	36.500	-106.430	.00	.70	.00	..	75	NM	...	...	.	.....	.....
62	1979 FEB 12	09:23:47.30	36.500	-106.750	.00	.50	.00	..	83	NM	...	...	.	.....	.....
63	1979 APR 07	03:45:17.00	36.701	-106.357	.00	1.10	.00	..	97	NM	...	...	.	.....	.....
64	1979 APR 30	01:44:15.07	36.357	-106.741	6.66	.65MDLA	.00	..	68	WC	8	144	.	.0	.0
65	1979 APR 30	09:43:02.70	35.546	-107.215	.00	.70	.00	..	84	NM	...	...	.	.....	.....
66	1979 MAY 17	16:00:55.18	36.426	-106.697	8.78	.98MDLA	.00	..	73	WC	16	140	.	.0	.0
67	1979 JUN 02	14:41:08.50	36.645	-107.001	.00	1.30	.00	..	108	NM	...	...	.	.....	.....
68	1979 JUN 05	05:26:09.40	36.432	-106.709	6.11	1.30MDLA	.00	..	74	WC	15	176	.	.0	.0
69	1979 JUN 12	16:51:41.49	36.312	-106.452	6.76	1.10MDLA	.00	..	54	WC	17	227	.	.0	.0
70	1979 JUN 22	09:32:29.60	36.610	-106.730	.00	.70	.00	..	93	NM	...	...	.	.....	.....
71	1979 JUN 25	12:17:26.20	36.250	-106.433	.00	1.00	.00	..	47	NM	...	...	.	.....	.....
72	1979 JUN 28	23:12:39.37	36.198	-106.856	6.43	.57MDLA	.00	..	61	WC	8	249	.	.0	.0
73	1979 AUG 07	21:00:09.80	35.914	-106.767	.00	.80MDGS	.00	..	39	GS	0	0	.	.0	.0
74	1979 AUG 14	18:56:54.92	36.181	-106.855	.67	.97MDLA	.00	..	60	WC	14	179	.	.0	.0
75	1979 AUG 17	18:55:38.00	35.641	-106.984	.00	1.40	.00	..	61	NM	...	...	.	.....	.....
76	1979 AUG 20	11:09:33.04	36.524	-106.724	7.76	1.00MDLA	.00	..	84	WC	13	215	.	.0	.0
77	1979 AUG 25	04:35:42.25	35.466	-107.105	12.80	1.33MDLA	.00	..	79	WC	17	136	.	.0	.0
78	1979 AUG 31	17:26:29.52	35.452	-107.101	7.72	1.49MDLA	.00	..	80	WC	19	139	.	.0	.0
79	1979 SEP 01	21:15:50.70	36.499	-106.540	10.72	.90MDLA	.00	..	76	WC	15	210	.	.0	.0
80	1979 SEP 06	08:37:18.40	35.326	-107.250	.00	.70	.00	..	99	NM	...	...	.	.....	.....
81	1979 OCT 05	19:25:45.00	36.100	-106.767	.00	.80	.00	..	48	NM	...	...	.	.....	.....
82	1979 OCT 12	18:59:10.40	36.144	-106.721	.00	.70	.00	..	48	NM	...	...	.	.....	.....
83	1979 OCT 13	05:23:54.10	35.740	-106.828	.00	.80	.00	..	44	NM	...	...	.	.....	.....
84	1979 OCT 21	17:18:52.60	36.096	-106.740	.00	.70	.00	..	46	NM	...	...	.	.....	.....
85	1979 OCT 28	16:41:19.60	36.002	-106.745	12.40	.80MDGS	.00	..	40	GS	0	0	.	.0	.0
86	1979 OCT 29	04:05:49.89	36.444	-106.506	18.38	1.33MDLA	.00	..	70	WC	17	137	.	.0	.0
87	1979 NOV 03	01:11:10.53	36.571	-106.754	9.21	1.74MDLA	.00	..	90	WC	17	142	.	.0	.0
88	1979 NOV 06	02:15:35.51	36.076	-106.879	8.01	1.63MDLA	.00	..	55	WC	20	158	.	.0	.0
89	1979 NOV 11	18:37:17.00	36.598	-106.749	.00	1.30	.00	..	92	NM	...	...	.	.....	.....
90	1979 NOV 13	06:42:02.50	36.367	-106.581	.00	.50	.00	..	63	NM	...	...	.	.....	.....
91	1979 NOV 13	21:58:33.45	36.305	-106.784	9.81	1.17MDLA	.00	..	66	WC	19	151	.	.0	.0
92	1979 NOV 14	08:43:31.08	35.781	-106.937	.33	1.18MDLA	.00	..	53	WC	20	152	.	.0	.0
93	1979 NOV 19	02:56:38.09	36.087	-106.700	8.38	.60MDLA	.00	..	43	WC	10	112	.	.0	.0
94	1979 NOV 24	15:28:13.53	36.464	-106.739	5.38	.91MDLA	.00	..	79	WC	14	197	.	.0	.0
95	1979 NOV 26	10:11:03.29	36.331	-106.862	7.66	.98MDLA	.00	..	72	WC	9	218	.	.0	.0
96	1979 DEC 20	04:47:08.50	35.914	-106.736	6.80	.80MDGS	.00	..	36	GS	0	0	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
97	1979 DEC 24	13:03:39.30	36.614	-106.800	.00	.80	.00	..	96	NM	...	...	.	.....	.....
98	1979 DEC 28	06:48:05.60	36.420	-106.750	.00	.50	.00	..	75	NM	...	...	.	.....	.....
99	1980 JAN 05	13:29:53.10	36.183	-106.850	5.00	.50	.00	..	60	NM	...	...	.	.....	.....
100	1980 FEB 10	21:06:23.53	36.447	-106.903	3.24	1.32MDLA	.00	..	85	WC	16	256	.	.0	.0
101	1980 FEB 15	10:28:39.95	35.937	-106.887	5.00	.60MDGS	.00	..	50	GS	6	0	b	.0	.0
102	1980 FEB 21	11:13:10.26	36.378	-106.810	10.00	.60MDLA	.00	..	74	LA	12	273	D	1.1	189.9
103	1980 FEB 25	00:54:09.80	36.673	-106.616	5.00	1.30	.00	..	97	NM	...	...	.	.....	.....
104	1980 MAR 02	15:26:00.20	36.466	-106.638	5.00	.50	.00	..	75	NM	...	...	.	.....	.....
105	1980 MAR 09	07:59:04.40	36.629	-106.553	5.00	.70	.00	..	91	NM	...	...	.	.....	.....
106	1980 MAR 15	10:09:30.70	36.622	-106.876	5.00	1.60	.00	..	100	NM	...	...	.	.....	.....
107	1980 MAR 15	17:53:17.84	35.601	-106.952	8.69	.79MDLA	.00	..	60	WC	19	148	.	.0	.0
108	1980 APR 03	10:04:05.40	36.638	-106.602	5.00	.60	.00	..	92	NM	...	...	.	.....	.....
109	1980 APR 15	14:43:33.20	35.909	-106.696	2.70	1.60MDGS	.00	..	32	GS	0	0	b	.0	.0
110	1980 APR 24	19:12:33.48	35.874	-106.783	7.03	1.90MDLA	.00	..	39	WC	12	135	.	.0	.0
111	1980 MAY 01	02:49:58.40	35.584	-107.206	5.00	.80	.00	..	82	NM	...	...	.	.....	.....
112	1980 MAY 06	12:01:02.87	35.623	-106.980	5.00	.80MDGS	.00	..	61	GS	0	0	a	.0	.0
113	1980 MAY 16	07:47:10.06	35.868	-106.685	.80	.80MDGS	.00	..	31	GS	0	0	c	.0	.0
114	1980 MAY 27	21:20:09.47	35.889	-106.790	5.00	1.20MDGS	.00	..	40	GS	0	0	d	.0	.0
115	1980 JUN 07	00:55:44.46	35.886	-106.691	.00	.70MDGS	.00	..	31	GS	0	0	a	.0	.0
116	1980 JUN 13	12:00:01.48	35.879	-106.683	2.30	1.10MDGS	.00	..	31	GS	0	0	b	.0	.0
117	1980 JUN 25	08:11:42.79	35.751	-106.942	.66	1.29MDLA	.00	..	54	WC	18	144	.	.0	.0
118	1980 JUN 27	00:47:53.26	35.958	-106.829	5.00	1.20MDGS	.00	..	45	GS	0	0	c	.0	.0
119	1980 JUL 14	12:45:20.44	36.456	-106.562	10.16	.51MDLA	.00	..	72	WC	18	146	.	.0	.0
120	1980 AUG 13	18:33:29.69	36.008	-106.774	4.33	1.09MDLA	.00	..	43	WC	12	84	.	.0	.0
121	1980 SEP 11	02:07:10.22	35.735	-106.914	.08	.57MDLA	.00	..	52	WC	17	142	.	.0	.0
122	1980 SEP 11	09:57:08.34	35.884	-106.678	2.00	1.20MDGS	.00	..	30	GS	0	0	a	.0	.0
123	1980 SEP 13	03:04:53.64	35.503	-107.205	5.00	.50MDGS	.00	..	86	GS	0	0	b	.0	.0
124	1980 SEP 23	05:57:56.02	36.013	-106.847	7.38	.73MDLA	.00	..	49	WC	14	251	.	.0	.0
125	1980 SEP 25	10:40:19.30	36.066	-106.845	5.00	.60	.00	..	52	NM	...	...	.	.....	.....
126	1980 SEP 25	17:38:33.70	35.909	-106.702	1.00	1.20	.00	..	33	NM	...	...	.	.....	.....
127	1980 OCT 11	20:31:41.00	36.530	-106.850	.00	2.20	.00	..	90	SJ	...	...	.	.....	.....
128	1980 OCT 26	10:29:13.83	35.893	-106.687	3.00	.80MDGS	.00	..	31	GS	0	0	d	.0	.0
129	1980 NOV 16	21:32:09.20	35.873	-106.781	1.10	1.00MDGS	.00	..	39	GS	0	0	a	.0	.0
130	1980 NOV 20	02:11:24.60	36.641	-106.796	5.00	.50	.00	..	99	NM	...	...	.	.....	.....
131	1980 NOV 22	00:16:27.97	36.351	-106.916	12.42	1.47MDLA	.00	..	77	WC	19	207	.	.0	.0
132	1980 NOV 30	07:20:30.52	36.541	-106.649	15.22	.88MDLA	.00	..	83	WC	21	195	.	.0	.0
133	1980 DEC 17	09:27:29.72	35.878	-106.679	3.00	.60MDGS	.00	..	30	GS	0	0	a	.0	.0
134	1980 DEC 23	03:18:08.42	35.757	-106.861	5.00	.80MDGS	.00	..	47	GS	0	0	b	.0	.0
135	1981 MAR 24	00:57:28.53	35.656	-106.952	5.00	.60MDGS	.00	..	58	GS	3	0	c	.0	.0
136	1981 APR 01	02:17:38.00	35.340	-107.090	.00	.50	.00	..	86	SJ	...	...	.	.....	.....
137	1981 APR 05	00:48:55.70	35.889	-106.767	.00	.90	.00	..	38	NM	...	...	.	.....	.....
138	1981 JUN 06	02:52:59.88	35.891	-106.765	5.00	1.30MDGS	.00	..	38	GS	4	0	a	.0	.0
139	1981 SEP 09	21:41:49.10	36.594	-106.736	5.00	1.10	.00	..	92	NM	...	...	.	.....	.....
140	1981 SEP 11	17:09:14.10	35.884	-106.746	1.00	1.10	.00	..	36	NM	...	...	.	.....	.....
141	1981 SEP 21	04:19:04.12	36.519	-106.647	13.86	.86MDLA	.00	..	81	WC	23	187	.	.0	.0
142	1981 SEP 26	02:15:59.46	36.514	-106.499	10.45	.53MDLA	.00	..	77	WC	15	159	.	.0	.0
143	1981 OCT 16	14:30:16.00	35.260	-107.240	.00	.90	.00	..	103	SJ	...	...	.	.....	.....
144	1981 OCT 21	08:41:48.69	36.465	-106.668	10.61	1.72MDLA	.00	..	76	WC	22	166	.	.0	.0
145	1981 NOV 24	06:51:19.38	35.764	-106.760	10.52	1.29MDLA	.00	..	38	WC	16	125	.	.0	.0
146	1981 DEC 03	09:54:14.09	35.601	-106.885	5.00	.50MDGS	.00	..	55	GS	3	0	c	.0	.0
147	1981 DEC 27	00:59:04.80	36.286	-107.109	5.00	1.10	.00	..	85	NM	...	...	.	.....	.....
148	1982 MAY 05	21:13:45.14	36.497	-106.608	5.00	1.30MDGS	.00	..	78	GS	5	0	d	.0	.0
149	1982 MAY 25	18:50:42.69	35.337	-107.188	5.00	.50MDGS	.00	..	94	GS	4	0	c	.0	.0
150	1982 MAY 26	22:37:15.68	36.735	-106.910	5.00	1.90MDGS	.00	..	112	GS	7	0	d	.0	.0
151	1982 MAY 30	00:07:44.00	36.239	-106.622	5.00	1.30MDGS	.00	..	52	GS	5	0	b	.0	.0
152	1982 JUL 06	21:05:59.72	35.183	-107.201	5.00	1.30MDGS	.00	..	105	GS	3	0	c	.0	.0
153	1982 JUL 12	16:37:07.91	35.575	-107.120	8.27	2.61MDLA	.00	..	75	WC	8	157	.	.0	.0
154	1982 JUL 17	06:05:51.19	36.249	-106.623	5.00	1.10MDGS	.00	..	53	GS	4	0	d	.0	.0
155	1982 JUL 22	12:46:23.99	35.695	-106.949	3.35	1.70MDLA	.00	..	56	WC	24	146	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Vert
156	1982 JUL 22	20:51:01.22	35.457	-107.082	1.14	1.74MDLA	.00	..	78	WC	6	205	.	.0	.0
157	1982 AUG 18	23:01:37.57	35.792	-106.943	5.00	1.60MDGS	.00	..	54	GS	3	0	d	.0	.0
158	1982 AUG 19	01:52:41.12	36.463	-106.649	1.38	1.86MDLA	.00	..	75	LA	18	96	D	1.5	4.7
159	1982 AUG 19	05:18:31.40	36.052	-106.789	5.00	1.30MDGS	.00	..	47	GS	6	0	b	.0	.0
160	1982 OCT 29	22:35:00.70	36.288	-106.650	5.00	.50	.00	..	58	NM	...	...	.	.....	.....
161	1982 NOV 13	09:57:55.60	36.148	-106.722	5.00	2.10	.00	..	49	NM	...	...	.	.....	.....
162	1982 NOV 22	03:01:38.20	36.705	-106.950	5.00	.80	.00	..	111	NM	...	...	.	.....	.....
163	1982 DEC 15	14:54:59.58	36.026	-106.852	8.13	.93MDLA	.00	..	50	WC	10	191	.	.0	.0
164	1982 DEC 16	04:08:03.68	35.691	-106.918	.51	.82MDLA	.00	..	54	WC	16	148	.	.0	.0
165	1982 DEC 30	02:24:12.99	36.506	-106.651	4.89	1.54MDLA	.00	..	80	WC	7	217	.	.0	.0
166	1983 JAN 14	13:41:37.00	36.650	-106.797	.00	.80	.00	..	99	NM	...	...	D	.....	.....
167	1983 JAN 25	05:14:11.20	35.932	-106.773	.00	.50	.00	..	40	NM	...	...	B	.....	.....
168	1983 FEB 01	03:54:51.90	36.590	-106.608	.00	1.40	.00	..	87	NM	...	...	D	.....	.....
169	1983 FEB 04	15:50:29.00	36.168	-107.174	.00	1.20	.00	..	83	NM	...	...	D	.....	.....
170	1983 APR 17	04:04:51.70	35.419	-107.238	.00	.90	.00	..	92	NM	...	...	B	.....	.....
171	1983 MAY 20	15:51:03.39	35.520	-107.016	1.72	1.03MDLA	.00	..	69	LA	5	324	D	8.4	121.2
172	1983 MAY 27	20:05:34.74	35.593	-106.918	.07	.54MDLA	.00	..	58	LA	6	298	D	4.8	120.2
173	1983 JUN 27	01:51:05.36	36.196	-106.875	.97	.51MDLA	.00	..	62	WC	11	267	.	.0	.0
174	1983 JUL 12	16:37:08.20	35.576	-107.110	5.00	2.50MD LA	.00	..	74	SA	...	...	A	.....	.....
175	1983 JUL 19	17:12:43.15	36.175	-106.848	5.62	.75MDLA	.00	..	59	WC	9	262	.	.0	.0
176	1983 JUL 24	10:14:16.70	36.639	-106.901	.00	1.00	.00	..	103	NM	...	...	A	.....	.....
177	1983 AUG 03	09:17:29.81	36.088	-106.903	8.15	1.49MDLA	.00	..	58	WC	17	222	.	.0	.0
178	1983 AUG 03	10:05:39.50	35.595	-107.241	.00	.50	.00	..	85	NM	...	...	D	.....	.....
179	1984 MAY 26	19:33:03.10	36.495	-106.495	.00	1.90	.00	..	75	NM	...	...	A	.....	.....
180	1984 JUN 04	02:54:18.70	36.684	-106.453	.00	1.90	.00	..	95	NM	...	...	B	.....	.....
181	1984 SEP 27	04:05:27.23	36.168	-106.882	3.26	1.82MDLA	.00	..	61	WC	8	236	.	.0	.0
182	1985 JAN 06	21:02:30.93	35.842	-106.741	7.48	2.51MDLA	.00	..	35	WC	5	125	.	.0	.0
183	1985 JUL 30	16:02:16.73	36.444	-107.029	5.00	2.10MDGS	.00	..	91	GS	3	0	c	.0	.0

APPENDIX D
HISTORICAL EARTHQUAKE CATALOGUE FOR THE SOUTHERN ROCKY MOUNTAINS USED IN RECURRENCE

EARTHQUAKE DATABASE SEARCH

31 Events Selected Searched: 25 OCT 1994 File: rec.rst By: jdjb

SOURCE DATABASE:
Root name: rec

Created: 11 APR 1994 14:15
By: jdjb
Original file: rec.dmp Type: ASCII Dump
Hypoctr rec: 31
Comment rec: 0
Time span: 1952 08 03 20:42:00.00 -> 1984 06 30 12:02:52.80

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31 Mag 1: -9.99 -> 9.99 Type: All
Lat: -90.000 -> 90.000 Mag 2: -9.99 -> 9.99 Type: None
Long: -180.000 -> 180.000 Intensity: 0 -> 12 Mode: 0
Depth: .00 -> 999.00 Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1	1952 AUG 03	20:42:00.00	36.500	-106.000	.00	4.33MIWC	.00	V	81	AS	...	...	.	.....	.....
2	1976 APR 24	08:24:42.61	35.704	-105.750	11.22	1.47MDLA	.00	..	56	LA	10	271	C	1.5	1.1
3	1976 MAY 26	07:10:39.55	36.709	-105.294	.00	.80MDGS	.00	..	136	GS	0	0	.	.0	.0
4	1976 JUN 01	16:39:58.73	36.522	-106.211	6.98	1.12MDLA	.00	..	78	WC	8	194	.	.0	.0
5	1977 JAN 03	01:02:36.50	36.450	-105.333	.00	1.50	.00	..	115	CA	...	...	.	.....	.....
6	1977 JUN 27	00:34:21.57	36.502	-105.401	10.00	1.15MDLA	.00	..	113	LA	10	310	D	1.5	173.8
7	1977 OCT 04	20:08:17.00	35.530	-105.420	.00	1.00	.00	..	91	JA	...	...	.	.....	.....
8	1977 NOV 06	12:21:39.40	36.733	-105.409	70.20	.50MDGS	.00	..	131	GS	0	0	.	.0	.0
9	1978 MAR 05	02:58:32.00	36.623	-105.476	15.00	.70	.00	..	118	CA	...	...	.	.....	.....
10	1978 MAR 08	17:07:30.20	36.401	-106.116	5.00	1.70	.00	..	67	CA	...	...	.	.....	.....
11	1978 MAR 19	22:51:46.10	36.188	-105.643	7.00	.50	.00	..	75	CA	...	...	.	.....	.....
12	1978 SEP 19	07:33:45.41	36.361	-105.547	9.27	1.67MDLA	.00	..	93	WC	7	235	.	.0	.0
13	1978 OCT 11	13:43:06.98	36.311	-106.050	10.12	1.18MDLA	.00	..	60	WC	13	101	.	.0	.0
14	1978 OCT 24	17:00:47.62	36.738	-105.449	9.48	1.84MDLA	.00	..	129	WC	15	270	.	.0	.0
15	1979 MAR 25	20:04:24.89	36.488	-105.340	6.87	.71MDLA	.00	..	117	WC	12	262	.	.0	.0
16	1979 AUG 12	13:03:50.30	36.346	-105.924	.00	.50	.00	..	69	NM	...	...	.	.....	.....
17	1979 OCT 19	00:07:24.00	36.411	-105.295	.00	.80	.00	..	115	NM	...	...	.	.....	.....
18	1979 DEC 15	01:18:11.70	36.250	-105.920	.00	.50	.00	..	61	NM	...	...	.	.....	.....
19	1980 MAY 23	03:51:14.40	36.586	-105.332	5.00	.60	.00	..	124	NM	...	...	.	.....	.....
20	1980 NOV 29	08:19:48.97	36.407	-105.519	14.85	1.70MDLA	.00	..	98	WC	17	240	.	.0	.0
21	1981 DEC 23	21:06:02.40	35.525	-105.657	5.00	.50	.00	..	71	NM	...	...	.	.....	.....
22	1982 MAR 02	16:05:21.23	35.891	-105.454	.28	2.56MDLA	.00	..	81	LA	20	239	D	2.9	2.2
23	1982 APR 18	05:46:16.07	35.876	-105.276	10.00	.82MDLA	.00	..	97	LA	12	302	D	1.1	176.5
24	1982 JUL 04	22:13:01.66	36.213	-105.859	4.60	1.30MDGS	.00	..	61	GS	3	0	d	.0	.0
25	1982 DEC 18	01:21:43.22	35.488	-105.396	5.81	1.72MDLA	.00	..	94	LA	8	309	D	5.9	6.3
26	1983 APR 25	08:05:18.80	36.723	-106.132	.00	1.00	.00	..	101	NM	...	...	B	.....	.....
27	1983 MAY 26	17:17:50.60	36.625	-105.318	.00	2.50	.00	..	128	NM	...	...	D	.....	.....
28	1983 JUN 11	18:01:57.70	35.684	-105.534	.00	.90	.00	..	76	NM	...	...	D	.....	.....
29	1983 OCT 17	23:56:53.50	36.645	-105.505	.00	1.60	.00	..	118	NM	...	...	C	.....	.....
30	1983 NOV 28	17:31:12.61	36.512	-105.967	13.95	1.67MDLA	.00	..	83	WC	9	175	.	.0	.0
31	1984 JUN 30	12:02:52.80	36.545	-106.219	5.64	1.75MDLA	.00	..	80	WC	11	134	.	.0	.0

APPENDIX E
HISTORICAL EARTHQUAKE CATALOGUE FOR THE GREAT PLAINS USED IN RECURRENCE

EARTHQUAKE DATABASE SEARCH

20 Events Selected   Searched: 25 OCT 1994   File: rec.rst   By: jdjb

SOURCE DATABASE:
Root name: rec

Created: 11 APR 1994 14:11
By: jdjb
Original file: rec.dmp   Type: ASCII Dump
Hypoctr rec: 20
Comment rec: 0
Time span: 1930 12 03 21:36:00.00 -> 1988 12 25 07:52:33.93

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31   Mag 1: -9.99 -> 9.99   Type: All
Lat: -90.000 -> 90.000   Mag 2: -9.99 -> 9.99   Type: None
Long: -180.000 -> 180.000   Intensity: 0 -> 12   Mode: 0
Depth: .00 -> 999.00   Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	Q	Std-Err Horiz	Std-Err Vert
1	1930 DEC 03	21:36:00.00	35.000	-106.400	.00	4.50MLAS	.00	VI	92	SA	...	...	.	.....	.....
2	1956 APR 26	03:30:00.00	35.100	-106.300	1.00	4.00	.00	V	81	AS	...	...	.	.....	.....
3	1975 JAN 03	12:33:13.00	35.266	-105.281	.00	1.70MDGS	.00	..	115	GS	0	0	.	.0	.0
4	1976 OCT 14	07:27:11.00	35.010	-105.850	.00	1.00	.00	..	102	JA	...	...	.	.....	.....
5	1978 OCT 10	17:56:06.50	35.038	-106.316	.00	1.10	.00	..	88	NM	...	...	.	.....	.....
6	1978 DEC 16	23:06:34.44	35.317	-106.126	3.78	1.57MDLA	.00	..	60	WC	8	209	.	.0	.0
7	1978 DEC 17	05:59:06.20	35.126	-106.283	.00	1.00	.00	..	78	NM	...	...	.	.....	.....
8	1978 DEC 17	16:13:02.30	35.077	-106.306	32.60	1.40MDGS	.00	..	84	GS	0	0	.	.0	.0
9	1978 DEC 29	20:44:50.18	35.174	-106.141	10.00	1.45MDLA	.00	..	75	LA	6	333	D	8.6	541.3
10	1979 JAN 12	23:08:17.01	35.258	-106.083	1.64	1.77MDLA	.00	..	68	LA	11	284	D	2.7	5.9
11	1979 FEB 06	19:00:38.00	35.158	-106.284	.00	1.00	.00	..	75	NM	...	...	.	.....	.....
12	1979 FEB 08	23:24:00.57	35.312	-106.122	3.13	1.33MDLA	.00	..	61	WC	18	192	.	.0	.0
13	1979 FEB 23	20:33:28.07	35.265	-106.129	20.42	1.54MDLA	.00	..	66	WC	11	243	.	.0	.0
14	1979 MAR 15	19:00:48.10	35.097	-106.347	.00	1.20	.00	..	81	NM	...	...	.	.....	.....
15	1979 AUG 17	09:38:20.00	35.015	-105.616	.00	1.20	.00	..	112	NM	...	...	.	.....	.....
16	1982 NOV 02	23:54:05.70	35.021	-106.255	5.00	1.20	.00	..	90	NM	...	...	.	.....	.....
17	1983 JUL 02	00:07:56.70	35.074	-106.170	.00	1.10	.00	..	85	NM	...	...	C	.....	.....
18	1983 AUG 09	00:36:08.30	35.087	-106.014	.00	1.00	.00	..	88	NM	...	...	C	.....	.....
19	1983 NOV 16	10:15:25.01	35.079	-105.998	10.00	1.50MDLA	.00	..	89	LA	6	301	D	3.0	57.8
20	1988 DEC 25	07:52:33.93	35.118	-105.957	.00	2.80MDSNM	.00	..	87	PE	14	...	.	.....	.....

APPENDIX F
EARTHQUAKE RECURRENCE PARAMETERS

TABLE F-1

RECURRENCE PARAMETERS FOR VARYING COMPLETENESS RANGES FOR EACH SEISMOTECTONIC PROVINCE AND CIRCULAR SOURCE REGION

Province or areal source	a- and b-values (± 1 s.d.) for $M_L \geq 0.5$ (No. of events)	a- and b-values (± 1 s.d.) for $M_L \geq 1.0$ (No. of events)	a- and b-values (± 1 s.d.) for $M_L \geq 1.5$ (No. of events)	a- and b-values (± 1 s.d.) for $M_L \geq 2.0$ (No. of events)	a- and b-values (± 1 s.d.) for $M_L \geq 2.5$ (No. of events)
Rio Grande Rift	-2.50, 0.68±0.04 (159)	-2.27, 0.80±0.05 (107)	-2.06, 0.89±0.08 (62)	-2.36, 0.79±0.11 (24)	-3.16, 0.79±0.11 (10)
Colorado Transition Zone	-2.27, 0.87±0.05 (183)	-2.02 1.04±0.09 (93)	-1.81 1.15±0.16 (39)	-1.90 1.11±0.26 (12)	(only 6 events)
Great Plains	not complete	-2.52, 0.83±0.13 (20)	-2.84, 0.70±0.16 (8)	(only 3 events)	(only 3 events)
Southern Rocky Mountains	-3.07, 0.69±0.09 (31)	-2.92, 0.77±0.13 (19)	-2.57, 0.93±0.21 (12)	(only 3 events)	(only 3 events)
Radius of 20 km	-2.59, 0.75±0.14 (13)	(only 10 events and 2 points)	(only 5 events)	(no events)	(no events)
Radius of 40 km	-2.42, 0.75±0.06 (78)	-2.15, 0.89±0.09 (49)	-2.03 0.95±0.14 (24)	-2.26 0.86±0.19 (9)	(only 4 events)
Radius of 60 km	-2.40, 0.78±0.04 (170)	-2.13 0.94±0.07 (101)	-2.10 0.96±0.10 (45)	-2.43 0.84±0.14 (16)	(only 7 events)
Radius of 80 km	-2.45, 0.81±0.04 (261)	-2.16 0.66±0.06 (152)	-1.98 1.07±0.10 (68)	-2.58 0.85±0.13 (19)	-2.67 0.82±0.17 (10)

TABLE F-2

ACTIVITY RATES COMPUTED FOR FIXED b-VALUES FOR VARYING COMPLETENESS RANGES FOR EACH SEISMOTECTONIC PROVINCE

Province	Activity Rates at M_W 5 using earthquakes of $M_L \geq 0.5$ ($\pm$ 1 std)	Activity Rates at M_W 5 using earthquakes of $M_L \geq 1.0$ ($\pm$ 1 std)	Activity Rates at M_W 5 using earthquakes of $M_L \geq 1.5$ ($\pm$ 1 std)
Rio Grande Rift (b=0.75)	6.28×10^{-7} (5.0×10^{-8})	8.26×10^{-7} (8.0×10^{-8})	8.72×10^{-7} (1.11×10^{-7})
Rio Grande Rift (b=0.85)	2.32×10^{-7} (1.8×10^{-8})	3.46×10^{-7} (3.3×10^{-8})	4.13×10^{-7} (5.2×10^{-8})
Rio Grande Rift (b=0.95)	8.4×10^{-8} (6.7×10^{-9})	1.43×10^{-7} (1.4×10^{-8})	1.92×10^{-7} (2.4×10^{-8})
Colorado Plateau (b=0.9)	1.76×10^{-7} (1.3×10^{-8})	2.12×10^{-7} (2.2×10^{-8})	1.96×10^{-7} (3.1×10^{-8})
Colorado Plateau (b=1.0)	6.38×10^{-8} (4.7×10^{-9})	8.67×10^{-8} (9.0×10^{-9})	8.99×10^{-8} (1.4×10^{-8})
Colorado Plateau (b=1.1)	2.30×10^{-8} (1.7×10^{-9})	3.53×10^{-8} (3.7×10^{-9})	4.09×10^{-8} (6.6×10^{-9})
Southern Rocky Mountains (b=0.7)	2.75×10^{-7} (4.9×10^{-8})	3.13×10^{-7} (7.2×10^{-8})	3.47×10^{-7} (1.0×10^{-7})
Southern Rocky Mountains (b=0.8)	1.02×10^{-7} (1.8×10^{-8})	1.31×10^{-7} (3.0×10^{-8})	1.63×10^{-7} (4.7×10^{-8})
Southern Rocky Mountains (b=0.9)	3.72×10^{-8} (6.7×10^{-9})	5.40×10^{-8} (1.2×10^{-8})	7.53×10^{-8} (2.2×10^{-8})
Great Plains (b=0.7)	not complete	6.56×10^{-7} (1.5×10^{-7})	4.58×10^{-7} (1.6×10^{-7})
Great Plains (b=0.8)	not complete	2.79×10^{-7} (6.2×10^{-8})	2.21×10^{-7} (7.8×10^{-8})
Great Plains (b=0.9)	not complete	1.17×10^{-7} (2.6×10^{-8})	1.05×10^{-7} (3.7×10^{-8})

TABLE F-3

RETURN PERIODS FOR A M 6.3 RANDOM EARTHQUAKE WITHIN THE RIO GRANDE RIFT PROVINCE WITHIN THE STUDY REGION

Activity rate	b = 0.65	b = 0.75	b = 0.85
Assigned Lower Bound	279 yrs	668 yrs	1679 yrs
Computed Mean (different for each b-value)	556 yrs	1334 yrs	3350 yrs
Assigned Upper Bound	1109 yrs	2723 yrs	6683 yrs

TABLE F-4

RETURN PERIODS FOR A M 6.0 RANDOM EARTHQUAKE WITHIN THE COLORADO PLATEAU TRANSITION ZONE WITHIN THE STUDY REGION

Activity rate	b = 0.8	b = 0.9	b = 1.0
Assigned Lower Bound	589 yrs	1820 yrs	5495 yrs
Computed Mean (different for each b-value)	1175 yrs	3631 yrs	10965 yrs
Assigned Upper Bound	2344 yrs	7244 yrs	22387 yrs

TABLE F-5

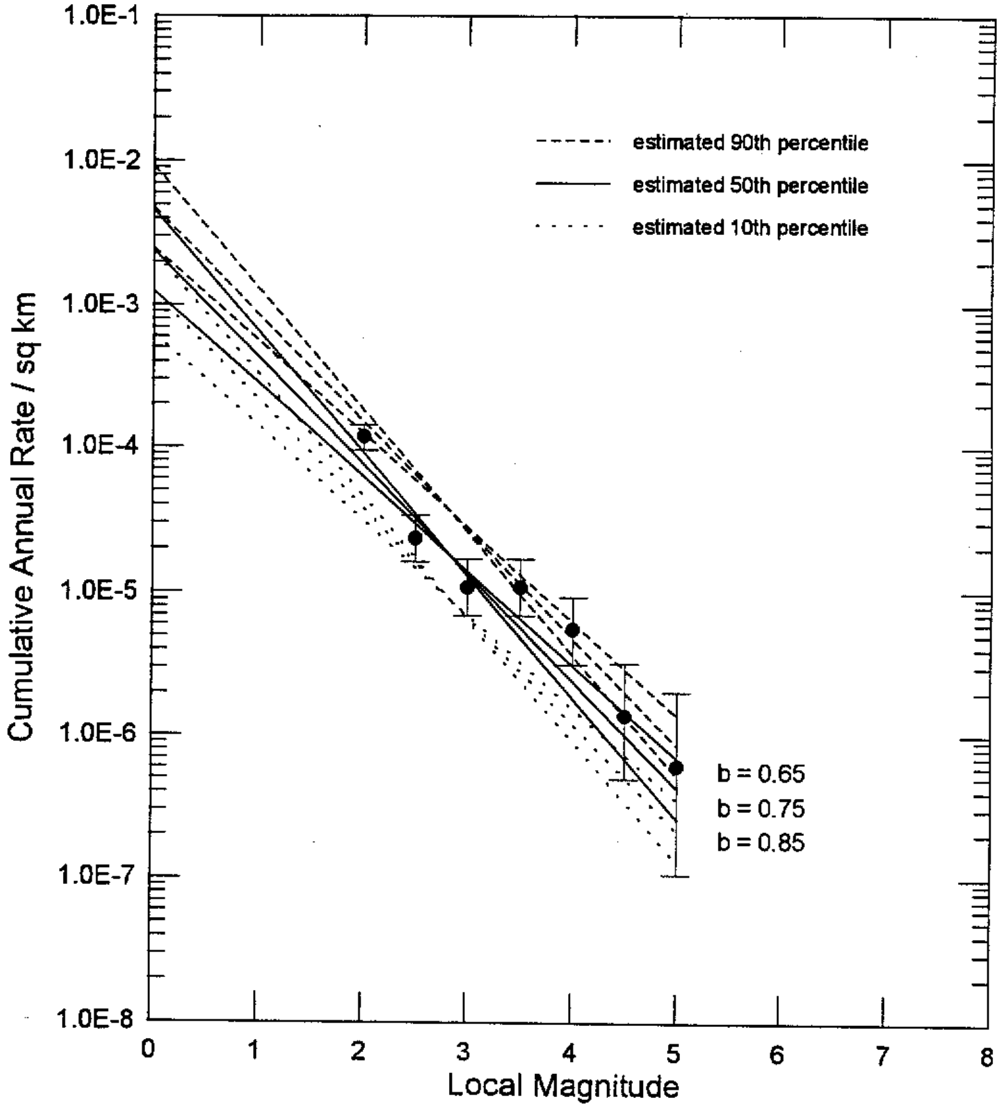
RETURN PERIODS FOR A M 6.3 RANDOM EARTHQUAKE WITHIN THE SOUTHERN ROCKY MOUNTAINS PROVINCE WITHIN THE STUDY REGION

Activity rate	b = 0.7	b = 0.8	b = 0.9
Assigned Lower Bound	1413 yrs	4074 yrs	11789 yrs
Computed Mean (different for each b-value)	2818 yrs	8318 yrs	23442 yrs
Assigned Upper Bound	5623 yrs	16595 yrs	46774 yrs

TABLE F-6

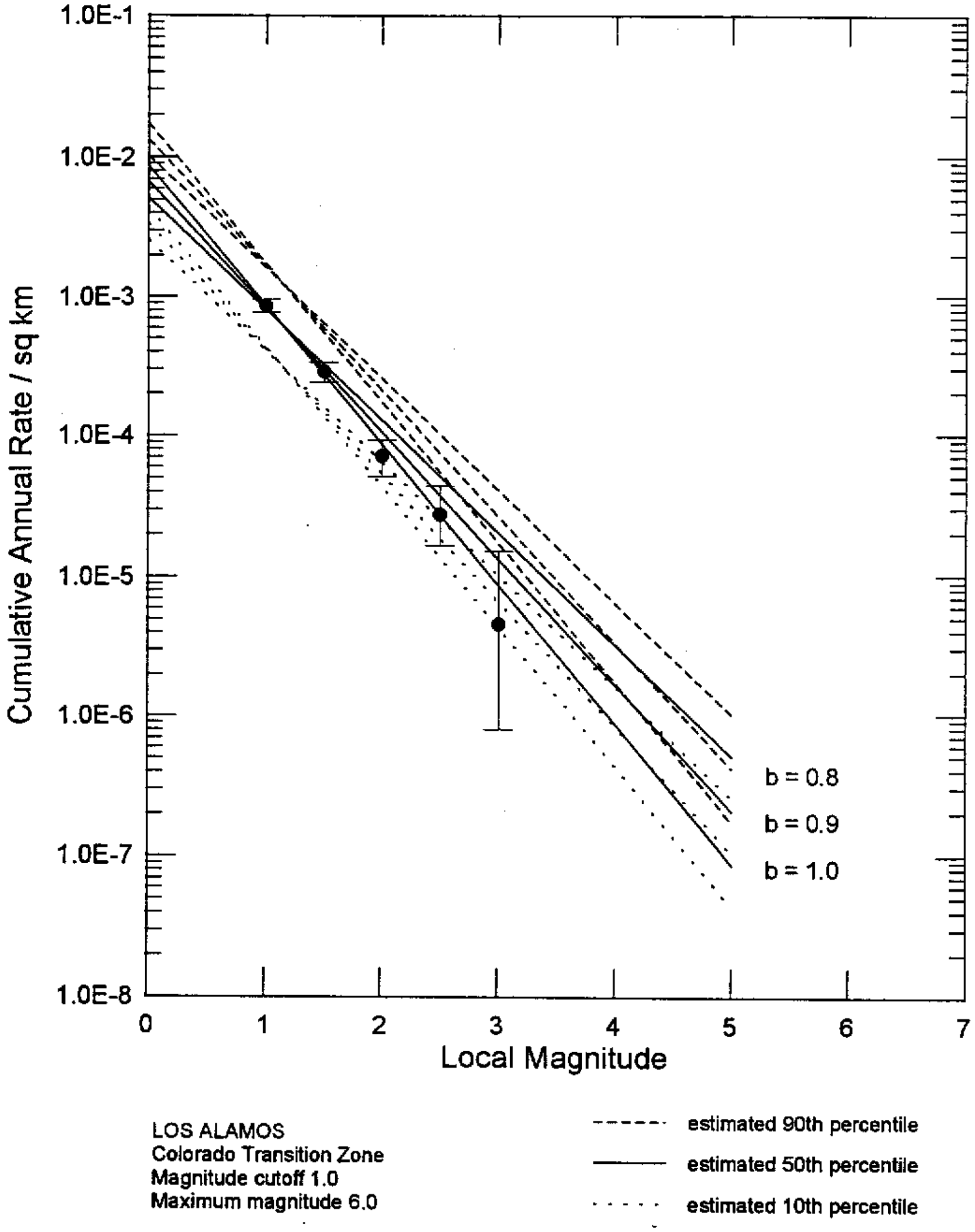
RETURN PERIODS FOR A M 6.0 RANDOM EARTHQUAKE WITHIN THE GREAT PLAINS PROVINCE WITHIN THE STUDY REGION

Activity rate	b = 0.6	b = 0.7	b = 0.8
Assigned Lower Bound	468 yrs	1175 yrs	3090 yrs
Computed Mean (different for each b-value)	933 yrs	2344 yrs	6310 yrs
Assigned Upper Bound	1862 yrs	4677 yrs	12303 yrs

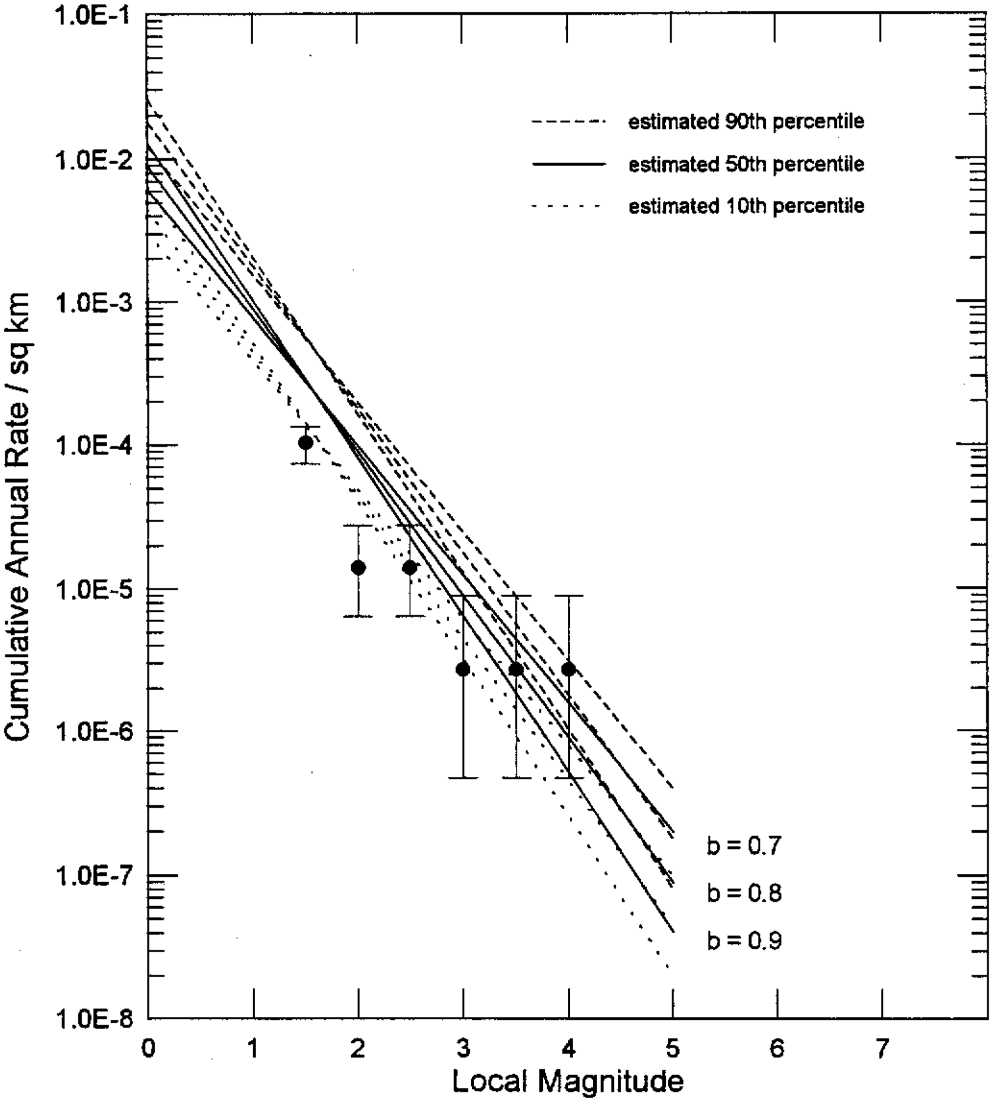


LOS ALAMOS
Rio Grande
Magnitude cutoff 2.0
Maximum magnitude 6.25

Project No. 91C0509	Los Alamos Seismic Hazards	RANGE OF RECURRENCE CURVES INCORPORATED INTO THE PROBABILISTIC ANALYSIS FOR THE RIO GRANDE RIFT	Figure F-1
Woodward-Clyde Federal Services			

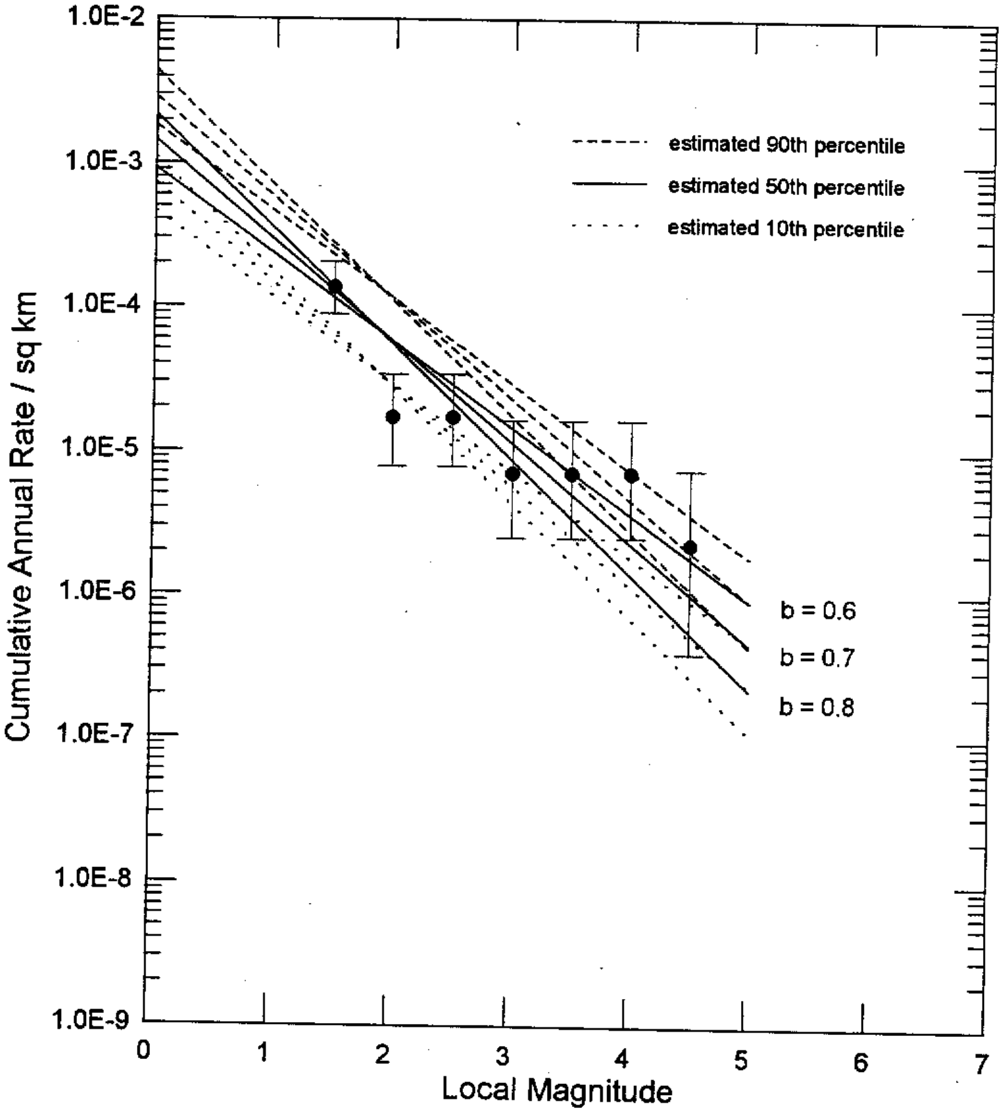


Project No. 91C0509	Los Alamos Seismic Hazards	RANGE OF RECURRENCE CURVES INCORPORATED INTO THE PROBABILISTIC ANALYSIS FOR THE COLORADO PLATEAU TRANSITION ZONE	Figure F-2
Woodward-Clyde Federal Services			



LOS ALAMOS
Southern Rocky Mountains
Magnitude cutoff 1.5
Maximum magnitude 6.25

Project No. 91C0509	Los Alamos Seismic Hazards	RANGE OF RECURRENCE CURVES INCORPORATED INTO THE PROBABILISTIC ANALYSIS FOR THE SOUTHERN ROCKY MOUNTAINS	Figure F-3
Woodward-Clyde Federal Services			



LOS ALAMOS
Great Plains
Magnitude cutoff 1.5
Maximum magnitude 6.0

Project No. 91C0509	Los Alamos Seismic Hazards	RANGE OF RECURRENCE CURVES INCORPORATED INTO THE PROBABILISTIC ANALYSIS FOR THE GREAT PLAINS	Figure F-4
Woodward-Clyde Federal Services			

APPENDIX G
LITHOLOGIC DESCRIPTIONS OF DEPOSITS EXPOSED IN TRENCHES

APPENDIX G
LITHOLOGIC DESCRIPTIONS OF DEPOSITS EXPOSED IN TRENCHES

DESCRIPTION OF COLLUVIAL WEDGE FORMATION

Large normal-faulting earthquakes in the Basin and Range province generally rupture to the surface producing fault scarps from 1 to as much as 6 m high. The initial geometry of the scarp is abrupt and highly angular, but degradation by surficial processes will rapidly erode the near-vertical free face of the scarp and, given at least many tens of thousands of years of quiescence on the fault, will completely obliterate all trace of scarp morphology (Wallace, 1977; Nelson, 1992). Sediments derived from both the fault scarp and from eolian influx are deposited at its scarp base in a wedge-shaped, fining-upwards sequence (Figure G-1) that can be divided into a proximal debris facies overlain by a generally more distal wash facies (Nelson, 1992; Forman et al., 1991). These genetic characteristics of colluvial wedges, described in more detail below, can be complicated or altogether eliminated by numerous tectonic and depositional factors (see McCalpin, 1987; Nelson, 1992).

Before the ground motion ceases, talus can begin to accumulate at the base of the free face (Nelson, 1992). This generally coarse material is comprised of blocks, fragments and a subordinate amount of loose sediment shed off of the free face by gravity-controlled processes (e.g., falling, toppling, slumping or sliding) (Wallace, 1977; McCalpin, 1987; Forman et al., 1991). These deposits tend to be poorly sorted, poorly stratified (Nelson, 1992) and have clasts that show complex patterns of preferred orientations, although clasts are dominantly deposited with the shortest axis perpendicular to the slope (McCalpin et al., 1993). In fact, McCalpin et al. (1993) found in his study of colluvial wedge fabrics that elongate clasts dominantly show a preferential alignment of long axes parallel or subparallel to the transport direction. This package of coarse material commonly tapers away from the fault and is referred to as the debris facies. The toe of the wedge is supported by sorted clasts that are imbricated parallel to the wedge surface (sorted-debris wedges) (Nelson, 1992). These deposits are generally mixed with and are gradational to the overlying wash facies deposits (Nelson, 1992; Forman et al., 1991).

After the free face has been buried by the proximal debris wedge and the scarp begins to erode to a gentler slope, commonly in 100 years or less, deposition changes from gravity-controlled processes to wash-controlled processes that include sheetwash, rill wash, and rain splash (Nelson, 1992; Forman et al., 1991). The change in the mode of deposition is accompanied by a marked decrease in the rate of deposition (Forman et al., 1991). The wash facies deposits are therefore influenced by eolian deposition, soil development and burrowing. The wash facies is better sorted and stratified, and composed of finer-grained sediment than the debris facies (McCalpin, 1987). The lower wash facies tend to be sandier than the upper wash facies sediment, but both may have scattered clasts and fragments as minor components.

Ideally, each successive faulting event creates a new free face that ravels to form a colluvial wedge over the wash facies of the pre-existing wedge. Thus, the number of events may be determined by identifying discrete fining-upwards packages of debris and wash colluvium that perhaps are capped by vesicular A horizons and other evidence of pedogenesis (soil development). In practice, complications in making these determinations can arise because climatic events can also result in deposition of a package of coarser colluvium, or events closely spaced in time may not allow enough time for soils to develop, particularly on steep slopes with coarse parent material. However, other lines of evidence can be used to help distinguish climatic-related deposits from those associated with surface-faulting events. The presence of fissures, fault terminations, and abrupt changes in fabric orientations of clasts at the base of a colluvial wedge may help to identify faulting-related deposits. Rejuvenation of the scarp free-face during a surface-faulting earthquake will result in a sudden increase in the slope angle, corresponding to an abrupt change in the preferential alignment of clasts to a more steeply dipping slope-parallel fabric at the base of the proximal debris facies relative to the underlying wash facies. Thus, where discernible, this abrupt change in fabric can be used to help distinguish colluvium associated with surface-faulting events from colluvium associated with climatic or other non-tectonic events. Complications may also arise in identifying events because the scarp is higher after each faulting event and successive colluvial wedges are deposited on steeper slopes resulting in wedges that are thinner and spread farther downslope than underlying wedges (Ostenaa, 1984). The genetic facies of these latter wedges may be less distinct and the only evidence of the associated events may be basal stone lines (McCalpin, 1987).

During the paleoseismic investigations at LANL, we differentiated deposits on the basis of depositional process and origin. In particular, we identified and described colluvial wedges associated with scarp-forming events along the Rendija Canyon fault and colluvial deposits that potentially may be colluvial wedges associated with surface-faulting events on the Pajarito fault. We also used colluvial-wedge thicknesses on the Rendija Canyon fault to estimate scarp height and displacement per event. Theoretical models of how normal fault scarps degrade (e.g., Nash, 1986) suggest that scarp heights are roughly twice the colluvial wedge thickness as long as slopes of surfaces offset are not too steep and recurrence intervals are not too short, resulting in thinner wedges (Ostenaa, 1984). Summary descriptions of stratigraphic units identified during the paleoseismic studies are presented in Tables G-1 through G-11.

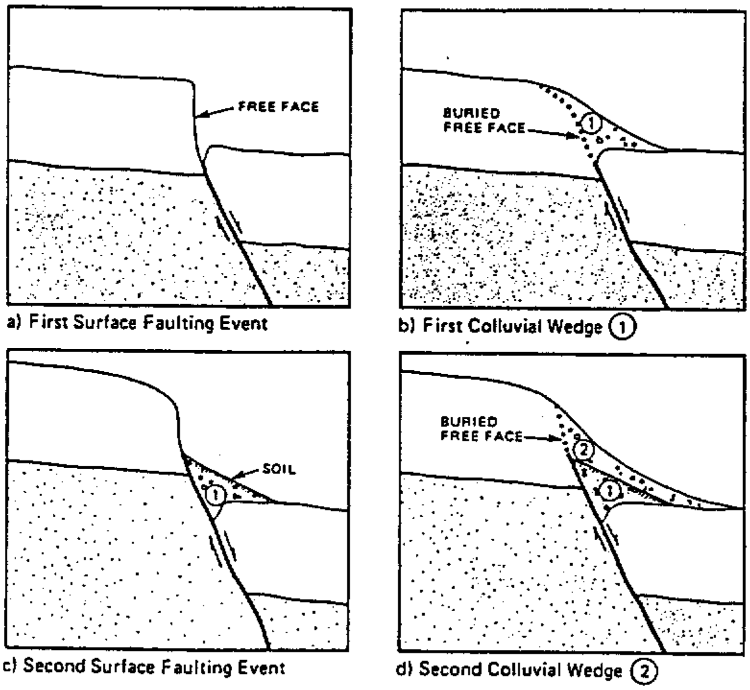


Figure G-1. Generalized diagram of colluvial wedge formation (from Schwartz and Coppersmith, 1984)

TABLE G-1. WATER CANYON TRENCH LITHOLOGIC DESCRIPTIONS (PLATE 5)

Stratigraphic Unit Color (Dry)	Description
1 10YR6/2 light brownish gray (matrix)	**Colluvium**; unsorted gravel; 95% cobbles and boulders, 5% matrix; rounded to subangular; randomly oriented; matrix supported; dominant clast size >0.8 m; approximately 60% tuff, 40% dacite; matrix consists of loose silt sand and gravel; lower contact appears diffuse and wavy; number of boulders and unit thickness decrease to the west.
2 7.5YR4/6 strong brown (matrix)	**Alluvium**; moderately- to poorly-sorted gravel; 70% cobbles and boulders, 30% matrix; rounded to subangular; randomly oriented; matrix supported; dominant clast size <0.8 m; approximately 80% tuff, 20% dacite; matrix consists of loose gravelly sand; lower contact appears diffuse and wavy; a dark brown (7.5YR3/4) clay coats under sides of clasts in the upper half of the unit.
3 10YR6/4 light yellowish brown (matrix)	**Alluvium**; moderately-sorted gravel; 80% pebbles, 20% sand and 10% cobbles; surrounded to subangular; dominant clast size <0.6 m; clast supported mixed with discontinuous zones of sandy matrix support or open framework; gravel are subangular to well rounded and poorly graded; lower contact appears diffuse and wavy; axes of elongated gravel and cobbles are typically orientated horizontally; unit thickens and sandy matrix content increases to the west.
5 10YR6/4 light yellowish brown (matrix)	**Alluvium**; moderately-sorted gravel; 50% cobbles, 50% pebbles, trace sand; rounded to subangular; framework supported; randomly oriented clasts; lower contact is gradual and smooth; the unit forms a lens.
6 10YR6/4 light yellowish brown (matrix)	**Alluvium**; moderately-sorted gravel; 70% cobbles, 20% pebbles, 10% sand; well rounded to subangular; matrix supported; matrix consists of loose sandy gravel; dominant clast size >0.6 m; approximately 50% tuff and 50% dacite; lower contact is diffuse and wavy.

7 10YR6/4 light yellowish brown (matrix)	**Alluvium**; moderately-sorted gravel; 80% gravel to small cobbles 20% sand; well rounded to subangular with most being subrounded to rounded; matrix supported; matrix consists of loose sandy gravel; lower contact is diffuse and smooth.
8 7.5YR4/6 strong brown (matrix)	**Alluvium**; moderately-sorted gravel; 90% fine pebbles to coarse sand, 5% cobbles, 5% clay; cobbles rounded to subrounded; pebbles are subangular to angular; matrix supported; dominant clast size <0.1 m; matrix consists of red brown clay; lower contact is gradual and smooth; axes of elongated cobbles are typically orientated horizontally; cobbles increase to the west.
9	**Alluvium**; well-sorted gravel; 70% gravel, 30% sand; well rounded to subangular; clast to matrix supported; dominant clast size <0.1 m; matrix consists of loose medium to coarse sand in discontinuous lenses; lower contact is clear and smooth.
9a	**Alluvium**; well-sorted gravel; 80% pebbles, 10% sand, 10% cobbles; well rounded to subrounded; framework supported; dominant clast size <0.3 m; lower contact is clear and wavy; thick clay accumulation separates Unit 9a from underlying Unit 6 between 14 and 16 meters.
9b	**Alluvium**; similar to 9a, but elongated cobbles locally lie horizontally along upper and lower contacts.
10	**Alluvium**; moderately-sorted gravel; 70% cobbles, 20% sand 10% gravel; well rounded to subangular; matrix supported; dominant clast size >0.6 m; matrix consists of loose gravelly sand.
11 7.5YR6/2 pinkish gray	**Colluvium**; moderately-sorted gravel; 80% pebbles, 10% cobbles, 10% sand; well rounded to subangular; matrix supported; dominant clast size <0.1 m; gradational matrix consists of loose coarse sand at the base to sandy silt near the top; cobble content increases to the west; lower contact is diffuse and wavy.
12 7.5YR6/4 light yellowish brown	**Colluvium**; silty sand; 60% silty sand, 30% cobbles and boulders, 10% clay; 90% tuff 10% dacite; subangular to angular; matrix supported; matrix consists of reddish brown clay; lower contact is gradual and wavy; as exposed, unit is locally confined to a depression between Stations 31 and 33.5 m.

13 10YR7/3 very pale brown	**Colluvium**; reworked tuff; 80% sand 20% boulders and tuff slabs; 100% tuff; angular; large tuff clasts are typically 0.8 m in diameter and supported by a coarse sandy matrix; upper 10 cm of the unit is a possible Btb soil horizon consisting of a sand containing common clay films, which impart a strong brown color (7.5YR 5/6); as exposed, unit is locally confined to a depression between Stations 31 and 33.5 m.
14	**Alluvium**; moderately- to poorly-sorted sand; 80% sand, 20% cobbles; well rounded to sub-angular clasts; dominant clast size <0.1 m.
15	**Colluvium**; reddish moderately-sorted silt; 70% silt; 20% sand; 10% gravel; dominant clast size <0.05 m.
16	**Colluvium**; gray silty sand, 80% sand; 30% gravel; 10% cobbles; clasts rounded; dominant clast size <0.1 m.

TABLE G-2. WATER CANYON TEST PITS 1, 2 & 3 LITHOLOGIC DESCRIPTIONS (PLATE 5)

Stratigraphic Unit Color (Dry)	Description
TP1-1 7.5YR6/0 gray	**Colluvium and Loess**; silt; homogeneous; weakly coherent and nonstratified; lower contact is gradual and wavy.
TP1-2 7.5YR3/4 dark brown	**Bt soil horizon**; silty clay; contains occasional mottled red stains; lower contact is gradual and smooth.
TP1-3 10YR4/6-5/8 dark reddish brown yellowish brown	**Colluvium**; silty sand to sandy silt; nonstratified; contains very few flat, angular, tuff pebbles and few to many, 10YR 4/6, El Cajete pumice clasts; pumice concentrate near the base; lower contact is clear and smooth.
TP1-4 5YR4/4 reddish brown	**Alluvium**; sandy gravel; dominant clast size <0.2 m with few up to 0.6 m; predominately rounded with some 5YR 4/4 angular clasts; clasts are typically tuff with some dacite and few pumice.
TP2-1 4YR4/4 reddish brown	**Colluvium and Loess**; similar to TP1-1 description.
TP2-2 7.5YR3/4 dark brown	**Bt soil horizon**; similar to TP1-2, but contains El Cajete pumice clasts.
TP2-3 10YR4/6-5/8 dark reddish brown yellowish brown	**Colluvium**; similar to TP1-3.

TP3-1 7.5YR6/0 gray	**Colluvium and Loess**; similar to TP1-1, but contains El Cajete pumice clasts.
TP3-2 7.5YR5/4 brown	**Colluvium**; clayey silt; nonstratified; mottled with dark brown, 7.5YR 3/4; lower contact gradual and smooth.
TP3-3 7.5YR5/8 yellowish red	**Colluvium**; silt; dark brown and yellow laminations; platy structure; lower contact gradual and smooth; 7.5YR 5/8 thickens to the west.
TP3-4 7.5YR5/6 yellowish red	**Alluvium**; sandy gravel, dominant clast size <0.4 m with some up to 0.6 m; angular to subangular tuff, with 7.5YR 5/6 most elongated; matrix supported; matrix consists of silty sand; unit fines upward with basal clasts yellowish crudely imbricated to the east; lower contact gradual and smooth.
TP3-5 10YR4/6-5/8 dark reddish brown yellowish brown	**Alluvium**; similar to TP1-3, but contains no pumice clasts.
TP3-6 7.5YR3/4 dark reddish brown	**Alluvium**; sandy gravel; dominant clast size <0.3 m with some up to 0.6 m; 90% tuff, 10% dacite; most are 7.5YR 3/4 angular to subangular and elongated; basal clasts crudely imbricated to the east.

TABLE G-3. WATER TANKS TRENCH 1 LITHOLOGIC DESCRIPTIONS (PLATE 6)

Stratigraphic Unit Color (Dry)	Description
1a 7.5YR5/4-5/6 brown to strong brown (matrix)	**Debris colluvium (tectonic?)**; poorly-sorted gravel; 90% cobbles and few boulders, 10% silty sand; clasts are 100% tuff, most angular and elongated; unit dips to the west and becomes progressively steeper to the west; discontinuous $CaCO_3$ coatings; dominant clast size 0.6 m; matrix supported; matrix consists of loose, slightly effervescent, silty sand.
1b 10YR5/4 yellowish brown (matrix)	**Colluvium/fissure fill**; sandy gravel; 40% pebbles and cobbles, 60% matrix; fining upward with elongated and angular base clasts near vertically oriented, 100% tuff; dominant clast size <0.6 m; matrix supported; matrix consists of loose silty sand; lower contact is gradual and smooth.
2 7.5YR4/4 brown to dark brown	**Colluvium/fissure fill**; silty sand with gravel; 50% sand, 30% gravel, 10% silt, 10% clay; sand is fine to medium grain; gravel is generally <0.2 m, angular and some elongated; elongated clasts are near vertical and matrix is looser near the base.
3 7.5YR4/6 strong brown	**Debris colluvium (tectonic?)**; poorly-sorted gravel; 80% gravel, 10% silt, 10% clay; clasts are 100% tuff, angular, frequently elongated and discontinuously coated with $CaCO_3$; orientation rotates from near vertical to slope parallel to the east; matrix supported; matrix consists of loose clayey silt; very slightly effervescent; lower contact gradual and smooth.
5a 7.5YR4/4 brown to dark brown	**Colluvium (tectonic?)**; moderately- to poorly-sorted clayey gravel; 60% gravel, 15% silt, 15% clay, 10% sand; clasts are angular, commonly <0.6 m, occasionally up to 0.2 m, 100% tuff, discontinuously coated with $CaCO_3$, slope-parallel; $CaCO_3$ seam divides unit; matrix supported; matrix consists of clayey silt; clay content decreases from top to bottom as sand content increases; clay films are evident in the upper half of the unit; lower contact is gradual and wavy.

5b 5YR4/4 reddish brown	**Colluvium (tectonic?)**; moderately- to poorly-sorted clayey gravel; 70% gravel, 20% clay, 10% silty sand; dominant clast size 0.3 m; most are elongated, angular, 100% tuff; elongated clasts are slope parallel; matrix supported; matrix consists of silty clay; well developed clay films completely cover grains and locally imparts blocky structure; lower contact is gradual and wavy; elongated cobbles and chroma decrease to the east, downslope.
6 7.5YR5/4 to 4/6 brown to strong brown	**Colluvium**; moderately- to poorly-sorted silty gravel; 50% gravel, 20% silt, 10% sand, 10% clay; dominant clast size <0.05 m with few >0.3 m; clasts are angular, often elongated, 100% tuff, generally slope parallel and matrix supported; matrix consists of sandy silt with clay; chroma generally increases downslope; lower contact is gradual and smooth; surface may be offset along $CaCO_3$ filled fractures that are difficult to follow within the unit.
10 7.5YR5/4 brown	**Colluvium**; moderately-sorted silty gravel; 70% gravel, 25% silt, 5% fine sand; clasts are 100% tuff with most <0.1 m; matrix supported; matrix consists of sandy silt; lower contact is gradual and smooth.
11 7.5YR4/6 strong brown	**Colluvium (tectonic?)**; moderately- to poorly-sorted silty gravel; 70% gravel, 15% silt, 10% sand, 5% clay; dominant clast size <0.05 m; clasts are subangular tuff becoming fewer to the east; suggestion of a stone line occurs at the base; matrix supported; matrix consists of silty sand; contact with lower unit is gradual and smooth; the unit is offset along 3 vertical $CaCO_3$-filled fractures at the east end of the trench.
12 7.5YR5/6 strong brown	**Colluvium**; gravelly silt 40% silt, 30% gravel, 25% fine sand, 5% clay; clasts are 100% tuff, frequently elongated, angular, slope parallel, commonly <0.2 m with few >0.4 m; matrix supported; matrix consists of sandy silt with suggestion of subangular to prismatic structure; contact with lower unit is gradual and smooth; offsets occur at the east end along 3 vertical $CaCO_3$-filled fractures.

13 7.5YR5/4 brown	**Colluvium**; moderately- to poorly-sorted silty gravel with sand; 45% gravel, 30% silt, 20% sand, 5% clay; dominant clast size <0.1 m; clasts are 100% tuff, commonly, elongated, slope parallel and decrease in number to the east away from the fault; matrix supported; matrix consists of sandy silt and commonly contains roots and root pores; clast size fines to the east with increased clay imparting a darker color (7.5YR 4/6) and platy to angular blocky structure; contact with lower units is clear and smooth with 3 apparent offsets occurring along $CaCO_3$-filled fractures that originate below and terminate without offset at the top of the unit.
14 10YR5/1-5/2 dark yellowish brown (moist)	**Mottled buried soil in colluvium**; well-sorted sandy silt; mottled color; zone of aeration; iron stains abundant at the base; appears modified by vadose zone processes such as water ponded at a permeability contrast; contact with lower unit is clear and smooth.
15 10YR6/6 brownish yellow (moist)	**El Cajete pumice deposit (air fall?)**; well-sorted gravel; 95% gravel, 5% clay; dominant clast size <.06 m; clasts are 100% pumice fragments that contain abundant biotite, indicative of the El Cajete Pumice; homogeneous and unstratified; dark reddish clay (5YR 3/4) forms common thin coatings and concentrations along bands or lamellae; roots concentrate along the lower, clear and smooth contact; thickness increases to the east with decreasing slope; sorting, lithology, texture, and stratification suggest that this unit is probably a primary air-fall deposit; alternatively, there is a small possibility that the pumice fragments have been reworked as colluvium.
16 5YR3/4 dark reddish brown (moist)	**Colluvium/reworked pumice**; clayey silty gravel similar to Unit 15, but with more matrix and an increase of 10% clay; clay films are many and thin, imparting a platy structure; $CaCO_3$ stringers concentrate along the lower, clear and smooth contact; unit is highly disrupted by bioturbation.
17 7.5YR3/4 dark brown (moist)	**Bt soil horizon/colluvium**; Clay with gravel; 60% clay, 40% gravel; gravel are subangular pumice with dominant clast size <.06 m; most have thick continuous clay films; clay decreases downward; lower contact is clear and wavy.

18 10YR3/3-3/2 grayish brown (moist)	**Colluvium with A soil horizon** ; silt with gravel; 15% gravel 65% silt 5% sand 15% organics; 5% of gravel contains clasts >0.3 m angular, elongated, 100% tuff, slope parallel and become fewer to the east, downslope; matrix is composed of a silt, which becomes darker (10YR 2/3 moist) where this unit overlies Unit 15; includes small pockets of silt at the base near Stations 3 to 4 m and Stations 9 to 10 m, that may be deposits of primary loess; contact with lower unit is gradual and smooth.
Qbt	**Bandelier Tuff**; flesh to pinkish, coarsely crystalline, moderately welded.

TABLE G-4. WATER TANKS TRENCH 2 LITHOLOGIC DESCRIPTIONS (PLATE 6)

Stratigraphic Unit Color (Dry)	Description
1	**<u>Colluvium</u>**; moderately-sorted gravel with silt and sand; 60% gravel, 30% sand, 10% silt; dominant clast size <0.08 m with few up to 0.4 m; clasts are angular tuff; matrix supported; matrix consists of loose granular sandy silt.
2	**<u>Colluvium</u>**; poorly-sorted sand with silt and gravel; 45% sand, 30% silt, 20% gravel, 5% clay; dominant clast size < 0.05 m with some up to 2.0 m; 100% tuff; fines away from the fault; towards the fault, boulders comprise 30% of the volume with many weathered, soft and slightly iron stained; matrix supported; matrix consists of loose, granular, sandy silt with clay; clay imparts a reddish color; contact with the lower unit is clear and smooth.
3	**<u>Colluvium/fissure fill</u>**; similar to Unit 4; unsorted gravel with sand; 70% gravel, 30% sand; dominant clast size >0.4 m with some up to 1.5 m; angular to subangular tuff clasts; predominately clast supported with open framework; where present, matrix consists of loose sand.
4	**<u>Debris colluvium (tectonic?)</u>**; unsorted gravel with sand; 70% gravel, 30% sand; dominant clast size >0.4 m with some up to 1.5 m; angular to subangular tuff clasts; clast to matrix supported; matrix consists of loose sand containing abundant, powdery Stage III to IV $CaCO_3$; unstable and susceptible to caving.
5	**<u>Debris colluvium (tectonic?)</u>**; similar to Unit 4; unsorted gravel with sand; 80% gravel, 20% sand; dominant clast size >0.6 m with some up to 2.0 m; angular to subangular tuff clasts; clast to matrix supported; matrix consists of loose sand and Stage II to III $CaCO_3$.
6	**<u>Colluvium/colluvial wedge(?)</u>**; unsorted gravel with sand; 70% gravel, 30% sand dominant clast size >0.4 m; angular to subangular tuff clasts with some elongated; elongated clasts are concentrated at the distal end and near slope parallel; matrix supported; matrix consists of sand.

7	**Colluvium**; poorly-sorted silty gravel with sand; 45% gravel 30% silt, 20% sand, 5% clay; dominant clast size <0.05 m with few up to 2.0 m; 100% tuff, angular to subangular with some elongated; fines to the east away from the fault; clast orientation varies from random to slope parallel; matrix supported; matrix consists of loose sandy silt with clay; clay imparts a reddish yellow color; contact with the lower unit is clear and smooth.
8	**Colluvium**; poorly-sorted silty gravel with sand; 45% gravel 30% silt, 20 % sand, 5% clay; dominant clast size <0.05 m with few up to 2.0 m; 100% tuff, angular to subangular with some elongated; clast orientation varies from random to slope parallel; matrix supported; matrix consists of loose sandy silt with clay.
9	**Colluvium**; poorly-sorted clayey gravel with sand; 40% gravel 30% sand, 20% silt, 10% clay; dominant clast size <0.1 m with few up to 0.4 m; 100% tuff; angular to subangular with some elongated and typically slope parallel; matrix supported; matrix consists of sandy silt with clay; many, moderately thick clay films coat grains; clay imparts a reddish color; contact with lower unit is clear and smooth.
10	**Colluvium**; moderately- to poorly-sorted silty sand with gravel; 40% sand, 30% gravel, 30% silt; dominant clast size <0.01 m with few up to 0.3 m; 100%tuff, angular to subangular with some elongated; elongated clasts concentrate along the slope parallel lower contact; matrix supported; matrix consists of a loose, homogeneous silty sand; lower contact is clear and smooth.
11	**Colluvium**; moderately- to poorly-sorted gravel with sand and silt; 60% gravel, 30% sand, 10% silt; dominant clast size <0.3 m with few up to 1.0 m; 100% tuff, angular to subangular with some elongated and slope parallel; fines away from the fault; matrix supported; matrix consists of sandy silt; lower contact is clear and smooth.
12	**Colluvium**; moderately- to poorly-sorted sand with silt and gravel; 80% sand, 10% silt, 10% gravel; dominant clast size <0.05 m with few up to 0.6 m; 100% tuff, angular to subangular; fines away from the fault.

13	**Mottled buried soil in colluvium**; sandy silt; mottled color; zone of aeration; iron stains abundant at the base; appears modified by vadose zone processes such as water ponded at a permeability contrast; exhibits large (+/- 0.1 m) platy to blocky structure at distal end; contact with lower unit is clear and smooth to gradual and wavy.
14	**El Cajete pumice deposit (air fall?)**; moderately-sorted gravel; 95% gravel, 5% clay; dominant clast size <.06 m clasts are 100% pumice fragments that contain abundant biotite, indicative of El Cajete Pumice; homogeneous and unstratified; dark reddish clay (5YR 3/4) forms common thin coatings and concentrations along bands or lamellae; roots concentrate along the lower, clear and smooth contact which is; thickness increases to the east with decreasing slope; lithology, sorting, stratification, and texture suggest that this unit is probably a primary air-fall deposit, alternatively, there is a small possibility that the pumice fragments have been reworked as colluvium; includes a thin, variable and discontinuous A horizon of the modern soil.
Qbt	**Bandelier Tuff**; flesh to pinkish, coarsely crystalline, moderately welded.

TABLE G-5. PAJARITO CANYON TRENCH LITHOLOGIC DESCRIPTIONS (PLATE 7)

Stratigraphic Unit Color (Dry)	Description
1 10YR5/2 grayish brown	**Colluvium**; silt; 60% silt, 30% roots, 10% gravel; dominant clast size <0.1 m occasionally up to 0.3 m; 80% dacite 20%, tuff; loam to silty loam; loose; granular; nonsticky and nonplastic; lower contact is clear and wavy.
2 10YR7/3 very pale brown	**Loess and Colluvium**; Silt with gravel; 65% silt, 30% fine gravel, 5% organics; dominant clast size <0.05 m occasionally >0.2 m; angular to subrounded, some elongated; 90% dacite, 10% tuff; matrix supported; matrix consists of a nonsticky and nonplastic, moderate platy to granular silt loam; fines away from the fault to the east; lower contact is clear and wavy.
3 5YR3/4 dark reddish brown	**Colluvium**; clay to clayey gravel; dominant clast size <0.01 m with few up to 0.9 m; matrix supported; matrix is sticky and very plastic clay with a weak blocky structure; lower boundary is gradual and smooth. Contains buried pedogenic Bt horizon.
4 7.5YR4/4 brown to dark brown (moist)	**Loess**; sandy clayey silt; 50% silt, 20% clay, 20% sand, 10% gravel; clasts are 90% tuff, 10% dacite; matrix supported; matrix consists of moderately blocky, slightly sticky and plastic, clay loam; lower contact is clear and smooth, contains a buried pedogenic Bt horizon.
5 5YR3/4 dark reddish brown	**Alluvium and Colluvium**; slightly-sorted silty sand with gravel; 40% silt, 25% gravel, 20% sand, 15% clay dominant clast size <0.01 m with some up to 0.2 m; angular; 90% tuff, 10% dacite; matrix supported; matrix consists of silty sand; strong prismatic to angular blocky structure; clay coats ped surfaces and fills fractures; lower contact is clear and smooth; thins to the east and west; cobbles increase to the west. Contains a buried pedogenic horizon.

6 5YR4/4 to 7.5YR4/6 reddish brown to strong ground	**Alluvium**; moderately-sorted gravel; 90% gravel, 5% sand, 5% silty clay; dominant clast size 0.2 m with few up to 1.0 m; subangular to subrounded with some elongated and sub-horizontally imbricated; 70% tuff, 30% dacite; matrix supported; matrix consists of sand and silt; lower boundary is clear and smooth.
7 7.5YR5/6 strong brown	**Colluvium/slopewash**; moderately-sorted sand with gravel; 40% sand, 30% gravel, 25% silt, 5% clay; dominant clast size <0.01 m with few >0.4 m; 70% tuff, 30% dacite; subangular to subrounded; matrix supported; matrix consists of sandy silt; lower contact is clear and smooth.
8 10YR4/6 to 5YR4/4 strong brown to reddish brown	**Loess and Colluvium**; moderately-sorted sandy silt; 80% very fine sand to silt, 10% clay, 5% gravel, 5% coarse sand; nonsticky and nonplastic sandy loam; coarse subangular blocky to prismatic structure; thins to the west, towards the fault; possible stone line at the upper contact, contains buried pedogenic Bt horizon.
9 5YR3/4 to 7.5YR5/4 dark reddish brown to brown	**Colluvium/slopewash**; unsorted silty sand with gravel; 40% sand, 30% silt, 20% gravel, 10% clay; gravel content increases to 40% in pods; dominant clast size <0.01 m; 95% tuff, 5% dacite; nonsticky nonplastic; moderate angular blocky structure; thins to the east and west
10 7.5YR6/4 light brown	**Alluvium/debris-flow deposit (?)**; unsorted gravel; 60% gravel 20% silt, 15% sand; 5% clay; 80% dacite, 20% tuff; dominant clast size >0.6 m with some up to 2.0 m; rounded to subrounded; cobbles and boulders increase towards the fault; matrix supported although some clasts are in contact; matrix consists of loose well graded sand and silt with iron staining and some clay coatings; noticeably coarser than Unit 11; thins and fines away from the fault; lower contact is diffuse and smooth.

11 7.5YR5/6 strong brown	**Alluvium/debris-flow deposit (?)**; unsorted gravel; 85% gravel, 10% sand, 5% clay; dominant clast >0.3 m with some up to 1.5 m; 70% dacite, 30% tuff; rounded to subrounded; subangular clasts present but rare; moderate imbrication primarily in cobbles; matrix supported; matrix consists of loose, fine to coarse graded sand; thick clay films coat most clasts and commonly grains.
12a	**Bandelier Tuff**; flesh to pinkish color; coarsely crystalline; 10% pumice clasts, most <0.01 m; 10% lithics, most <0.01 m; nonwelded, moderately friable; 0.01 vertical seam/fracture at 22 m contains granular, $CaCO_3$ rich filling; other vertical fractures between 22-23 m are narrower and iron stained.
12b 7.5YR7/6 dry reddish brown	**Pyroclastic deposit/tuff (?)**; 50% very fine sand, 30% coarse crystals, 20% pumice, trace lithics;
12c	**Surge deposit**; sub-horizontal bedding; dark reddish brown irregular clay seam separates Units 12b and 12c.
12d	**Pyroclastic or Eolian deposit**; 40% subangular to rounded tuff clasts, most <0.01; 15% crystal fragments, 10% pumice, 35% very fine sand; tan to fleshy pink; contains reddish brown clay seams along subhorizontal partings/fractures.
12e	**Pyroclastic deposit**; possible flow(?), lahar(?), reworked (?); similar to 12b, but contains larger lithic and pumice clasts; grain supported; angular to subrounded; clay films along vertical partings, seams and filling wider vertical fractures (5YR 4/4, red brown).
13 7.5YR6/4-5/6 light brown to strong brown	**Alluvium/inset channel deposit**; moderately-sorted sand and gravel; cobbles up to 0.8 m; 80% tuff, 20% dacite; subangular to rounded; matrix supported; matrix consists of well-sorted medium coarse sand and fine gravel, most subrounded; moderate to strong cementation; many clay films coat grains and occasionally form bridges; cobbles become infrequent at the west end; roots common in the upper third of the unit.

14a 10YR7/3 very pale brown	**Graben-fill deposit**; moderately-sorted silty to very fine sand; angular blocky structure; common clay films on ped surfaces; infrequent gravel and cobbles; lacks apparent bedding; appears massive and homogeneous; root casts or vesicles are fine and common; fractured to locally highly sheared; MnO_2 occasionally coats ped faces.
14b 10YR7/3 very pale brown	**Graben-fill deposit**; similar, but distinct from 14a by coarser sand, lighter color, higher density, greater silt content in matrix, blocky structure and less shearing; it defines three west-dipping pods that probably represent bedding.
15 7.5YR5/6 strong brown	**Colluvium**; unsorted silty sand with gravel; 70% silty sand, 30% gravel and cobbles; angular to subangular clasts.
16	**Colluvium**; unsorted gravel with sand and silt; 60% gravel and cobbles 40% sand and silt; angular to subangular clasts; elongated clasts are west dipping and imbricated; thins and fines to the east.
17	**Alluvium/debris-flow deposit (?)**; unsorted sandy and cobbles gravel; 60% gravel, 20% silt, 15% sand, 5% clay; 80% dacite, 20% tuff; dominant clast size >0.6 m, some up to 2.0 m; rounded to subrounded cobbles and few boulders; matrix supported; matrix consists of loose unsorted sand and silt with some clay coatings (strong brown 7.5YR 4/6); noticeably coarser than Unit 11; thins away from the fault; lower contact is diffuse and smooth.
18 7.5YR3/4 dark brown	**Alluvium/channel deposit**; similar to 13, contains less clasts and overall appears to be finer grained.

TABLE G-6. GUAJE PINES TRENCH 1 (GPT1) LITHOLOGIC DESCRIPTIONS (PLATE 8)

Stratigraphic Unit Color (Dry)	Description
1 10YR5/3 yellowish brown	**Colluvium**; silt with trace of sand and gravel; few angular pebbles; rare round pebbles; hint of platy structure at the base; very loose; abundant roots; number and size of gravel increases to east; contact with lower Unit 2 gradual and smooth; contact with Unit 12 clear wavy; flatter areas to the west disturbed by plowing, may contain substantial loess component.
2a 7.5YR4/4-5/4 brown to dark brown	**Bt soil horizon**; well-sorted silt with clay; trace of sand, few pebbles and cobbles up to 0.8 m; 50% tuff, 50% dacite; number and size of clasts increase to the east; subrounded with dominant clast size <0.1 m; randomly distributed; thin continuous clay films coat gravel; silt matrix contains sufficient clay to impart sticky and plastic consistence; angular blocky structure; lower contact is gradual irregular; unit terminates in the east at the fault and pinches out over Unit 2b to the west.
2b 7.5YR6/4 to 7/8 light brown to strong brown	**Alluvium/loess**; silt with trace of sand and gravel; few roots; angular blocky to massive structure; vesicular; contact with Unit 3 abrupt and smooth, with Unit 5, gradual smooth, may contain substantial loess component.
3 10YR7/2 light gray (upper) 7.5YR4/6 (lower)	**Alluvium**; silt with traces of sand clay and gravel; gravel are subangular with most less than 0.1 m; few clay films on fractures; gravel content increases toward the fault; subdivided into Units 3x and 3y in the east; contact with Units 5 and 4b is gradual and wavy.
3x	**Colluvium**; poorly-sorted silty gravel; 60% gravel, 35% silt, 5% clay; dominant clast size <0.7 m; subangular to subrounded; 90% dacite, 10% tuff; mottling associated with variable clay content; lower contact is gradual and wavy.

3y	**Colluvium**; moderately- to poorly-sorted gravelly silt with clay; 30% gravel, 65% silt, 5% clay; angular to subrounded dacite and tuff clasts, commonly <0.1 m with some >0.2 m; matrix supported; reddish brown mottling 5YR 4/4; clay films coat vesicles, pores, ped faces, and gravel.
3z	**Fissure fill**; poorly-sorted gravelly silt with clay and sand; 50% silt, 40% subangular to subrounded gravel, 5% sand, <5% clay; similar to Unit 8; clay forms thin coats on clasts and ped surfaces; matrix supported; matrix consists of silty gravel with clay; east half contains more gravel and less clay; west half is more clayey and redder; contains less gravel and appears slightly darker than Btb of Unit 5a.
4a 7.5YR4/6 to 4/4 brown to strong brown	**Colluvium/alluvium**; moderately- to poorly-sorted gravel with silt; gravel is 90% dacite, 10% tuff with some angular pumice; subangular to rounded; contains occasional cobbles, most <0.2 m; matrix supported; matrix consists of coarse sand cemented with clay (10YR 4/6); clay films are common, thin to moderately thick coatings on gravel; sandy lenses are very fine to coarse and well sorted; no bedding observed; few fractures contain $CaCO_3$; lower contact with Unit 4d is gradational, and with Unit 4b is gradual and wavy.
4b	**Alluvium**; poorly-sorted gravel with sand; 80% gravel, 20% sand; gravel consists of 40% boulders from 1.0 m to 2.5 m most are rounded dacite and 40% subangular to rounded cobbles and pebbles, 80% tuff, 20% dacite; few tuff clasts are oxidized; matrix supported; matrix consists of gravelly silty sand; contact with 4c is abrupt and smooth.
4c 7.5YR4/6 strong brown (moist)	**Alluvium**; moderately- to poorly-sorted sandy gravel; 95% rounded, pebbly gravel; most clasts are < 0.3 m; matrix supported; matrix consists of sticky and plastic, sandy clay to clayey sand.
4d	**Colluvium**; poorly-sorted silty gravel; 50% boulders up to 1.5; few cobbles; subrounded to rounded; 80% dacite 20% tuff; matrix supported; matrix consists of silt with clay and sand; 35% silt, 10% sand and 5% clay; clay films are thin, common coatings on clasts and ped surfaces.

5 7.5YR4/4 brown	<u>**Alluvium**</u>; moderately- to poorly-sorted gravelly silt with clay; gravel consists of subangular to rounded clast <0.2; 60% dacite 40% tuff and some angular pumice; gravel increases to 80% at the west end forming a stone line at the upper contact; matrix supported; matrix consists of silty, clayey sand to clayey sandy silt; mottled by 7.5YR 6/4 sand; fines downward and eastward; clay films are common on angular blocky ped faces, pores and grains; lower contact is gradual and irregular.
5a 5YR4/4-4/6 reddish to yellowish brown	<u>**Btb soil horizon**</u>; moderately-sorted clayey gravel with sand and silt; 50% gravel, 30% clay, 10% sand, 10% silt; clasts are angular to subrounded, most <0.1 m; randomly distributed; matrix supported; matrix consists of clay with sand and silt; sticky and plastic.
6a 7.5YR6/8 reddish brown	<u>**Alluvium**</u>; gravel; 75% pebbles, 20% cobbles up to 1.0 m, 5% matrix; matrix consists of well graded loose sandy silt; few clay films coat clasts; crudely layered; lower contact with Unit 6b is clear and irregular and with 6c diffuse irregular.
6b 7.5YR5/6-6/6 reddish brown	<u>**Alluvium**</u>; poorly-sorted silty sand; coarse grained; few pebbles; subangular to rounded up to 0.1; loose to medium dense; lower contact is clear and wavy; possibly a sand lens within Unit 6.
6c 7.5YR4/6 strong brown	<u>**Alluvium**</u>; moderately- to poorly-sorted sandy gravel; 20% tuff cobbles up to 0.8 m near top of unit; subrounded to round; 70% tuff and dacite pebbles; 10% matrix; matrix consists of fine-grained silty sand, with little clay.
7 7.5YR4/6 strong brown	<u>**Alluvium**</u>; moderately-sorted gravelly sand; 80% pebbles, most <0.1 m, trace cobbles; fines downward; becomes bouldery to the east; matrix supported; matrix consists of moderate to poorly graded, coarse to medium sand with distinct layering; lower contact is clear and smooth.
8 7.5YR5/4 brown	<u>**Alluvium**</u>; poorly-sorted silty gravel; 20% cobbles; subangular to round; 60% dacite, 30% tuff; most <0.8 m; 60% pebbles, subrounded to round; well graded with no preferred orientation; matrix supported; matrix consists of fine-grained sandy silt; lower contact is gradual and smooth.

9 7.5YR5/4 brown	**<u>Alluvium</u>**; poorly-sorted silty sandy gravel; 40% gravel, most <0.5 m, few up to 1.5 m; angular to rounded; few pumice clasts; matrix supported; matrix consists of silty sand; lower contact is abrupt and smooth; more boulders to the east.
10 7.5YR4/6 strong brown	**<u>Alluvium</u>**; moderately-sorted sandy gravel with silt; 80% dacite 20% tuff; angular to subrounded, with 5% cobbles; stone line forms along upper contact; matrix supported; fines and thickens to the east.
10a	**<u>Alluvium</u>**; similar to Unit 10 except slightly smaller pebbles <0.1 m; more silt in matrix; slightly less well bedded; inset into Unit 11.
11 7.5YR4/6 strong brown	**<u>Alluvium</u>**; moderately-sorted silty sand with gravel; contains lenses of coarse sand and fine gravel; silty areas impart prismatic structure; some crude bedding is evident; grades from silty fine sand in the west to sandy gravel in the east; thins to the west; lower contact is abrupt and smooth.
12 7.5YR4/6 strong brown	**<u>Alluvium</u>**; moderately-sorted gravel; contains coarse sand, pebbles and cobbles, some elongate; 100% dacite; angular to subrounded, with most <0.1 m; elongate clasts are horizontal; common thin clay films impart color and cement grains; coarsens to the east.

TABLE G-7. GUAJE PINES TRENCHES 2, 3, AND 4 (GPT2, GPT3, AND GPT4) LITHOLOGIC DESCRIPTIONS (PLATE 8)

Stratigraphic Unit Color (Dry)	Description
13 10YR5/3 brown	**Colluvium/plowed zone**; silt with trace sand, clay and gravel; rare clasts up to 0.2 m; subrounded tuff and dacite clasts; trace of platy structure near base; abundant roots; lower contact is abrupt and wavy; may contain substantial loess component.
14 10YR6/3 pale brown	**Colluvium**; silt with trace of clay common sand grains and pebbles up to 0.15; massive to angular blocky structure, slightly platy in the upper 4 cm; abundant krotovina; more gravelly, more vesicular to the east end of GPT-2; may contain substantial loess component.
15 7.5YR4/4 brown to dark brown	**Colluvium**; moderately-sorted sandy silt; soil horizon in the upper 20 cm; parent material is a sandy silt with a trace of gravel; most clasts <0.1 m; subangular to rounded; 70% dacite, 30% tuff; common thin clay films bridging pores and on ped faces; slightly sticky and plastic; angular blocky structure with numerous vesicles; The Bt horizon has angular blocky to prismatic structure with many roots; thickens to the east; many thick clay films along pores and ped faces; sticky and plastic; lower boundary is clear and smooth.
16 7.5YR4/4 brown to dark brown	**Colluvium**; moderately- to poorly-sorted gravelly silt with clay; 50% gravel most <0.1 m; angular to subrounded; 90% dacite 10% tuff; clay films coat clasts and ped surfaces.
16a	**Colluvium**; moderately- to poorly-sorted gravel; 90% gravel, 10% matrix; contains two elongate dacite clasts >1.0 m that parallel fault; matrix supported; matrix consists of gravelly sand with clay; thin clay films coat grains and larger clasts; lower contact is clear and smooth.
17 7.5YR6/4 light brown	**Colluvium**; poorly-sorted silty gravel; 70% gravel, clasts are composed of 70% boulders and cobbles and 30% pebbles; 60% dacite, 40% tuff; subangular to subrounded; matrix supported; matrix consists of sandy silt; thickens toward the fault and becomes coarser; lower contact is clear and smooth.

18	**Alluvium**; poorly-sorted gravel; 90% gravel mostly dacite boulders up to 2.2 m, 10% sand; subangular to subrounded; matrix supported; matrix consists of gravely sand with common thin clay films.
19a 7.5YR4/6 strong brown	**Alluvium**; poorly-sorted sandy gravel; 75% pebbles and cobbles; bedded; most are rounded and framework supported; 20% sand, medium to coarse grained, slight fining upward; 5% matrix, loose, moderately sorted and very porous; lower contact with 19b and 19c is abrupt and smooth.
19b 7.5YR5/4 brown	**Alluvium**; moderately- to poorly-sorted sandy gravel; 70% cobbles and boulders; subrounded to rounded; 70% tuff, 30% dacite; 20% pebbles <0.1 m occurring in framework-supported pockets, some are crudely bedded; 10% matrix; matrix consists of medium to coarse grained silty sand with little clay; some pockets near the lower contact have greenish matrix; finer grained and better sorted to the east; lower contact is abrupt and smooth.
19c 7.5YR4/6 strong brown	**Alluvium**; moderately- to poorly-sorted gravel; clast supported to open framework; 80% dacite, 20% tuff; subangular to subrounded, most <0.1 m, up to 0.3 m; variable thickness; clasts commonly coated with thin clay films; when present, matrix is sand and clay; lower contact is clear and smooth.
19d	**Alluvium**; poorly-sorted sandy gravel; sand, pebbles and occasional cobbles; some clasts elongate and near horizontal; matrix supported; matrix consists of sand.
19x	**Alluvium or Fissure fill(?)**; poorly-sorted gravel; 80% pebbles and cobbles, 15% sand, 5% clay; subangular to subrounded; dominant grain size <0.1 m; 90% dacite, 10% tuff; few clasts are elongate and parallel to the fault scarp; matrix supported; matrix consists of pebbly coarse sand; thin clay films coat and bridge grains.
20 5YR4/2-6/4 olive gray to light olive gray	**Pond Deposit (?)**; well-sorted clay; prismatic structure near the top, massive in the center and to the east with extensive shearing to the west near the fault; the prismatic zone contains <1% tuff clasts <0.1 m and coarse sand size fragments; massive and sheared zones contain 15% sand; lower contact is abrupt and wavy; pinches out to the east.

21 2.5YR4/8-3/6 red to dark red	**Debris Flow or Alluvium**; poorly sorted clayey gravel; 65% cobbles and pebbles; 60% tuff, 40% dacite, most highly oxidized and subangular to subrounded; matrix supported; matrix consists of silty clay with sand; clay films coat clasts.
22	**Alluvium**; poorly sorted sandy gravel; 90% pebbles, 10% sand; clasts are 100% dacite, subangular to rounded, most less than 1 cm diameter; clasts contain thin clay coatings; crude bedding; deposit is distinct from Unit 19 based on less clay and fewer cobbles; lower contact is clear and smooth.

TABLE G-9. SPORTSMAN'S CLUB TRENCH 1 (SCT1) LITHOLOGIC DESCRIPTIONS (PLATE 11)

Stratigraphic Unit Color (Dry)	Description
1 10YR5/2 grayish brown	**Alluvium/colluvium**; moderately- to poorly-sorted gravelly sand with silt; clasts are subrounded to rounded pumice, commonly <0.1 m, occasionally up to 0.3 m; very loose; many fine rootlets; thickens to the west; lower contact is clear and smooth.
2 10YR5/2 grayish brown	**Alluvium/overbank deposits**; well-sorted silt with trace of gravel; loose; contains many roots; onlaps terrace deposits to the east; thickens to the west; lower contact is abrupt and smooth.
3 10YR4/2 dark grayish brown	**Alluvium/overbank deposits**; moderately- to poorly-sorted silt with gravel; coarsens downward and to the east, to a gravel with loose sandy matrix; 80% dacite, 20% tuff; rounded to subrounded pebbles and cobbles; lower contact is clear and smooth.
4	**Alluvium/channel deposit**; poorly-sorted gravel; 90% gravel, 10% loose sandy matrix; clasts are 70% dacite, 20% tuff; subangular to rounded; commonly <0.4 m with occasional boulder to 1.5 m; matrix supported; lower contact is abrupt and wavy.
5	**Cerro Toledo bedrock**; reworked pyroclastics; horizontally bedded, pumice-rich gravelly sand.

TABLE G-10. SPORTMAN'S CLUB TRENCH 2 (SCT2) LITHOLOGIC DESCRIPTIONS (PLATE 11)

Stratigraphic Unit Color (Dry)	Description
1 10YR5/3 brown	**Alluvium/colluvium**; poorly-sorted gravelly sand; 30% angular to subrounded gravel, 70% sand; clasts are pumice <0.1 m with few angular lithics; very loose granular sand is composed of crystals, crystal and fragments, and occasional lithic fragment; some bedding is evident with the suggestion of two discontinuous fining upward sequences; less dense than underlying units due to pumice content.
1a 10YR5/2 grayish brown	**Alluvium/colluvium**; poorly-sorted gravelly sand; 30% angular to subrounded gravel, 70% very loose granular sand; dominant clast size <0.1 m; contains many fine rootlets; coarse, crystal-rich sand forms discontinuous lenses; lower contact is clear and wavy.
2 10YR6/1-6/2 gray to light brownish gray	**Alluvium/colluvium, burn layer 1**; similar to Unit 1, but contains charcoal fragments that imparts a gray to dark gray cast; lower contact is clear and smooth; pinches out to the west.
3 10YR6/1-6/2 gray to light brownish gray	**Alluvium/colluvium**; poorly-sorted gravelly sand; similar to Unit 1, but slightly grayer and sandier; contains charcoal flecks; lower contact is clear and smooth; pinches out to the west.
4 10YR6/1-6/2 gray to light brownish gray	**Alluvium/colluvium**; poorly-sorted gravelly sand; similar to Units 2 and 3, but contains a light brown pumice-rich gravelly zone in the center; sand increases above and below this zone and is slightly grayer containing charcoal flecks; lower contact is clear and smooth.
5 10YR5/2 grayish brown	**Alluvium/colluvium**; moderately-sorted coarse sand with gravel; 70% coarse, crystal- and lithic-rich sand; 30% gravel, most are subangular to subrounded pumice <0.1 m; contains numerous charcoal flecks; lower contact is clear and smooth.

6 10YR6/3 pale brown	**Alluvium/colluvium**; poorly-sorted gravelly sand; 70% sand, 30% gravel; dominant clast size <0.2 with occasional lithics to 0.4 m and subrounded pumice to 0.5 m; contains charcoal-rich zone in the center.
7 10YR6/3 pale brown	**Alluvium/colluvium**; poorly-sorted gravelly sand; 60% sand, 40% gravel; similar to overlying Unit 4 but separated by a charcoal-rich layer; lithic clasts are angular and pumice clasts are subrounded to rounded; dominant clast size <0.1 m with few up to 0.4 m; sand is crystal-rich and contains pumice and few lithics; toward the west gravel content increases to 70%, most angular to subrounded pumice; matrix is a fine pumice sand with common crystals and trace of lithics; the burn layer becomes gravelly and darker; bedding is evident and dips to the east.
8 10YR7/3 very pale brown	**Cerro Toledo bedrock**; well-sorted beds of reworked pyroclastics; horizontal to gently west dipping; beds include pumice-rich sandy gravel and lithic- and crystal-rich coarse sand.

TABLE G-11. SPORTSMAN'S CLUB TRENCHES 3 and 4 (SCT3 and SCT4) LITHOLOGIC DESCRIPTIONS (PLATE 11)

Stratigraphic Unit Color (Dry)	Description
1	**Colluvium/slope wash**; gravelly sand with silt; contains abundant roots; loose; contact with Unit 3 is abrupt and wavy, with Unit 4 clear and planar.
2	**Cerro Toledo bedrock**; reworked pyroclastics; moderate to strongly weathered; contains abundant pumice fragments up to 0.1 m.
2x	**Colluvium**; sandy gravel; small pumice pebbles in sand matrix; 85% clasts up to 0.1 m; 15% sand and silt; overlies Cerro Toledo with abrupt contact.
3 7.5YR6/2-4/6	**Alluvium**; poorly-sorted sandy gravel; few boulders, abundant cobbles and pebbles; 50% tuff, 50% dacite; subangular to rounded; imbrication and layering is strong near the base and weak to absent above; matrix is loose sand.

TABLE G-8. COUNTY LANDFILL EXPOSURE (CLEI) LITHOLOGIC DESCRIPTIONS (PLATE 9)

Stratigraphic Unit	Description
B1a	**Bedrock**; Bandelier Tuff.
B1b	**Bedrock**; weathered upper part of Bandelier Tuff.
PC	**Weathered bedrock/colluvium**; gravel with silt and sand matrix; yellowish brown; 40% to 90% angular cobbles and boulders of moderately welded tuff; disarticulated with matrix between clast faces; loose to moderately indurated.
FC	**Alluvium or Loess**; fine sandy silt, yellowish brown; moderately indurated.
B2	**Alluvium**; fine sandy silt, yellowish brown, moderately indurated.
B3	**Alluvium**; medium to fine pumice pebbles and sand, yellowish brown.
B4	**Alluvium or Loess**; fine sandy silt, yellowish brown; moderately indurated.
B5	**Alluvium**; medium pumice pebbles and sand, yellowish brown.
B6	**Alluvium or Loess**; fine sandy silt, yellowish brown; moderately indurated.
B7	**Rhyolite ash**? fine sandy silt with glass shards; white.
B8	**Alluvium**; pumice and dacite gravel; imbricated,and grades upward from pea gravel to fine sand; reddish yellow near base to yellow near the top.
B9	**Alluvium**; pumice and dacite gravel; slightly coarser than Unit B8; mostly medium to coarse sand; upper part of unit is small pumice gravel, imbricated.
B10	**Alluvium**; massive silty sand with rare clasts of tuff; some dacite gravel.
B11	**Alluvium**; pumice gravel; pumice clasts up to 2 cm, rounded and imbricated, silt and fine sand matrix; poorly to moderately indurated.

B12	**Alluvium**; pumice gravel; pumice clasts up to 2 cm, rounded and imbricated; silt matrix; poorly to moderately indurated.
B13	**Weathered bedrock/alluvium**; clayey sandy silt; strongly developed soil structure; reddish brown; base of unit consists of small clasts of tuff, possibly weathered from bedrock and not depositional; poorly indurated.
B14	**Alluvium or Loess**; massive silt; slightly pink-gray, with rare subrounded clasts <3-4 cm; poorly to moderately indurated.
B15	**Alluvium**; pumice gravel; small (<1-2 cm) pumice clasts; rounded and imbricated; small interbed of fine to medium sand and silt; yellow gray; matrix consists of silt and fine sand; poorly to moderately indurated.
B16	**Alluvium**; pumice gravel; small (<1-2 cm); more silty matrix than B15; yellow gray; moderately to poorly indurated.

APPENDIX H
DESCRIPTIONS OF SELECTED SOIL PROFILES IN TRENCHES

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Guaje Pines Site: GPT1, 17m														
Ap	0-28	-	-	-	-	-	-	-	-	-	-	-	-	-
Bt	28-56	7.5YR 6/4	7.5YR 4/4	L	2/3 m abk	-	h	-	s,p	2 n/mk pf/co	2npo	-	-	gs
Bw1	56-90	7.5YR 6.5/4	7.5YR 5/3	L	2 f/m abk	-	h	-	ss,ps	v1 n po/co	-	-	-	gw
Bw2	90-137	7.5YR 6.5/4	7.5YR 5/3	L	2 f/m abk	-	h	-	ss,ps	v1 n po/co	-	-	-	gw
2Bt1b	137-170	7.5YR 4.5/5	7.5YR 4/6	CL	2 f/m sbk	-	h	vfi	s,p	2 n/mk pf/br/co	-	-	-	gs
2Bt2b	170-240	7.5YR 5.5/5	7.5YR 5/6	L	1/2 m abk	-	h	fi	s,ps/p	2 n pf/br/co	-	-	-	gs
3Bt3b	240-310	-	7.5YR 5/4	L	1 f abk	-	-	fi	ss/s,ps	2 mk pf/br/co	1npf/br	-	-	-
Notes: Color of clay films in horizons Bt, Bw1, Bw2, and 2Bt1b 7.5 YR 4/4. Horizons Bw1 and Bw2 are identical, except for weak parent material in Bw2.														
Guaje Pines Site: GPT2, 6m (soil developed in unit 20 only)														
Bt1b	140-165	-	5YR 4/6	C	3 c abk	3c/vcpr/c	eh	efi	s,p	4 k pf	-	-	-	cs
Bt2b	165-190	-	5YR 4/6	C	2/3 c abk	2c/vcpr	vh	vfi	s,p	4 k pf	-	-	-	cw
Bt3b	190-230	-	5.75YR 6/6	C	1/2 m/c abk	-	h/vh	fi/vfi	s,p	4 k pf	-	-	-	-
Notes: Stage III MnO in upper 15cm of horizon Bt1b, stage I, nodular MnO below 15 cm to base of horizon. Stage I MnO in horizons Bt2b and Bt3b. Soil is gleyed closer to fault.														
Guaje Pines Site: GPSP1														
Ap	0-65	-	-	L	-	-	-	-	-	-	-	-	-	-
Bt	65-100	7.5YR 7/5	-	L	3 m abk	-	h,vh	-	s,p	2 mk po	-	-	eo	cw
Bwkj	100-150	7.5YR 6.5/5	-	L	M	-	h	-	ss,ps	1 n po	-	K I	ve	gs
Bw	150-250	7.5YR 7/4	-	SiL	M	-	sh	-	so,ps	-	-	-	eo	cs
2Cu	250+	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: Horizon Bt boundary broken by very thin wedges of clay into underlying horizons. Spacing of clay wedges 10-20 cm apart. Stage I MnO on ped faces. Color of clay films 5YR 3/3. Clay lined wedges (5YR 3/3) extend through base of horizon Bwkj, most terminate half-way through horizon. Lower, approx. 25 cm, part of wedges are lined with CaCO3 with clay in center. Clay in wedges up to 2mm thick.														
Guaje Pines Site: GPSP2														
Ap	0-25	-	-	-	-	-	-	-	-	-	-	-	-	as
Bwkj	25-60	7.5YR 6/4	-	L	1 m abk	m	h	-	s,ps/p	1 n po	v1npo	ve	-	cw
Bw	60-100	7.5YR 6/4	-	SiL	1 m abk	-	h	-	ss,ps/p	v1 n po	-	eo	-	cs
2Cu	100-200	-	-	SL	-	-	-	-	-	-	-	-	-	-
Notes: Within horizon Bwkj clay wedges extend to base of horizon. Lower 10 - 15 cm of wedges are carbonate-lined clay septa. Clay wedge color, 7.5 YR 4/4 (dry). Horizon Bw has one clay wedge down to 83 cm.														

Horizon	Depth (cm)	Color Dry	Color Moist	Texture	Structure Primary	Structure Secondary	Consistence Dry	Consistence Moist	Consistence Wet	Clay Films Primary	Clay Films Secondary	Salts	HCl Rxn	Boundary
Guaje Pines Site: GPSP3														
Ap	0-27	-	-	-	-	-	-	-	-	-	-	-	-	as
Bw1	27-80	7.5YR 5.5/5	-	L	1/2 m abk	-	h/vh	-	s,ps	1 n pf/po	-	-	-	gw
Bw2	80-100	7.5YR 6/4	-	SiL	1 m abk	-	sh	-	ss,ps	1 n po	-	-	-	cs
2Cu	100+	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: Clay films in horizon Bw1, 7.5 YR 4/4. Clay films in horizon Bw2, 7.5 YR 4.5/6.														
Pajarito Canyon Site: PCT1, 9m														
A1	0-6	10YR 6/2	10YR 2/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
A2	6-19	10YR 6/2	10YR 2/2	SiL	m	1msbk	so	-	ss,ps	-	-	-	-	aw
AB	19-37	10YR 7/2	10YR 4/7	L	m	1msbk	h	-	ss,p	1 n pf/po	-	-	-	cs
Bt1	37-66	10YR 7/3	8.25YR 4/4	CL	2/3 f/m abk	-	vh	-	ss,p	2 n pf/po/co	-	-	-	cs
Bt2	66-85	7.5YR 5/4	7.5YR 4/4	C	3 f/m abk	-	eh	-	s,p	2 n/mk pf/co	-	-	-	cs
Bt3	85-121	7.5YR 4/4	7.5YR 4/6	CL	3 f/m abk	1fpr	h	-	ss/s,p	2 n pf/po/co	-	-	-	as
2Bt4	121-151	7.5YR 6/4	7.5YR 4/6	CL	m	-	so	-	ss/s,ps/p	2/3 mk br/co	-	-	-	as
3Btb	151-220	7.5YR 5/5	7.5YR 4/6	C	3 m abk	2crpr	h	vfr	s,p	3 mk pf/co	-	-	-	-
Notes: Clay films in horizon AB, 7.5 YR 4/3. Clay films in horizon Bt1, 7.5 YR 4/3. Horizon Bt3, clay films 7.5 YR 4/4 and stage I MnO. Horizon 3Btb stage II MnO and MnO coatings on ped faces.														
Water Canyon Site: WCT1, 4.5m														
A1	0-10	10YR 6/2	10YR 2/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
A2	10-15	10YR 5/2	10YR 3/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
BA	15-25	7.5YR 4/4	7.5YR 4/3	SCL	2 m abk	-	h	-	ss,ps	2/3 mk pf/co	-	-	-	cw
Bt1	25-60	-	7.5YR 4/3	C	3 m abk	1mpr	-	vfi	s,p	3/4 k pf/po/br/co	-	-	-	gw
Bt2	60-90	7.5YR 6/4	7.5YR 4.5/5	SCL	m	1mabk	h	vfr	ss,ps	3/4 mk/k co	-	-	-	dw
Bw	90-150	7.5YR 7/4	7.5YR 5/5	SL	m	-	sh	fr	so,po	2 n br/co	-	-	-	-
Notes: Horizon BA, mottling from horizon A2. Horizon A2 is coming into the upper part of the horizon Bt along ped faces and pores. Some pores are invertebrate burrows. Clay films in horizon Bt2, 7.5 YR 3/4.														

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Water Canyon Site: WCSP1														
A1	0-5	10YR 6/2	10YR 2/2	SiL	m	-	lo/so	-	ss,ps	-	-	-	-	aw
A2	5-19	10YR 5/2	10YR 2/2	SiL	m	-	lo	-	ss,ps	-	-	-	-	aw
Bt1	19-46	7.5YR 4/4	7.5YR 4.5/5	CL	2 m abk	-	h	vfi	ss,ps	3 mk/k pf/po/br/co	2npfpo	-	-	cw
Bt2	46-80	7.5YR 5.5/5	7.5YR 5/4	CL	1 m/c abk	-	-	fr	s,p	2 n pf/co	-	-	-	ds
Bw	80-162	7.5YR 5/6	7.5YR 4.5/5	L	1 m/c abk	m	-	fr	ss,ps	v1 n po/co	v1npf	-	-	cs
2C	162-192	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: In horizon Bt1 the color changes in the lower half to 7.5 YR 6/3, clay films also change in the lower half, 1-2npf/po with a color of 7.5 YR 4/4. Horizon A2 is coming through horizon Bt1 through fractures and pores.														
Water Tanks Site: WCT1 5.5m														
A1	0-5	10YR 6/2	10YR 2/2	SiL	2 f gr	-	lo/so	-	ss,ps	-	-	-	-	aw
A2	5-13	10YR 5/2	10YR 3/2	SiL	m	-	lo	-	ss,ps	-	-	-	-	aw
Bt1	13-30	7.5YR 7/3	7.5YR 3.5/4	CL	3 m abk	vh	-	-	ss,ps/p	2 n/mk pf/po/co	-	-	-	cw
Bt2	30-66	7.5YR 6.3/4	7.5YR 4.5/4	L	1 m abk	sh/h	fi	-	ss,ps	2 n pf/po/co	-	-	-	cw
2Bt3	66-100	7.5YR 4/6	7.5YR 4/4	SCL	m	h	-	-	ss,ps	3 n/mk pr/co	-	-	-	cw
2Bw	100-180	10YR 8/4	7.5YR 5/6	S	sg	-	lo	lo	so,po	v1/1 n co	-	-	-	-
Notes: Horizon Bt1 clay films, 7.5 YR 3/4 and ped interiors 7.5 YR 7/2. Questionable pedogenic orgin for carbonate in horizons Bt2 and 2Bt3. Horizons Bt3 and 2Bw within El Cajete.														
Rendija Canyon Area: TP1 (Qt2)														
Ap	0-15	7.5YR 4/6	7.5YR 4/4	SiL	3 m pl	-	sn	-	ss,ps	-	-	-	-	-
AC	15-24	7.5YR 5/4	7.5YR 4/4	SiCL	2 f/m sbk	-	sh/h	-	ss,p	-	-	-	-	-
2Bw1b	24-47	7.5YR 4/4	7.5YR 4/4	CL	2 f/m sbk	-	sh	-	s,p	2 n pf/po		K I-	-	-
2Bw2b	47-61	7.5YR 4/6	7.5YR 4/4	CL	2 f/m sbk	-	sh	-	s,p	1 n pf/po	-	-	-	-
3Btkb2	61-104	5YR 4/6	5YR 4/6	SCL	2 m abk	-	h	-	s,p	3 mk pf/po/br/co		K I+	-	gi
3Coxb2	104-140	7.5YR 4/4	7.5YR 4/6	LS	sg	-	lo	-	ss,po	-	-	-	-	ci
4Coxb2	140-190	7.5YR 5/4	7.5YR 4/4	LS	sg	-	lo	-	so,po	-	-	-	-	-
Notes: Horizon Ap, developed in loess parent material. Platey structure in Ap related to cultural disturbance. Horizon AC developed in loess parent material. Clasts of dacite welded and unwelded Bandelier tuff, clasts up to 23 cm, in horizons 2Bw2b, 3Btkb2, and 3Coxb2, with carbonate filaments in horizon 3Btkb2. In horizon 2Bw2b clay films in discontinuous zones approx. 30% of horizon.														

Horizon	Depth (cm)	Color Dry	Color Moist	Texture	Structure Primary	Structure Secondary	Consistence Dry	Consistence Moist	Consistence Wet	Clay Films Primary	Clay Films Secondary	Salts	HCl Rxn	Boundary
Rendija Canyon Area: TP2 (Qt1)														
A	0-7	10YR 5/4	10YR 3/3	SiL	2 m pr	-	so	-	so,po	-	-	-	-	cs
Bw	7-34	7.5YR 4/4	7.5YR 4/4	SiCL	2 m sbk	-	sh/h	-	ss,p	vl n pf/po	-	-	-	aw
2Bt1b	34-67	5YR 3/4	5YR 4/4	SC	3 m pr	-	h/vh	-	vs,p	3 mk pf/po/co	-	-	-	gs
2Bt2b	67-105	5YR 3/4	5YR 4/4	SC	3 f/m abk	-	h/vh	-	s,p	3 mk pf/po/co	-	-	-	gs
3Coxb	105-119	7.5YR 5/4	7.5YR 4/4	S	m	-	vh	-	so,po	vl n pf	-	-	-	aw
4Coxb	119-163	7.5YR 6/6	7.5YR 4/4	S	sg	-	lo	-	so,po	-	-	-	-	cw
2 cm pine needle mat at surface. Clay films along permeability contrasts in horizon 3Coxb. Both horizons 3Coxb and 4Coxb contain discontinuous lenses of fluvial deposits.														
Rendija Canyon Area: TP3 (Qt2)														
AV	0-3	10YR 6/3	10YR 4/4	Si	2 m pl	-	so	-	so,po	-	-	-	-	as
AB	3-9	10YR 5/4	7.5YR 4/4	SiC	1 m pl	-	sn	-	s,p	-	-	-	-	cs
Bw1	9-43	7.5YR 4/4	7.5YR 4/4	SiC	2 m sbk	-	sn	-	s,p	-	-	-	-	cs
Bw2	43-62	7.5YR 4/4	7.5YR 4/4	SiCL	2 f/m sbk	-	sn	-	s,p	1 n pf/po	-	-	-	cs
2Btb	62-106	5YR 4/4	5YR 3/4	SC	2 m abk	-	sn	-	s,p	1 n pf/po	-	-	-	cw
3Bwb	106-127	7.5YR 4/4	7.5YR 4/4	SCL	2 m abk	-	h	-	s,p	3 mk pf/po/co	-	-	-	aw
4Coxb	127-190	7.5YR 4/6	7.5YR 3/4	S	sg	-	lo	-	s,ps	1 mk pf/po	-	-	-	aw
Notes: AV horizon appears to engulf horizon AB, evidence of stripping. Horizon Bw2 superimposed on 2Btb.														
Rendija Canyon Area: TP4 (Qt6)														
A	0-10	10YR 4/2	10YR 3/2	SL	1 f sbk	-	so	-	so,po	-	-	-	-	gs
AB	10-36	10YR 5/3	10YR 4/3	SL	2 m sbk	-	sh	-	so,po	-	-	-	-	gs
C	36-80	10.5YR 5/3	-	SL	m	-	-	-	so,po	-	-	-	-	-
Notes: AB horizon defined on slight reddening and increase of structure.														
Rendija Canyon Area: TP5 (Qt3, eroded)														
A	0-6	10YR 5/3	10YR 3/2	SiL	m	-	so	-	so,po	-	-	-	-	cs
AB	6-14	10YR 5/4	10YR 3/3	SL	2 f sbk	-	sh	-	so,po	-	-	-	-	cs
BC	14-43	7.5YR 4/6	7.5YR 3/4	LS	1 f sbk	-	lo	-	so,po	1 mk co	-	-	-	aw
2Cox	43-59	10YR 6/6	10YR 4/4	S	m	-	so	-	so,po	-	-	-	-	-
Notes: 1 - 2 cm pine needle mat. Gravel in horizon 2Cox made up of pumice.														

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Rendija Canyon Area: TP6 (Qt4)														
A	0-10	10YR 5/4	10YR 3/3	Si	2 m pl/shk	-	so	-	so,po	-	-	-	-	cs
AB	10-22	10YR 6/4	10YR 4/4	SiL	2 m sbk	-	sh	-	ss,po	-	-	-	-	cs
Bt	22-49	7.5YR 4/4	7.5YR 4/4	SiL	3 m abk	-	h	-	s,p	2/3 n/mk pf/po/co	-	-	-	cs
Bk	49-63	10YR 6/4	10YR 4/3	L	2 f/m sbk	-	h	-	s,ps	1 n po/co	-	-	-	gw
2Ck1b	63-78	10YR 6/4	10YR 4/3	SC	1 f sbk	-	sh	-	ss,po	-	-	-	-	gw
2Ck2b	78-120	10YR 4/4	10YR 3/4	S	sg	-	lo	-	so,po	-	-	-	-	-
Notes: 1 - 2 cm pine needle mat. RC-1 collected at bottom of horizon Bt and RC-2 collected at contact of horizon Bk and 2Ck1.														
Carbonate coatings on clast bottoms, secondary cycle, in horizon 2Ck1b. In horizon 2Ck2b prexisting carbonate, no secondary														
cycle. Coatings on bottoms of clasts are thick and discontinuous.														

LEGEND

Color : Munsell Color Chart used

Texture:
Si - Silt
SiL - Silty Loam
L - Loam
SL - Sandy Loam
SCL - Sandy Clay Loam
S - Sand
SC - Sandy Clay
CL - Clay Loam
C - Clay

Struture:
grade
m - massive
sg - single grain
1 - weak
2- moderate
3 - strong

size
vf - very fine
f - fine
m - medium
c - coarse

type
gr - granular
pl - platy
pr - prismatic
cpr - columnar
abk - angular blocky
sbk - subangular blocky

Consistence:
dry
lo - loose
so - soft
sh - slightly hard
h - hard
vh - very hard
eh - extremely hard

moist
lo - loose
vfr - very friable
fr - friable
fi - firm
vfi - very firm
efi - extremely firm

wet
so - nonsticky
ss - slightly sticky
s - sticky
vs - very sticky

plasticity
po - nonplastic
ps - slightly plastic
p - plastic
vp - very plastic

Clay Films:
frequency
v1 - very few
1 - few
2 - common
3 - many
4 - continuous

thickness
n - thin
mk - moderately thick
k - thick

morphology
pf - ped faces
po - pores
br - bridges
co - colloid

Salts:
HCl Reaction
e - slightly effervescent
es - strongly effervescent
ev - violently effervescent

KI - stage I carbonate

Boundary:
a - abrupt
c - clear
g - gradual
d - diffuse
s - smooth
w - wavy
i - irregular
b - broken

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Guaje Pines Site: GPT1, 17m														
Ap	0-28	-	-	-	-	-	-	-	-	-	-	-	-	-
Bt	28-56	7.5YR 6/4	7.5YR 4/4	L	2/3 m abk	-	h	-	s,p	2 n/mk pf/co	2npo	-	-	gs
Bw1	56-90	7.5YR 6.5/4	7.5YR 5/3	L	2 f/m abk	-	h	-	ss,ps	v1 n po/co	-	-	-	gw
Bw2	90-137	7.5YR 6.5/4	7.5YR 5/3	L	2 f/m abk	-	h	-	ss,ps	v1 n po/co	-	-	-	gw
2Bt1b	137-170	7.5YR 4.5/5	7.5YR 4/6	CL	2 f/m sbk	-	h	vfi	s,p	2 n/mk pf/br/co	-	-	-	gs
2Bt2b	170-240	7.5YR 5.5/5	7.5YR 5/6	L	1/2 m abk	-	h	fi	s,ps/p	2 n pf/br/co	-	-	-	gs
3Bt3b	240-310	-	7.5YR 5/4	L	1 f abk	-	-	fi	ss/s,ps	2 mk pf/br/co	1npf/br	-	-	-
Notes: Color of clay films in horizons Bt, Bw1, Bw2, and 2Bt1b 7.5 YR 4/4. Horizons Bw1 and Bw2 are identical, except														
for weak parent material in Bw2.														
Guaje Pines Site: GPT2, 6m (soil developed in unit 20 only)														
Bt1b	140-165	-	5YR 4/6	C	3 c abk	3c/vcpr/c	eh	efi	s,p	4 k pf	-	-	-	cs
Bt2b	165-190	-	5YR 4/6	C	2/3 c abk	2c/vcpr	vh	vfi	s,p	4 k pf	-	-	-	cw
Bt3b	190-230	-	5.75YR 6/6	C	1/2 m/c abk	-	h/vh	fi/vfi	s,p	4 k pf	-	-	-	-
Notes: Stage III MnO in upper 15cm of horizon Bt1b, stage I, nodular MnO below 15 cm to base of horizon. Stage I MnO in														
horizons Bt2b and Bt3b. Soil is gleyed closer to fault.														
Guaje Pines Site: GPSP1														
Ap	0-65	-	-	L	-	-	-	-	-	-	-	-	-	-
Bt	65-100	7.5YR 7/5	-	L	3 m abk	-	h,vh	-	s,p	2 mk po	-	-	eo	cw
Bwkj	100-150	7.5YR 6.5/5	-	L	M	-	h	-	ss,ps	1 n po	-	K I	ve	gs
Bw	150-250	7.5YR 7/4	-	SiL	M	-	sh	-	so,ps	-	-	-	eo	cs
2Cu	250+	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: Horizon Bt boundary broken by very thin wedges of clay into underlying horizons. Spacing of clay wedges 10-20 cm apart.														
Stage I MnO on ped faces. Color of clay films 5YR 3/3. Clay lined wedges (5YR 3/3) extend through base of horizon Bwkj, most														
terminate half-way through horizon. Lower, approx. 25 cm, part of wedges are lined with CaCO3 with clay in center. Clay in wedges														
up to 2mm thick.														
Guaje Pines Site: GPSP2														
Ap	0-25	-	-	-	-	-	-	-	-	-	-	-	-	as
Bwkj	25-60	7.5YR 6/4	-	L	1 m abk	m	h	-	s,ps/p	1 n po	v1npo	ve	-	cw
Bw	60-100	7.5YR 6/4	-	SiL	1 m abk	-	h	-	ss,ps/p	v1 n po	-	eo	-	cs
2Cu	100-200	-	-	SL	-	-	-	-	-	-	-	-	-	-
Notes: Within horizon Bwkj clay wedges extend to base of horizon. Lower 10 - 15 cm of wedges are carbonate-lined clay septa.														
Clay wedge color, 7.5 YR 4/4 (dry). Horizon Bw has one clay wedge down to 83 cm.														

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Guaje Pines Site: GPSP3														
Ap	0-27	-	-	-	-	-	-	-	-	-	-	-	-	as
Bw1	27-80	7.5YR 5.5/5	-	L	1/2 m abk	-	h/vh	-	s,ps	1 n pf/po	-	-	-	gw
Bw2	80-100	7.5YR 6/4	-	SiL	1 m abk	-	sh	-	ss,ps	1 n po	-	-	-	cs
2Cu	100+	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: Clay films in horizon Bw1, 7.5 YR 4/4. Clay films in horizon Bw2, 7.5 YR 4.5/6.														
Pajarito Canyon Site: PCT1, 9m														
A1	0-6	10YR 6/2	10YR 2/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
A2	6-19	10YR 6/2	10YR 2/2	SiL	m	1msbk	so	-	ss,ps	-	-	-	-	aw
AB	19-37	10YR 7/2	10YR 4/7	L	m	1msbk	h	-	ss,p	1 n pf/po	-	-	-	cs
Bt1	37-66	10YR 7/3	8.25YR 4/4	CL	2/3 f/m abk	-	vh	-	ss,p	2 n pf/po/co	-	-	-	cs
Bt2	66-85	7.5YR 5/4	7.5YR 4/4	C	3 f/m abk	-	eh	-	s,p	2 n/mk pf/co	-	-	-	cs
Bt3	85-121	7.5YR 4/4	7.5YR 4/6	CL	3 f/m abk	1fpr	h	-	ss/s,p	2 n pf/po/co	-	-	-	as
2Bt4	121-151	7.5YR 6/4	7.5YR 4/6	CL	m	-	so	-	ss/s,ps/p	2/3 mk br/co	-	-	-	as
3Btb	151-220	7.5YR 5/5	7.5YR 4/6	C	3 m abk	2crpr	h	vfr	s,p	3 mk pf/co	-	-	-	-
Notes: Clay films in horizon AB, 7.5 YR 4/3. Clay films in horizon Bt1, 7.5 YR 4/3. Horizon Bt3, clay films 7.5 YR 4/4 and stage I MnO. Horizon 3Btb stage II MnO and MnO coatings on ped faces.														
Water Canyon Site: WCT1, 4.5m														
A1	0-10	10YR 6/2	10YR 2/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
A2	10-15	10YR 5/2	10YR 3/2	SiL	m	sg	lo	-	ss,ps	-	-	-	-	aw
BA	15-25	7.5YR 4/4	7.5YR 4/3	SCL	2 m abk	-	h	-	ss,ps	2/3 mk pf/co	-	-	-	cw
Bt1	25-60	-	7.5YR 4/3	C	3 m abk	1mpr	-	vfi	s,p	3/4 k pf/po/br/co	-	-	-	gw
Bt2	60-90	7.5YR 6/4	7.5YR 4.5/5	SCL	m	1mabk	h	vfr	ss,ps	3/4 mk/k co	-	-	-	dw
Bw	90-150	7.5YR 7/4	7.5YR 5/5	SL	m	- -	sh	fr	so,po	2 n br/co	-	-	-	-
Notes: Horizon BA , mottling from horizon A2. Horizon A2 is coming into the upper part of the horizon Bt along ped faces and pores. Some pores are invertebrate burrows. Clay films in horizon Bt2, 7.5 YR 3/4.														

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Water Canyon Site: WCSP1														
A1	0-5	10YR 6/2	10YR 2/2	SiL	m	-	lo/so	-	ss,ps	-	-	-	-	aw
A2	5-19	10YR 5/2	10YR 2/2	SiL	m	-	lo	-	ss,ps	-	-	-	-	aw
Bt1	19-46	7.5YR 4/4	7.5YR 4.5/5	CL	2 m abk	-	h	vfi	ss,ps	3 mk/k pf/po/br/co	2npfpo	-	-	cw
Bt2	46-80	7.5YR 5.5/5	7.5YR 5/4	CL	1 m/c abk	-	-	fr	s,p	2 n pf/co	-	-	-	ds
Bw	80-162	7.5YR 5/6	7.5YR 4.5/5	L	1 m/c abk	m	-	fr	ss,ps	v1 n po/co	v1npf	-	-	cs
2C	162-192	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: In horizon Bt1 the color changes in the lower half to 7.5 YR 6/3, clay films also change in the lower half, 1-2npf/po with a color of 7.5 YR 4/4. Horizon A2 is coming through horizon Bt1 through fractures and pores.														
Water Tanks Site: WCT1 5.5m														
A1	0-5	10YR 6/2	10YR 2/2	SiL	2 f gr	-	lo/so	-	ss,ps	-	-	-	-	aw
A2	5-13	10YR 5/2	10YR 3/2	SiL	m	-	lo	-	ss,ps	-	-	-	-	aw
Bt1	13-30	7.5YR 7/3	7.5YR 3.5/4	CL	3 m abk	vh	-	-	ss,ps/p	2 n/mk pf/po/co	-	-	-	cw
Bt2	30-66	7.5YR 6.3/4	7.5YR 4.5/4	L	1 m abk	sh/h	fi	-	ss,ps	2 n pf/po/co	-	-	-	cw
2Bt3	66-100	7.5YR 4/6	7.5YR 4/4	SCL	m	h	-	-	ss,ps	3 n/mk pr/co	-	-	-	cw
2Bw	100-180	10YR 8/4	7.5YR 5/6	S	sg	-	lo	lo	so,po	v1/1 n co	-	-	-	-
Notes: Horizon Bt1 clay films, 7.5 YR 3/4 and ped interiors 7.5 YR 7/2. Questionable pedogenic orgin for carbonate in horizons Bt2 and 2Bt3. Horizons Bt3 and 2Bw within El Cajete.														
Rendija Canyon Area: TP1 (Qt2)														
Ap	0-15	7.5YR 4/6	7.5YR 4/4	SiL	3 m pl	-	sn	-	ss,ps	-	-	-	-	-
AC	15-24	7.5YR 5/4	7.5YR 4/4	SiCL	2 f/m sbk	-	sh/h	-	ss,p	-	-	-	-	-
2Bw1b	24-47	7.5YR 4/4	7.5YR 4/4	CL	2 f/m sbk	-	sh	-	s,p	2 n pf/po		K I-	-	-
2Bw2b	47-61	7.5YR 4/6	7.5YR 4/4	CL	2 f/m sbk	-	sh	-	s,p	1 n pf/po	-	-	-	-
3Btkb2	61-104	5YR 4/6	5YR 4/6	SCL	2 m abk	-	h	-	s,p	3 mk pf/po/br/co		K I+	-	gi
3Coxb2	104-140	7.5YR 4/4	7.5YR 4/6	LS	sg	-	lo	-	ss,po	-	-	-	-	ci
4Coxb2	140-190	7.5YR 5/4	7.5YR 4/4	LS	sg	-	lo	-	so,po	-	-	-	-	-
Notes: Horizon Ap, developed in loess parent material. Platey structure in Ap related to cultural disturbance. Horizon AC developed in loess parent material. Clasts of dacite welded and unwelded Bandelier tuff, clasts up to 23 cm, in horizons 2Bw2b, 3Btkb2, and 3Coxb2, with carbonate filaments in horizon 3Btkb2. In horizon 2Bw2b clay films in discontinuous zones approx. 30% of horizon.														

Horizon	Depth	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl	Boundary
	(cm)	Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary		Rxn	
Rendija Canyon Area: TP2 (Qt1)														
A	0-7	10YR 5/4	10YR 3/3	SiL	2 m pr	-	so	-	so,po	-	-	-	-	cs
Bw	7-34	7.5YR 4/4	7.5YR 4/4	SiCL	2 m sbk	-	sh/h	-	ss,p	vl n pf/po	-	-	-	aw
2Bt1b	34-67	5YR 3/4	5YR 4/4	SC	3 m pr	-	h/vh	-	vs,p	3 mk pf/po/co	-	-	-	gs
2Bt2b	67-105	5YR 3/4	5YR 4/4	SC	3 f/m abk	-	h/vh	-	s,p	3 mk pf/po/co	-	-	-	aw
3Coxb	105-119	7.5YR 5/4	7.5YR 4/4	S	m	-	vh	-	so,po	vl n pf	-	-	-	cw
4Coxb	119-163	7.5YR 6/6	7.5YR 4/4	S	sg	-	lo	-	so,po	-	-	-	-	-
2 cm pine needle mat at surface. Clay films along permeability contrasts in horizon 3Coxb. Both horizons 3Coxb and 4Coxb contain discontinuous lenses of fluvial deposits.														
Rendija Canyon Area: TP3 (Qt2)														
AV	0-3	10YR 6/3	10YR 4/4	Si	2 m pl	-	so	-	so,po	-	-	-	-	as
AB	3-9	10YR 5/4	7.5YR 4/4	SiC	1 m pl	-	sn	-	s,p	-	-	-	-	cs
Bw1	9-43	7.5YR 4/4	7.5YR 4/4	SiC	2 m sbk	-	sn	-	s,p	1 n pf/po	-	-	-	cs
Bw2	43-62	7.5YR 4/4	7.5YR 4/4	SiCL	2 f/m sbk	-	sn	-	s,p	1 n pf/po	-	-	-	cw
2Btb	62-106	5YR 4/4	5YR 3/4	SC	2 m abk	-	h	-	s,p	3 mk pf/po/co	-	-	-	aw
3Bwb	106-127	7.5YR 4/4	7.5YR 4/4	SCL	2 m abk	-	h	-	s,ps	1 mk pf/po	-	-	-	aw
4Coxb	127-190	7.5YR 4/6	7.5YR 3/4	S	sg	-	lo	-	s,ps	-	-	-	-	-
Notes: AV horizon appears to engulf horizon AB, evidence of stripping. Horizon Bw2 superimposed on 2Btb.														
Rendija Canyon Area: TP4 (Qt6)														
A	0-10	10YR 4/2	10YR 3/2	SL	1 f sbk	-	so	-	so,po	-	-	-	-	gs
AB	10-36	10YR 5/3	10YR 4/3	SL	2 m sbk	-	sh	-	so,po	-	-	-	-	gs
C	36-80	10.5YR 5/3	-	SL	m	-	-	-	so,po	-	-	-	-	-
Notes: AB horizon defined on slight reddening and increase of structure.														
Rendija Canyon Area: TP5 (Qt3, eroded)														
A	0-6	10YR 5/3	10YR 3/2	SiL	m	-	so	-	so,po	-	-	-	-	cs
AB	6-14	10YR 5/4	10YR 3/3	SL	2 f sbk	-	sh	-	so,po	-	-	-	-	cs
BC	14-43	7.5YR 4/6	7.5YR 3/4	LS	1 f sbk	-	lo	-	so,po	1 mk co	-	-	-	aw
2Cox	43-59	10YR 6/6	10YR 4/4	S	m	-	so	-	so,po	-	-	-	-	-
Notes: 1 - 2 cm pine needle mat. Gravel in horizon 2Cox made up of pumice.														

Horizon	Depth (cm)	Color		Texture	Structure		Consistence			Clay Films		Salts	HCl Rxn	Boundary
		Dry	Moist		Primary	Secondary	Dry	Moist	Wet	Primary	Secondary			
Rendija Canyon Area: TP6 (Qt4)														
A	0-10	10YR 5/4	10YR 3/3	Si	2 m pl/sbk	-	so	-	so,po	-	-	-	-	cs
AB	10-22	10YR 6/4	10YR 4/4	SiL	2 m sbk	-	sh	-	ss,po	-	-	-	-	cs
Bt	22-49	7.5YR 4/4	7.5YR 4/4	SiL	3 m abk	-	h	-	s,p	2/3 n/mk pf/po/co	-	-	-	cs
Bk	49-63	10YR 6/4	10YR 4/3	L	2 f/m sbk	-	h	-	s,ps	1 n po/co	-	-	-	gw
2Ck1b	63-78	10YR 6/4	10YR 4/3	SC	1 f sbk	-	sh	-	ss,po	-	-	-	-	gw
2Ck2b	78-120	10YR 4/4	10YR 3/4	S	sg	-	lo	-	so,po	-	-	-	-	-

Notes: 1 - 2 cm pine needle mat. RC-1 collected at bottom of horizon Bt and RC-2 collected at contact of horizon Bk and 2Ck1.
Carbonate coatings on clast bottoms, secondary cycle, in horizon 2Ck1b. In horizon 2Ck2b prexisting carbonate, no secondary cycle. Coatings on bottoms of clasts are thick and discontinuous.

LEGEND

Color : Munsell Color Chart used

Texture:
Si - Silt
SiL - Silty Loam
L - Loam
SL - Sandy Loam
SCL - Sandy Clay Loam
S - Sand
SC - Sandy Clay
CL - Clay Loam
C - Clay

Struture:
grade
m - massive
sg - single grain
1 - weak
2- moderate
3 - strong

size
vf - very fine
f - fine
m - medium
c - coarse

type
gr - granular
pl - platy
pr - prismatic
cpr - columnar
abk - angular blocky
sbk - subangular blocky

Consistence:
dry
lo - loose
so - soft
sh - slightly hard
h - hard
vh - very hard
eh - extremely hard

moist
lo - loose
vfr - very friable
fr - friable
fi - firm
vfi - very firm
efi - extremely firm

wet
so - nonsticky
ss - slightly sticky
s - sticky
vs - very sticky

plasticity
po - nonplastic
ps - slightly plastic
p - plastic
vp - very plastic

Clay Films:
frequency
v1 - very few
1 - few
2 - common
3 - many
4 - continuous

thickness
n - thin
mk - moderately thick
k - thick

morphology
pf - ped faces
po - pores
br - bridges
co - colloid

Salts:
HCl Reaction
e - slightly effervescent
es - strongly effervescent
ev - violently effervescent

KI - stage I carbonate

Boundary:
a - abrupt
c - clear
g - gradual
d - diffuse
s - smooth
w - wavy
i - irregular
b - broken

APPENDIX I
RELOCATED EARTHQUAKES IN THE LANL REGION, 1973-1992

452 Events Selected   Searched: 25 OCT 1994   File: bestcmb2.rst   By: jdjb

SOURCE DATABASE:
Root name: bestcmb1

Created: 25 OCT 1994 10:43
By: jdjb
Original file: bestcmb1.dmp   Type: ASCII Dump
Hypoctr rec: 457
Comment rec: 0
Time span: 1974 01 17 23:04:20.10 -> 1989 07 26 01:43:10.78

SEARCH PARAMETERS:
Time: 0001 JAN 01 -> 2100 DEC 31   Mag 1: -9.99 -> 9.99   Type: All
Lat: 35.000 -> 36.750   Mag 2: -9.99 -> 9.99   Type: None
Long: -107.250 -> -105.250   Intensity: 0 -> 12   Mode: 0
Depth: .00 -> 999.00   Search Mode: DATABASE

CENTER FOR DISTANCE CALC: Lat 35.83 Long -106.35

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Vert
1	1974 JAN 17	23:04:20.10	36.188	-106.193	1.54	2.07MDLA	....	..	42	WC	10	268	17.0	.11	.	.0	.0
2	1974 APR 02	11:06:53.73	36.215	-106.194	2.53	1.65MDLA	....	..	45	WC	11	267	20.0	.08	.	.0	.0
3	1975 SEP 06	03:46:49.99	36.187	-106.175	3.85	2.30MDCN	....	..	43	WC	10	268	18.0	.09	.	.0	.0
4	1975 DEC 03	13:41:32.10	35.798	-106.176	2.22	1.44MDLA	....	..	16	WC	9	166	5.0	.11	.	.0	.0
5	1976 APR 10	22:39:33.49	36.288	-106.148	4.60	1.67MDLA	....	..	54	WC	15	139	29.0	.05	.	.0	.0
6	1976 APR 11	07:44:01.96	36.293	-106.152	4.05	1.94MDLA	....	..	54	WC	15	172	30.0	.05	.	.0	.0
7	1976 APR 11	07:45:31.28	36.286	-106.149	5.39	1.35MDLA	....	..	54	WC	14	172	29.0	.07	.	.0	.0
8	1976 MAY 02	00:32:35.71	36.402	-106.762	9.41	2.69MDLA	....	..	73	WC	9	201	57.0	.02	.	.0	.0
9	1976 MAY 22	10:50:38.86	36.338	-105.782	10.01	.89MDLA	....	..	76	WC	13	200	53.0	.08	.	.0	.0
10	1976 MAY 22	14:04:58.64	36.345	-105.782	12.21	1.04MDLA	....	..	77	WC	12	200	54.0	.07	.	.0	.0
11	1976 JUN 01	16:39:58.73	36.522	-106.211	6.98	1.12MDLA	....	..	78	WC	8	194	42.0	.11	.	.0	.0
12	1976 JUN 26	12:55:39.04	36.168	-106.207	2.55	2.00 CA	....	..	40	WC	11	244	15.0	.09	.	.0	.0
13	1976 JUN 29	01:31:35.25	36.174	-106.239	2.53	1.50 CA	....	..	39	WC	7	244	15.0	.08	.	.0	.0
14	1976 JUL 05	12:39:19.42	36.157	-106.236	3.23	2.30 CA	....	..	38	WC	11	121	13.0	.10	.	.0	.0
15	1976 JUL 06	12:48:44.66	36.161	-106.227	3.11	2.00 CA	....	..	38	WC	12	242	14.0	.11	.	.0	.0
16	1976 OCT 24	07:15:29.69	36.004	-106.273	9.87	.50 CA	....	..	21	WC	6	151	5.0	.02	.	.0	.0
17	1976 NOV 03	21:05:00.36	35.332	-107.230	8.54	1.09MDLA	....	..	97	WC	13	184	35.0	.11	.	.0	.0
18	1976 NOV 09	13:24:50.32	35.280	-107.128	11.55	.52MDLA	....	..	93	WC	12	200	43.0	.15	.	.0	.0
19	1976 NOV 11	10:00:08.82	36.007	-106.142	6.27	1.00 CA	....	..	27	WC	11	104	9.0	.03	.	.0	.0
20	1976 DEC 10	14:42:08.43	36.709	-106.721	7.57	1.36MDLA	....	..	103	WC	20	228	65.0	.24	.	.0	.0
21	1976 DEC 17	10:41:50.16	36.011	-106.136	4.93	1.40 CA	....	..	28	WC	10	108	10.0	.05	.	.0	.0
22	1976 DEC 31	07:53:58.37	36.674	-106.685	7.15	2.11MDLA	....	..	98	WC	13	222	63.0	.24	.	.0	.0
23	1977 JAN 20	23:26:47.43	36.272	-106.295	5.48	1.40MDLA	....	..	49	WC	12	156	35.0	.12	.	.0	.0
24	1977 MAR 02	08:54:10.97	36.056	-106.176	6.95	.30 CA	....	..	30	WC	5	138	35.0	.11	.	.0	.0
25	1977 MAR 03	13:35:46.19	36.009	-106.134	8.49	....	....	..	28	WC	11	123	28.0	.17	.	.0	.0
26	1977 APR 03	19:26:49.25	36.140	-106.220	.12	2.32MDLA	....	..	36	WC	13	75	12.0	.09	.	.0	.0
27	1977 APR 11	16:45:35.89	35.659	-107.043	9.24	.80 CA	....	..	65	WC	16	190	39.0	.12	.	.0	.0
28	1977 APR 26	11:35:05.38	36.127	-106.182	7.97	....	....	..	36	WC	7	156	11.0	.24	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Std-Err Vert
29	1977 APR 26	11:59:47.29	36.143	-106.220	4.67	.50 CA	....	..	37	WC	11	165	12.0	.16	.	.0	.0
30	1977 APR 26	12:01:43.79	36.107	-106.253	.66	.86MDLA	....	..	32	WC	11	231	8.0	.08	.	.0	.0
31	1977 JUN 03	18:41:25.24	35.738	-106.264	1.21	1.36MDLA	....	..	13	WC	6	123	9.0	.06	.	.0	.0
32	1977 JUL 02	01:24:41.17	36.231	-107.219	9.16	1.87MDLA	....	..	90	WC	13	219	42.0	.10	.	.0	.0
33	1977 JUL 28	07:44:29.92	35.849	-106.185	3.47	1.14MDLA	....	..	15	WC	9	147	10.0	.04	.	.0	.0
34	1977 JUL 29	16:42:08.76	35.106	-106.309	2.12	.89MDLA	....	..	80	WC	10	232	57.0	.08	.	.0	.0
35	1977 AUG 11	04:24:53.46	35.834	-106.189	4.87	.68MDLA	....	..	15	WC	9	143	8.0	.09	.	.0	.0
36	1977 AUG 20	13:52:07.35	36.708	-106.761	7.00	1.72MDLA	....	..	104	WC	11	229	68.0	.12	.	.0	.0
37	1977 AUG 26	21:44:24.88	35.694	-106.250	16.16	.29MDLA	....	..	18	WC	8	146	10.0	.06	.	.0	.0
38	1977 AUG 29	07:13:38.43	35.541	-107.101	10.16	1.78MDLA	....	..	75	WC	12	172	54.0	.06	.	.0	.0
39	1977 AUG 29	08:31:38.16	35.535	-107.105	12.01	.87MDLA	....	..	76	WC	9	181	24.0	.04	.	.0	.0
40	1977 AUG 29	22:17:08.51	36.354	-106.644	17.12	1.23MDLA	....	..	64	WC	17	189	51.0	.11	.	.0	.0
41	1977 SEP 01	22:48:40.21	35.529	-107.088	6.67	1.24MDLA	....	..	75	WC	9	175	55.0	.07	.	.0	.0
42	1977 SEP 02	11:29:22.75	35.510	-107.085	10.05	.83MDLA	....	..	75	WC	13	154	25.0	.09	.	.0	.0
43	1977 OCT 02	14:38:35.70	35.800	-106.951	8.46	.85MDLA	....	..	54	WC	15	159	26.0	.23	.	.0	.0
44	1977 OCT 04	20:57:42.24	36.181	-106.866	4.14	1.65MDLA	....	..	61	WC	14	168	19.0	.06	.	.0	.0
45	1977 OCT 13	19:28:17.24	36.073	-106.956	5.66	.94MDLA	....	..	61	WC	16	175	12.0	.10	.	.0	.0
46	1977 NOV 11	11:26:55.27	35.430	-107.167	9.65	.95MDLA	....	..	86	WC	14	105	17.0	.07	.	.0	.0
47	1977 NOV 17	13:02:28.88	35.520	-107.085	5.56	.61MDLA	....	..	75	WC	8	171	25.0	.16	.	.0	.0
48	1977 DEC 02	12:10:07.39	36.185	-106.300	2.72	.91MDLA	....	..	40	WC	8	245	17.0	.06	.	.0	.0
49	1978 JAN 30	02:53:01.40	35.874	-106.843	8.47	.87MDLA	....	..	45	WC	17	166	12.0	.21	.	.0	.0
50	1978 FEB 13	18:57:38.91	35.736	-107.197	10.74	1.51MDLA	....	..	77	WC	15	172	44.0	.19	.	.0	.0
51	1978 FEB 14	16:49:04.46	36.297	-106.927	10.47	1.35MDLA	....	..	73	WC	14	196	20.0	.14	.	.0	.0
52	1978 MAR 12	00:30:12.13	36.074	-106.223	3.16	.54MDLA	....	..	29	WC	9	147	5.0	.04	.	.0	.0
53	1978 MAR 12	02:28:48.16	36.069	-106.216	6.05	1.16MDLA	....	..	29	WC	11	145	4.0	.04	.	.0	.0
54	1978 MAR 12	03:04:04.22	36.050	-106.230	7.37	.54MDLA	....	..	27	WC	6	162	2.0	.08	.	.0	.0
55	1978 MAR 12	06:04:43.28	36.070	-106.206	2.53	.80 CA	....	..	30	WC	9	144	5.0	.11	.	.0	.0
56	1978 MAR 12	06:22:07.13	36.061	-106.215	6.21	....	....	..	28	WC	7	172	4.0	.06	.	.0	.0
57	1978 MAR 12	11:41:57.91	36.055	-106.221	7.22	....	....	..	28	WC	5	171	3.0	.10	.	.0	.0
58	1978 MAR 12	13:19:59.41	36.054	-106.210	5.12	....	....	..	28	WC	5	187	3.0	.05	.	.0	.0
59	1978 MAR 14	10:43:22.81	36.065	-106.220	4.90	1.57MDLA	....	..	29	WC	14	124	4.0	.07	.	.0	.0
60	1978 APR 23	13:10:59.91	35.663	-106.975	5.97	.33MDLA	....	..	59	WC	15	136	36.0	.14	.	.0	.0
61	1978 APR 23	17:06:28.66	35.661	-106.963	8.47	.44MDLA	....	..	59	WC	18	134	36.0	.19	.	.0	.0
62	1978 APR 23	23:25:35.75	35.659	-106.974	5.41	1.27MDLA	....	..	60	WC	16	135	37.0	.13	.	.0	.0
63	1978 APR 23	23:59:49.45	35.657	-106.967	8.59	1.18MDLA	....	..	59	WC	15	134	37.0	.23	.	.0	.0
64	1978 APR 24	00:03:30.25	35.659	-106.975	9.18	.67MDLA	....	..	60	WC	14	135	41.0	.14	.	.0	.0
65	1978 APR 24	02:09:22.09	35.663	-106.977	7.57	.77MDLA	....	..	60	WC	17	136	37.0	.14	.	.0	.0
66	1978 APR 24	03:01:24.98	35.665	-106.976	4.23	.99MDLA	....	..	59	WC	16	136	36.0	.11	.	.0	.0
67	1978 MAY 02	00:03:27.73	35.870	-106.837	4.38	.56MDLA	....	..	44	WC	16	132	15.0	.15	.	.0	.0
68	1978 MAY 28	05:04:06.63	36.356	-106.810	5.40	.64MDLA	....	..	72	WC	9	171	8.0	.09	.	.0	.0
69	1978 JUN 23	13:32:41.40	35.278	-106.152	12.99	.44MDLA	....	..	64	WC	7	199	5.0	.15	.	.0	.0
70	1978 AUG 05	23:08:05.39	35.472	-106.201	3.94	1.97MDLA	....	..	42	WC	11	162	15.0	.21	.	.0	.0
71	1978 SEP 19	07:33:45.41	36.361	-105.547	9.27	1.67MDLA	....	..	93	WC	7	235	34.0	.11	.	.0	.0
72	1978 SEP 24	18:19:08.63	35.729	-106.783	7.60	-.20MDLA	....	..	41	WC	12	216	20.0	.18	.	.0	.0
73	1978 SEP 24	20:47:32.48	35.747	-106.765	9.16	-.23MDLA	....	..	39	WC	14	108	17.0	.10	.	.0	.0
74	1978 SEP 24	22:38:16.23	35.741	-106.754	10.23	-.35MDLA	....	..	38	WC	14	105	17.0	.25	.	.0	.0
75	1978 SEP 25	00:31:49.93	35.734	-106.765	5.81	.18MDLA	....	..	39	WC	15	107	18.0	.12	.	.0	.0
76	1978 SEP 25	00:49:26.22	35.777	-106.756	9.69	-.59MDLA	....	..	37	WC	9	160	14.0	.18	.	.0	.0
77	1978 SEP 25	01:44:31.13	35.735	-106.764	6.84	1.85MDLA	....	..	39	WC	16	99	18.0	.16	.	.0	.0
78	1978 SEP 25	01:47:05.16	35.742	-106.760	10.28	-.04MDLA	....	..	38	WC	11	209	17.0	.19	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Std-Err Vert
79	1978 SEP 25	02:07:44.25	35.740	-106.778	8.22	-.04MDLA	....	..	40	WC	15	110	18.0	.18	.	.0	.0
80	1978 SEP 25	02:11:39.54	35.739	-106.765	8.17	-.32MDLA	....	..	39	WC	14	108	18.0	.17	.	.0	.0
81	1978 SEP 25	02:12:07.37	35.740	-106.758	9.66	-.26MDLA	....	..	38	WC	16	150	17.0	.25	.	.0	.0
82	1978 SEP 25	02:12:30.76	35.744	-106.763	10.16	.02MDLA	....	..	39	WC	16	107	17.0	.16	.	.0	.0
83	1978 SEP 25	02:15:47.58	35.731	-106.785	7.04	....	....	..	41	WC	10	246	19.0	.15	.	.0	.0
84	1978 SEP 25	02:15:56.16	35.735	-106.767	10.57	.85MDLA	....	..	39	WC	21	108	18.0	.09	.	.0	.0
85	1978 SEP 25	02:17:49.21	35.734	-106.767	8.17	.62MDLA	....	..	39	WC	25	108	18.0	.15	.	.0	.0
86	1978 SEP 25	02:28:13.62	35.745	-106.757	10.60	.31MDLA	....	..	38	WC	22	106	17.0	.23	.	.0	.0
87	1978 SEP 25	02:32:47.77	35.747	-106.757	10.09	-.12MDLA	....	..	38	WC	15	106	17.0	.20	.	.0	.0
88	1978 SEP 25	03:11:03.03	35.836	-106.745	19.55	-.33MDLA	....	..	36	WC	13	128	9.0	.25	.	.0	.0
89	1978 SEP 25	03:44:31.88	35.728	-106.791	8.61	-.76MDLA	....	..	41	WC	11	153	20.0	.12	.	.0	.0
90	1978 SEP 25	03:48:27.90	35.728	-106.782	9.27	-.43MDLA	....	..	41	WC	10	110	20.0	.11	.	.0	.0
91	1978 SEP 25	03:57:32.29	35.728	-106.759	8.13	.57MDLA	....	..	39	WC	23	106	19.0	.09	.	.0	.0
92	1978 SEP 25	04:01:17.40	35.730	-106.760	6.32	.27MDLA	....	..	39	WC	23	106	18.0	.22	.	.0	.0
93	1978 SEP 25	04:22:27.58	35.729	-106.779	10.18	-.50MDLA	....	..	40	WC	14	110	19.0	.24	.	.0	.0
94	1978 SEP 25	04:39:06.18	35.739	-106.759	10.33	.23MDLA	....	..	38	WC	19	106	17.0	.24	.	.0	.0
95	1978 SEP 25	04:51:28.73	35.741	-106.750	6.51	.31MDLA	....	..	37	WC	22	104	17.0	.21	.	.0	.0
96	1978 SEP 25	06:42:01.25	35.749	-106.744	9.48	.70 NM	....	..	37	WC	16	104	16.0	.22	.	.0	.0
97	1978 SEP 25	06:42:03.29	35.730	-106.767	9.52	....	....	..	39	WC	15	113	19.0	.21	.	.0	.0
98	1978 SEP 25	06:42:16.16	35.794	-106.753	15.03	.19MDLA	....	..	37	WC	13	123	12.0	.24	.	.0	.0
99	1978 SEP 25	06:55:34.94	35.728	-106.772	9.29	-.21MDLA	....	..	40	WC	17	108	19.0	.23	.	.0	.0
100	1978 SEP 25	07:18:43.85	35.730	-106.761	8.96	-.12MDLA	....	..	39	WC	13	111	18.0	.22	.	.0	.0
101	1978 SEP 25	08:29:15.01	35.730	-106.762	6.34	.42MDLA	....	..	39	WC	18	107	19.0	.22	.	.0	.0
102	1978 SEP 25	10:45:33.00	35.731	-106.766	7.21	.10MDLA	....	..	39	WC	17	107	19.0	.20	.	.0	.0
103	1978 SEP 25	12:30:47.49	35.725	-106.767	7.96	.12MDLA	....	..	39	WC	16	107	19.0	.25	.	.0	.0
104	1978 SEP 25	15:07:16.93	35.730	-106.787	9.61	-.16MDLA	....	..	41	WC	13	216	20.0	.25	.	.0	.0
105	1978 SEP 26	20:10:41.70	35.726	-106.767	9.91	.08MDLA	....	..	39	WC	10	213	33.0	.21	.	.0	.0
106	1978 SEP 28	09:00:45.40	35.106	-106.802	7.80	1.69MDLA	....	..	90	WC	19	209	58.0	.11	.	.0	.0
107	1978 SEP 28	12:12:23.24	35.112	-106.804	7.85	1.34MDLA	....	..	90	WC	18	208	58.0	.10	.	.0	.0
108	1978 SEP 28	16:24:24.87	35.132	-106.816	9.01	.80MDLA	....	..	88	WC	15	204	58.0	.12	.	.0	.0
109	1978 SEP 28	22:01:47.86	35.104	-106.806	8.53	2.08MDLA	....	..	91	WC	18	209	58.0	.13	.	.0	.0
110	1978 SEP 28	22:10:19.66	35.088	-106.800	10.47	.33MDLA	....	..	92	WC	13	212	58.0	.12	.	.0	.0
111	1978 SEP 29	02:44:12.94	35.111	-106.805	9.18	1.39MDLA	....	..	90	WC	20	208	58.0	.14	.	.0	.0
112	1978 SEP 29	09:38:39.20	35.110	-106.804	7.38	2.18MDLA	....	..	90	WC	21	208	58.0	.13	.	.0	.0
113	1978 SEP 29	09:50:39.23	35.056	-106.794	9.96	.44MDLA	....	..	95	WC	9	218	59.0	.13	.	.0	.0
114	1978 SEP 29	21:26:34.80	35.099	-106.807	9.99	.24MDLA	....	..	91	WC	12	210	58.0	.16	.	.0	.0
115	1978 SEP 29	22:26:18.40	35.100	-106.804	8.88	.39MDLA	....	..	91	WC	12	210	58.0	.08	.	.0	.0
116	1978 SEP 30	00:36:14.42	35.100	-106.801	9.42	1.25MDLA	....	..	91	WC	18	210	58.0	.07	.	.0	.0
117	1978 SEP 30	00:38:59.54	35.092	-106.808	9.72	.41MDLA	....	..	92	WC	9	237	59.0	.13	.	.0	.0
118	1978 SEP 30	08:18:52.88	35.114	-106.802	7.84	1.61MDLA	....	..	89	WC	19	208	58.0	.09	.	.0	.0
119	1978 SEP 30	11:52:46.33	35.124	-106.812	10.39	.79MDLA	....	..	89	WC	16	206	58.0	.16	.	.0	.0
120	1978 OCT 01	00:16:39.31	35.109	-106.804	10.38	1.41MDLA	....	..	90	WC	17	208	58.0	.07	.	.0	.0
121	1978 OCT 01	11:46:57.02	35.105	-106.804	9.22	.90MDLA	....	..	90	WC	19	209	58.0	.10	.	.0	.0
122	1978 OCT 01	11:57:15.66	35.103	-106.799	7.06	-.13MDLA	....	..	90	WC	10	210	58.0	.16	.	.0	.0
123	1978 OCT 02	02:03:44.72	35.124	-106.813	10.08	.42MDLA	....	..	89	WC	13	205	58.0	.24	.	.0	.0
124	1978 OCT 02	03:11:37.00	35.118	-106.802	9.45	.93MDLA	....	..	89	WC	18	207	57.0	.13	.	.0	.0
125	1978 OCT 03	17:01:24.34	35.118	-106.798	10.06	.49MDLA	....	..	89	WC	12	207	57.0	.20	.	.0	.0
126	1978 OCT 07	23:13:18.76	36.091	-106.814	5.26	.88MDLA	....	..	51	WC	16	151	9.0	.14	.	.0	.0
127	1978 OCT 11	13:43:06.98	36.311	-106.050	10.12	1.18MDLA	....	..	60	WC	13	101	13.0	.06	.	.0	.0
128	1978 OCT 11	14:47:11.66	36.312	-105.988	12.44	.06MDLA	....	..	63	WC	9	117	8.0	.07	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Std-Err Vert
129	1978 OCT 24	17:00:47.62	36.738	-105.449	9.48	1.84MDLA	....	..	129	WC	15	270	53.0	.14	.	.0	.0
130	1978 OCT 30	03:59:27.72	36.506	-106.549	9.25	1.14MDLA	....	..	77	WC	17	127	22.0	.09	.	.0	.0
131	1978 NOV 05	06:40:24.70	35.765	-106.748	9.74	-.33MDLA	....	..	37	WC	11	251	15.0	.21	.	.0	.0
132	1978 NOV 15	23:43:06.87	36.150	-106.192	6.54	1.26MDLA	....	..	38	WC	16	78	13.0	.05	.	.0	.0
133	1978 NOV 16	00:13:49.65	36.153	-106.190	3.15	.80 NM	....	..	39	WC	12	164	14.0	.11	.	.0	.0
134	1978 NOV 16	02:11:57.35	36.153	-106.192	5.54	.50 NM	....	..	39	WC	10	120	29.0	.05	.	.0	.0
135	1978 NOV 16	09:12:27.08	36.152	-106.194	4.57	.80 NM	....	..	38	WC	9	120	14.0	.05	.	.0	.0
136	1978 NOV 16	09:36:34.43	36.156	-106.191	6.24	....	....	..	39	WC	8	165	14.0	.25	.	.0	.0
137	1978 NOV 17	02:16:25.81	36.151	-106.190	5.31	....	....	..	38	WC	8	164	14.0	.08	.	.0	.0
138	1978 NOV 17	02:34:26.09	36.197	-106.182	20.53	....	....	..	43	WC	5	177	19.0	.08	.	.0	.0
139	1978 NOV 17	05:59:34.76	36.154	-106.191	5.61	....	....	..	39	WC	7	165	14.0	.05	.	.0	.0
140	1978 NOV 17	12:34:31.30	36.146	-106.188	6.32	.30 NM	....	..	38	WC	8	162	13.0	.08	.	.0	.0
141	1978 NOV 17	13:05:17.45	36.153	-106.186	4.99	.80 NM	....	..	39	WC	14	120	14.0	.08	.	.0	.0
142	1978 NOV 18	00:30:49.84	36.148	-106.185	4.92	.30 NM	....	..	38	WC	7	118	13.0	.21	.	.0	.0
143	1978 NOV 28	05:25:39.56	35.201	-106.709	5.58	1.92MDLA	....	..	77	WC	16	269	47.0	.20	.	.0	.0
144	1978 DEC 03	03:59:23.29	35.637	-106.815	6.20	.62MDLA	....	..	47	WC	14	154	30.0	.11	.	.0	.0
145	1978 DEC 07	20:27:23.38	35.138	-106.818	10.08	1.14MDLA	....	..	88	WC	21	203	58.0	.12	.	.0	.0
146	1978 DEC 07	23:25:50.31	35.107	-106.809	4.01	.69MDLA	....	..	90	WC	10	232	62.0	.11	.	.0	.0
147	1978 DEC 15	18:59:31.33	35.151	-106.825	10.08	.94MDLA	....	..	87	WC	17	200	59.0	.25	.	.0	.0
148	1978 DEC 16	23:06:34.44	35.317	-106.126	3.78	1.57MDLA	....	..	60	WC	8	209	10.0	.11	.	.0	.0
149	1978 DEC 26	03:08:02.92	35.925	-106.855	10.20	.22MDLA	....	..	47	WC	14	144	10.0	.11	.	.0	.0
150	1978 DEC 31	14:09:53.98	36.112	-106.167	12.17	1.10 NM	....	..	35	WC	7	167	11.0	.06	.	.0	.0
151	1979 JAN 14	01:43:18.28	35.685	-107.154	10.57	1.20MDLA	....	..	74	WC	22	162	30.0	.14	.	.0	.0
152	1979 JAN 17	00:15:38.86	36.284	-106.798	8.00	.46MDLA	....	..	65	WC	13	159	16.0	.10	.	.0	.0
153	1979 JAN 17	11:32:25.41	36.285	-106.811	7.08	1.54MDLA	....	..	65	WC	22	82	16.0	.10	.	.0	.0
154	1979 JAN 18	09:31:36.94	36.584	-106.563	8.32	1.72MDLA	....	..	86	WC	22	138	26.0	.15	.	.0	.0
155	1979 JAN 19	02:20:30.06	36.296	-106.806	8.63	.20MDLA	....	..	66	WC	9	185	15.0	.08	.	.0	.0
156	1979 JAN 20	15:17:30.63	35.800	-106.870	.22	.13MDLA	....	..	47	WC	16	138	4.0	.08	.	.0	.0
157	1979 JAN 22	20:18:13.42	35.125	-106.804	8.37	.50MDLA	....	..	88	WC	12	205	57.0	.10	.	.0	.0
158	1979 JAN 24	14:14:30.73	35.113	-106.801	4.61	.94MDLA	....	..	90	WC	19	208	57.0	.15	.	.0	.0
159	1979 JAN 25	02:51:26.18	35.115	-106.806	7.07	.09MDLA	....	..	89	WC	10	207	58.0	.17	.	.0	.0
160	1979 JAN 25	11:16:00.24	35.126	-106.810	8.50	.82MDLA	....	..	89	WC	15	205	58.0	.16	.	.0	.0
161	1979 JAN 27	00:24:09.47	35.094	-106.805	5.66	.17MDLA	....	..	91	WC	13	211	58.0	.13	.	.0	.0
162	1979 JAN 27	03:47:44.97	35.109	-106.816	6.84	.40MDLA	....	..	90	WC	12	208	59.0	.19	.	.0	.0
163	1979 JAN 28	02:45:06.95	35.098	-106.799	7.24	.17MDLA	....	..	91	WC	13	211	58.0	.12	.	.0	.0
164	1979 JAN 28	18:29:11.84	35.117	-106.802	8.14	.97MDLA	....	..	89	WC	22	207	57.0	.12	.	.0	.0
165	1979 JAN 28	18:37:03.25	35.112	-106.798	7.21	.03MDLA	....	..	89	WC	9	208	57.0	.07	.	.0	.0
166	1979 JAN 30	18:15:06.83	35.101	-106.805	6.69	.15MDLA	....	..	91	WC	11	210	58.0	.14	.	.0	.0
167	1979 JAN 31	12:01:32.14	35.115	-106.805	10.19	.53MDLA	....	..	89	WC	20	207	58.0	.14	.	.0	.0
168	1979 JAN 31	16:29:26.42	35.121	-106.803	6.29	-.11MDLA	....	..	89	WC	10	206	57.0	.18	.	.0	.0
169	1979 FEB 02	18:05:35.38	35.132	-106.819	7.11	.35MDLA	....	..	88	WC	13	229	60.0	.13	.	.0	.0
170	1979 FEB 03	10:27:41.63	35.118	-106.810	8.49	.10MDLA	....	..	89	WC	12	207	58.0	.10	.	.0	.0
171	1979 FEB 03	12:22:16.74	35.120	-106.806	8.21	-.02MDLA	....	..	89	WC	10	206	58.0	.09	.	.0	.0
172	1979 FEB 03	12:27:34.10	35.119	-106.807	9.26	-.17MDLA	....	..	89	WC	13	206	58.0	.17	.	.0	.0
173	1979 FEB 03	12:39:51.22	35.104	-106.811	9.23	.30MDLA	....	..	91	WC	13	209	59.0	.14	.	.0	.0
174	1979 FEB 05	23:10:38.51	35.119	-106.794	10.04	....	....	..	89	WC	14	232	57.0	.16	.	.0	.0
175	1979 FEB 05	23:10:43.26	35.151	-106.803	8.82	1.51MDLA	....	..	86	WC	17	252	60.0	.23	.	.0	.0
176	1979 FEB 06	23:09:16.81	36.019	-106.264	.00	.50 NM	....	..	22	WC	6	222	3.0	.13	.	.0	.0
177	1979 FEB 06	23:15:08.98	35.306	-106.110	4.79	.93MDLA	....	..	62	WC	14	201	10.0	.23	.	.0	.0
178	1979 FEB 08	23:24:00.57	35.312	-106.122	3.13	1.33MDLA	....	..	61	WC	18	192	9.0	.21	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Std-Err Vert
179	1979 FEB 12	06:55:51.28	35.097	-106.801	6.95	.10MDLA	....	..	91	WC	10	211	58.0	.14	.	.0	.0
180	1979 FEB 12	15:17:29.76	35.104	-106.810	3.06	.30MDLA	....	..	91	WC	13	209	58.0	.19	.	.0	.0
181	1979 FEB 13	15:21:08.73	35.107	-106.798	8.37	1.67MDLA	....	..	90	WC	17	209	57.0	.10	.	.0	.0
182	1979 FEB 17	16:56:02.93	35.124	-106.806	6.01	.42MDLA	....	..	89	WC	15	206	36.0	.13	.	.0	.0
183	1979 FEB 20	12:53:53.88	35.110	-106.807	6.41	.25MDLA	....	..	90	WC	8	208	36.0	.23	.	.0	.0
184	1979 FEB 23	20:33:28.07	35.265	-106.129	20.42	1.54MDLA	....	..	66	WC	11	243	6.0	.22	.	.0	.0
185	1979 FEB 24	02:25:20.55	35.128	-106.816	11.20	1.13MDLA	....	..	89	WC	21	205	35.0	.16	.	.0	.0
186	1979 FEB 25	07:57:56.71	35.123	-106.806	10.61	.56MDLA	....	..	89	WC	18	206	36.0	.13	.	.0	.0
187	1979 FEB 25	22:10:34.73	35.123	-106.804	4.54	.33MDLA	....	..	89	WC	16	206	36.0	.23	.	.0	.0
188	1979 FEB 25	22:13:36.38	35.127	-106.803	7.41	....	....	..	88	WC	16	205	36.0	.12	.	.0	.0
189	1979 FEB 25	22:14:00.50	35.171	-106.843	10.30	.45MDLA	....	..	86	WC	14	235	31.0	.18	.	.0	.0
190	1979 MAR 01	11:15:00.65	36.149	-106.174	3.36	.70 NM	....	..	39	WC	9	118	14.0	.18	.	.0	.0
191	1979 MAR 01	16:38:57.74	35.302	-106.099	4.33	1.18MDLA	....	..	63	WC	12	227	10.0	.20	.	.0	.0
192	1979 MAR 05	10:18:20.62	35.115	-106.801	3.18	.11MDLA	....	..	89	WC	9	207	36.0	.12	.	.0	.0
193	1979 MAR 05	11:33:58.23	35.121	-106.802	6.15	.80MDLA	....	..	89	WC	15	206	36.0	.19	.	.0	.0
194	1979 MAR 05	13:00:05.62	36.312	-106.200	5.21	2.66MDLA	....	..	55	WC	19	88	26.0	.10	.	.0	.0
195	1979 MAR 06	13:48:05.65	35.119	-106.809	4.47	.04MDLA	....	..	89	WC	15	206	36.0	.25	.	.0	.0
196	1979 MAR 07	10:51:05.87	35.126	-106.806	8.39	.76MDLA	....	..	88	WC	13	205	35.0	.17	.	.0	.0
197	1979 MAR 07	10:54:01.18	35.124	-106.808	7.29	.71MDLA	....	..	89	WC	12	206	35.0	.20	.	.0	.0
198	1979 MAR 07	11:03:53.21	35.109	-106.802	6.16	.07MDLA	....	..	90	WC	11	209	37.0	.19	.	.0	.0
199	1979 MAR 07	22:11:35.46	36.319	-106.193	7.54	1.94MDLA	....	..	56	WC	20	88	26.0	.09	.	.0	.0
200	1979 MAR 10	13:53:24.47	35.115	-106.800	6.44	2.19MDLA	....	..	89	WC	21	207	37.0	.16	.	.0	.0
201	1979 MAR 11	23:52:24.23	35.121	-106.814	6.34	.31MDLA	....	..	89	WC	9	206	35.0	.18	.	.0	.0
202	1979 MAR 12	00:21:38.12	35.108	-106.811	6.11	.04MDLA	....	..	90	WC	12	209	36.0	.22	.	.0	.0
203	1979 MAR 12	21:00:45.04	35.850	-106.207	9.28	1.50 NM	....	..	13	WC	15	71	10.0	.18	.	.0	.0
204	1979 MAR 12	22:54:12.00	35.104	-106.804	8.98	.44MDLA	....	..	90	WC	13	209	37.0	.13	.	.0	.0
205	1979 MAR 13	23:03:27.68	35.119	-106.802	7.43	.48MDLA	....	..	89	WC	14	206	36.0	.13	.	.0	.0
206	1979 MAR 15	00:29:24.08	35.118	-106.805	6.64	.26MDLA	....	..	89	WC	11	207	36.0	.14	.	.0	.0
207	1979 MAR 15	04:48:30.35	35.112	-106.817	6.42	.49MDLA	....	..	90	WC	13	208	35.0	.15	.	.0	.0
208	1979 MAR 17	11:25:59.48	36.319	-106.193	7.10	1.69MDLA	....	..	56	WC	21	88	26.0	.08	.	.0	.0
209	1979 MAR 17	17:14:34.02	35.116	-106.809	5.54	.04MDLA	....	..	89	WC	9	207	36.0	.17	.	.0	.0
210	1979 MAR 18	03:34:51.38	35.128	-106.806	8.47	1.05MDLA	....	..	88	WC	21	205	35.0	.16	.	.0	.0
211	1979 MAR 19	02:28:50.22	36.547	-105.338	10.78	1.01MDLA	....	..	121	WC	16	265	59.0	.17	.	.0	.0
212	1979 MAR 19	04:13:54.28	35.128	-106.806	8.46	.70MDLA	....	..	88	WC	19	205	35.0	.17	.	.0	.0
213	1979 MAR 21	02:27:41.63	35.112	-106.796	11.86	.65MDLA	....	..	89	WC	22	208	37.0	.14	.	.0	.0
214	1979 MAR 22	18:08:55.60	35.139	-106.818	10.12	.34MDLA	....	..	88	WC	15	228	34.0	.12	.	.0	.0
215	1979 MAR 25	20:04:24.89	36.488	-105.340	6.87	.71MDLA	....	..	117	WC	12	262	56.0	.25	.	.0	.0
216	1979 MAR 26	00:28:19.24	35.097	-106.799	6.90	-.20MDLA	....	..	91	WC	7	211	38.0	.11	.	.0	.0
217	1979 MAR 26	04:12:55.47	35.567	-106.057	4.73	.33MDLA	....	..	39	WC	13	153	14.0	.14	.	.0	.0
218	1979 MAR 27	19:08:42.60	35.123	-106.803	6.89	-.07MDLA	....	..	89	WC	9	206	36.0	.16	.	.0	.0
219	1979 MAR 28	18:49:19.18	35.095	-106.803	9.37	.28MDLA	....	..	91	WC	10	211	37.0	.10	.	.0	.0
220	1979 MAR 30	09:28:02.22	35.119	-106.801	7.68	2.00MDLA	....	..	89	WC	20	207	36.0	.09	.	.0	.0
221	1979 MAR 30	10:41:55.17	35.112	-106.796	7.05	2.58MDLA	....	..	89	WC	18	208	37.0	.13	.	.0	.0
222	1979 MAR 30	10:46:17.23	35.123	-106.799	7.88	-.34MDLA	....	..	88	WC	9	219	36.0	.17	.	.0	.0
223	1979 APR 02	11:17:12.92	35.138	-106.816	6.00	.52MDLA	....	..	88	WC	14	234	34.0	.18	.	.0	.0
224	1979 APR 04	12:14:07.26	35.106	-106.811	10.19	.10MDLA	....	..	91	WC	12	254	36.0	.23	.	.0	.0
225	1979 APR 06	21:56:11.69	35.141	-106.824	10.43	.04MDLA	....	..	88	WC	13	233	33.0	.12	.	.0	.0
226	1979 APR 07	08:17:06.73	35.680	-106.656	11.17	1.56MDLA	....	..	32	WC	20	124	20.0	.07	.	.0	.0
227	1979 APR 07	13:22:03.27	35.839	-106.099	7.53	....	....	..	23	WC	13	99	11.0	.08	.	.0	.0
228	1979 APR 07	23:35:39.95	35.148	-106.817	10.55	1.04MDLA	....	..	87	WC	21	227	34.0	.12	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Vert
229	1979 APR 07	23:40:53.41	35.124	-106.812	10.53	1.35MDLA	....	..	89	WC	19	230	35.0	.15	.	.0	.0
230	1979 APR 11	01:49:54.74	35.136	-106.808	8.39	1.04MDLA	....	..	88	WC	15	228	35.0	.16	.	.0	.0
231	1979 APR 11	02:22:41.11	35.147	-106.821	10.13	.60MDLA	....	..	87	WC	15	227	33.0	.09	.	.0	.0
232	1979 APR 11	11:41:24.99	35.126	-106.816	9.43	.39MDLA	....	..	89	WC	10	250	35.0	.09	.	.0	.0
233	1979 APR 12	03:48:53.99	35.143	-106.812	9.49	.34MDLA	....	..	87	WC	15	233	34.0	.11	.	.0	.0
234	1979 APR 13	07:38:52.60	35.846	-106.099	4.87	.29MDLA	....	..	23	WC	14	97	12.0	.07	.	.0	.0
235	1979 APR 16	09:49:37.16	35.153	-106.824	8.26	.27MDLA	....	..	87	WC	13	231	33.0	.20	.	.0	.0
236	1979 APR 17	05:49:21.61	35.146	-106.807	8.37	.07MDLA	....	..	86	WC	11	201	35.0	.18	.	.0	.0
237	1979 APR 17	10:24:25.35	35.688	-106.678	8.01	-.53MDLA	....	..	34	WC	9	201	17.0	.02	.	.0	.0
238	1979 APR 18	03:25:20.31	35.136	-106.804	9.02	1.47MDLA	....	..	87	WC	22	203	35.0	.16	.	.0	.0
239	1979 APR 18	06:55:35.70	35.141	-106.816	9.40	.38MDLA	....	..	87	WC	20	202	34.0	.15	.	.0	.0
240	1979 APR 18	13:13:36.82	35.133	-106.801	8.65	.10MDLA	....	..	88	WC	16	204	36.0	.12	.	.0	.0
241	1979 APR 22	00:43:53.77	35.135	-106.802	10.12	.16MDLA	....	..	87	WC	17	203	35.0	.16	.	.0	.0
242	1979 APR 26	03:21:55.53	35.131	-106.801	10.14	.19MDLA	....	..	88	WC	13	204	36.0	.15	.	.0	.0
243	1979 APR 30	01:41:23.31	36.345	-106.750	6.46	.34MDLA	....	..	67	WC	10	153	9.0	.10	.	.0	.0
244	1979 APR 30	01:44:15.07	36.357	-106.741	6.66	.65MDLA	....	..	68	WC	8	144	8.0	.15	.	.0	.0
245	1979 APR 30	19:08:04.76	35.126	-106.798	10.22	.75MDLA	....	..	88	WC	16	205	36.0	.15	.	.0	.0
246	1979 MAY 01	05:37:23.53	35.153	-106.822	10.82	.40MDLA	....	..	86	WC	14	226	33.0	.13	.	.0	.0
247	1979 MAY 17	16:00:55.18	36.426	-106.697	8.78	.98MDLA	....	..	73	WC	16	140	7.0	.08	.	.0	.0
248	1979 JUN 05	05:26:09.40	36.432	-106.709	6.11	1.25MDLA	....	..	74	WC	15	176	48.0	.07	.	.0	.0
249	1979 JUN 12	16:51:41.49	36.312	-106.452	6.76	1.30MDLA	....	..	54	WC	17	227	36.0	.13	.	.0	.0
250	1979 JUN 13	02:22:51.02	35.784	-106.720	8.88	-.43MDLA	....	..	34	WC	8	167	11.0	.15	.	.0	.0
251	1979 JUN 28	23:12:39.37	36.198	-106.856	6.43	.57MDLA	....	..	61	WC	8	249	58.0	.07	.	.0	.0
252	1979 JUL 08	15:55:04.30	35.112	-106.809	11.83	1.95MDLA	....	..	90	WC	14	208	36.0	.07	.	.0	.0
253	1979 JUL 21	11:39:56.63	35.127	-106.805	10.52	.54MDLA	....	..	88	WC	18	205	36.0	.16	.	.0	.0
254	1979 JUL 24	18:11:13.34	35.116	-106.799	9.26	.70MDLA	....	..	89	WC	16	207	37.0	.16	.	.0	.0
255	1979 JUL 30	13:38:18.55	35.140	-106.881	10.12	1.51MDLA	....	..	90	WC	22	202	29.0	.18	.	.0	.0
256	1979 AUG 14	18:56:54.92	36.181	-106.855	.67	.97MDLA	....	..	60	WC	14	179	19.0	.04	.	.0	.0
257	1979 AUG 15	04:24:40.18	35.114	-106.804	8.49	1.21MDLA	....	..	90	WC	20	208	36.0	.14	.	.0	.0
258	1979 AUG 18	00:39:07.02	36.432	-106.585	6.21	.18MDLA	....	..	70	WC	10	197	17.0	.08	.	.0	.0
259	1979 AUG 20	11:09:33.04	36.524	-106.724	7.76	1.00MDLA	....	..	84	WC	13	215	12.0	.12	.	.0	.0
260	1979 AUG 25	04:35:42.25	35.466	-107.105	12.80	1.32MDLA	....	..	79	WC	17	136	41.0	.21	.	.0	.0
261	1979 AUG 25	04:37:02.36	35.465	-107.116	4.76	.44MDLA	....	..	80	WC	14	136	42.0	.14	.	.0	.0
262	1979 AUG 26	15:37:15.18	36.542	-106.724	6.08	.58MDLA	....	..	86	WC	8	220	14.0	.02	.	.0	.0
263	1979 AUG 26	22:53:05.19	36.541	-106.752	10.23	1.16MDLA	....	..	87	WC	10	231	13.0	.06	.	.0	.0
264	1979 AUG 26	23:22:17.74	36.527	-106.709	6.35	.99MDLA	....	..	84	WC	12	208	13.0	.13	.	.0	.0
265	1979 AUG 28	01:19:42.82	35.477	-107.117	5.96	.17MDLA	....	..	80	WC	9	142	41.0	.20	.	.0	.0
266	1979 AUG 31	17:26:29.52	35.452	-107.101	7.72	1.49MDLA	....	..	80	WC	19	139	22.0	.14	.	.0	.0
267	1979 AUG 31	18:51:33.64	35.521	-105.969	12.76	1.03MDLA	....	..	49	WC	13	184	24.0	.08	.	.0	.0
268	1979 SEP 01	21:15:50.70	36.499	-106.540	10.72	.90MDLA	....	..	76	WC	15	210	58.0	.21	.	.0	.0
269	1979 SEP 04	18:36:12.11	35.481	-106.251	.06	1.73MDLA	....	..	40	WC	11	133	15.0	.10	.	.0	.0
270	1979 SEP 05	08:31:00.41	36.464	-105.514	11.36	.41MDLA	....	..	103	WC	11	243	41.0	.16	.	.0	.0
271	1979 SEP 21	02:55:44.80	35.744	-106.100	4.56	....	....	..	24	WC	11	108	7.0	.09	.	.0	.0
272	1979 SEP 21	10:43:00.77	35.747	-106.098	3.68	....	....	..	25	WC	14	131	7.0	.08	.	.0	.0
273	1979 SEP 22	09:03:28.96	35.947	-106.221	1.34	....	....	..	17	WC	14	77	10.0	.07	.	.0	.0
274	1979 OCT 02	23:15:51.19	35.128	-106.813	9.14	1.06MDLA	....	..	89	WC	20	205	58.0	.19	.	.0	.0
275	1979 OCT 28	08:22:34.35	35.916	-106.787	7.26	.62MDLA	....	..	41	WC	11	110	12.0	.06	.	.0	.0
276	1979 OCT 29	04:05:49.89	36.444	-106.506	18.38	1.33MDLA	....	..	70	WC	17	137	24.0	.15	.	.0	.0
277	1979 NOV 03	01:11:10.53	36.571	-106.754	9.21	1.74MDLA	....	..	90	WC	17	142	16.0	.09	.	.0	.0
278	1979 NOV 03	18:24:41.77	35.530	-106.220	.00	1.87MDLA	....	..	35	WC	12	241	9.0	.08	.	.0	.0

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279	1979 NOV 06	02:15:35.51	36.076	-106.879	8.01	1.63MDLA	....	..	55	WC	20	158	8.0	.09	.	.0	.0
280	1979 NOV 13	21:31:27.64	36.304	-106.792	10.71	1.10MDLA	....	..	66	WC	20	154	14.0	.07	.	.0	.0
281	1979 NOV 13	21:58:33.45	36.305	-106.784	9.81	1.17MDLA	....	..	66	WC	19	151	13.0	.07	.	.0	.0
282	1979 NOV 14	08:43:31.08	35.781	-106.937	.33	1.18MDLA	....	..	53	WC	20	152	9.0	.09	.	.0	.0
283	1979 NOV 15	21:40:43.49	36.082	-106.692	3.82	.55MDLA	....	..	42	WC	12	108	14.0	.08	.	.0	.0
284	1979 NOV 19	02:56:38.09	36.087	-106.700	8.38	.60MDLA	....	..	43	WC	10	112	15.0	.09	.	.0	.0
285	1979 NOV 24	15:28:13.53	36.464	-106.739	5.38	.91MDLA	....	..	79	WC	14	197	5.0	.08	.	.0	.0
286	1979 NOV 26	10:11:03.29	36.331	-106.862	7.66	.98MDLA	....	..	72	WC	9	218	13.0	.04	.	.0	.0
287	1979 DEC 18	16:39:24.90	35.757	-106.673	3.85	.89MDLA	....	..	30	WC	12	186	15.0	.06	.	.0	.0
288	1979 DEC 20	00:29:22.57	35.756	-106.678	3.84	.74MDLA	....	..	31	WC	14	187	15.0	.10	.	.0	.0
289	1979 DEC 20	06:18:51.61	35.929	-106.755	4.98	.09MDLA	....	..	38	WC	8	116	12.0	.08	.	.0	.0
290	1979 DEC 22	17:34:35.86	35.766	-106.690	13.28	-.31MDLA	....	..	32	WC	5	181	14.0	.07	.	.0	.0
291	1979 DEC 23	23:50:47.02	35.127	-106.822	5.19	.40MDLA	....	..	89	WC	9	205	59.0	.22	.	.0	.0
292	1979 DEC 24	13:54:41.19	35.134	-106.802	6.37	1.17MDLA	....	..	87	WC	18	204	57.0	.20	.	.0	.0
293	1979 DEC 24	14:07:01.23	35.132	-106.802	6.56	.55MDLA	....	..	88	WC	15	204	57.0	.18	.	.0	.0
294	1979 DEC 28	04:49:02.04	36.306	-105.854	12.13	.40MDLA	....	..	69	WC	19	187	6.0	.11	.	.0	.0
295	1980 JAN 08	00:22:44.22	35.709	-106.824	8.28	.49MDLA	....	..	45	WC	15	216	7.0	.12	.	.0	.0
296	1980 FEB 07	21:21:53.08	35.553	-106.819	4.68	1.13MDLA	....	..	52	WC	12	161	24.0	.05	.	.0	.0
297	1980 FEB 10	21:06:23.53	36.447	-106.903	3.24	1.32MDLA	....	..	85	WC	16	256	12.0	.15	.	.0	.0
298	1980 FEB 15	11:30:37.11	35.942	-106.919	7.05	.19MDLA	....	..	53	WC	10	241	10.0	.08	.	.0	.0
299	1980 FEB 19	15:04:13.20	35.715	-106.431	8.15	....	....	..	15	WC	7	160	7.0	.03	.	.0	.0
300	1980 FEB 27	00:16:57.72	35.711	-106.758	9.68	-.26MDLA	....	..	39	WC	14	209	10.0	.11	.	.0	.0
301	1980 FEB 28	11:14:56.84	36.451	-106.381	6.26	.32MDLA	....	..	69	WC	12	129	36.0	.08	.	.0	.0
302	1980 MAR 15	17:53:17.84	35.601	-106.952	8.69	.79MDLA	....	..	60	WC	19	148	21.0	.11	.	.0	.0
303	1980 MAR 16	14:46:01.42	35.620	-106.965	10.26	.04MDLA	....	..	60	WC	11	151	20.0	.25	.	.0	.0
304	1980 MAR 19	03:36:31.65	35.670	-106.459	4.48	.30 NM	....	..	20	WC	7	182	13.0	.07	.	.0	.0
305	1980 APR 01	02:23:03.81	36.110	-106.218	7.08	.40 NM	....	..	33	WC	8	156	8.0	.07	.	.0	.0
306	1980 APR 09	10:19:05.69	36.294	-105.882	9.46	.40 NM	....	..	67	WC	9	250	3.0	.12	.	.0	.0
307	1980 APR 18	15:53:23.79	35.880	-106.777	5.13	.19MDLA	....	..	39	WC	14	133	13.0	.04	.	.0	.0
308	1980 APR 21	03:13:04.78	35.770	-105.685	13.67	1.02MDLA	....	..	61	WC	16	263	9.0	.21	.	.0	.0
309	1980 APR 24	05:12:28.44	35.786	-106.721	.04	.03MDLA	....	..	34	WC	11	148	11.0	.17	.	.0	.0
310	1980 APR 24	19:11:57.97	35.876	-106.777	7.13	....	....	..	39	WC	12	132	13.0	.08	.	.0	.0
311	1980 APR 24	19:12:33.48	35.874	-106.783	7.03	1.90MDLA	....	..	39	WC	12	135	13.0	.09	.	.0	.0
312	1980 APR 24	22:30:33.13	35.874	-106.778	6.65	.02MDLA	....	..	39	WC	12	133	13.0	.04	.	.0	.0
313	1980 APR 27	08:49:14.72	35.877	-106.772	3.63	.55MDLA	....	..	38	WC	15	129	13.0	.07	.	.0	.0
314	1980 APR 28	07:26:01.42	35.876	-106.785	6.73	.28MDLA	....	..	40	WC	11	137	13.0	.04	.	.0	.0
315	1980 MAY 06	03:04:03.98	35.667	-106.987	17.25	.34MDLA	....	..	60	WC	12	148	17.0	.18	.	.0	.0
316	1980 MAY 16	08:09:27.67	35.987	-106.133	5.09	1.05MDLA	....	..	26	WC	10	94	11.0	.04	.	.0	.0
317	1980 MAY 16	09:11:18.76	35.600	-106.823	10.43	.48MDLA	....	..	50	WC	16	269	38.0	.25	.	.0	.0
318	1980 MAY 25	17:39:37.38	36.252	-106.223	7.70	.58MDLA	....	..	48	WC	9	151	24.0	.13	.	.0	.0
319	1980 JUN 08	07:04:01.66	36.014	-106.135	4.14	.61MDLA	....	..	28	WC	9	94	10.0	.10	.	.0	.0
320	1980 JUN 15	19:58:04.72	35.986	-106.155	8.28	.80 NM	....	..	25	WC	7	183	9.0	.09	.	.0	.0
321	1980 JUN 20	08:14:16.80	36.000	-106.152	7.55	.40 NM	....	..	26	WC	7	98	9.0	.11	.	.0	.0
322	1980 JUN 23	17:44:11.58	35.730	-106.659	8.10	.11MDLA	....	..	30	WC	12	200	17.0	.14	.	.0	.0
323	1980 JUN 25	08:11:42.79	35.751	-106.942	.66	1.29MDLA	....	..	54	WC	18	144	9.0	.06	.	.0	.0
324	1980 JUN 25	20:07:15.47	35.940	-105.970	8.37	1.59MDLA	....	..	36	WC	15	127	24.0	.09	.	.0	.0
325	1980 JUN 27	01:44:29.85	35.945	-106.821	6.74	.54MDLA	....	..	44	WC	15	179	18.0	.08	.	.0	.0
326	1980 JUN 28	23:04:10.30	35.980	-106.151	7.89	.10 NM	....	..	25	WC	5	90	10.0	.10	.	.0	.0
327	1980 JUL 05	10:24:06.12	36.305	-106.063	5.89	.40 NM	....	..	59	WC	9	96	14.0	.09	.	.0	.0
328	1980 JUL 14	12:45:20.44	36.456	-106.562	10.16	.51MDLA	....	..	72	WC	18	146	19.0	.09	.	.0	.0

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329	1980 AUG 08	10:05:18.43	35.625	-106.622	9.41	.25MDLA	....	..	34	WC	14	233	26.0	.08	.	.0	.0
330	1980 AUG 13	18:33:29.69	36.008	-106.774	4.33	1.09MDLA	....	..	43	WC	12	84	6.0	.08	.	.0	.0
331	1980 SEP 02	22:32:04.98	35.990	-106.127	2.99	.50 NM	....	..	27	WC	11	95	11.0	.04	.	.0	.0
332	1980 SEP 06	12:55:37.79	36.282	-106.499	7.53	....	....	..	52	WC	10	147	30.0	.10	.	.0	.0
333	1980 SEP 11	02:07:10.22	35.735	-106.914	.08	.57MDLA	....	..	52	WC	17	142	8.0	.13	.	.0	.0
334	1980 SEP 18	15:42:22.20	36.013	-106.851	7.52	.26MDLA	....	..	50	WC	12	252	1.0	.12	.	.0	.0
335	1980 SEP 23	05:57:56.02	36.013	-106.847	7.38	.73MDLA	....	..	49	WC	14	251	.....	.11	.	.0	.0
336	1980 SEP 24	18:14:45.05	35.549	-106.821	4.58	1.03MDLA	....	..	53	WC	15	171	25.0	.07	.	.0	.0
337	1980 OCT 08	19:56:47.30	36.476	-105.814	9.06	.83MDLA	....	..	86	WC	13	201	23.0	.05	.	.0	.0
338	1980 OCT 19	06:18:00.42	36.152	-106.170	4.52	....	....	..	39	WC	11	119	14.0	.06	.	.0	.0
339	1980 OCT 19	07:24:29.47	36.153	-106.172	5.74	.20 NM	....	..	39	WC	12	119	14.0	.06	.	.0	.0
340	1980 OCT 25	19:42:52.29	35.540	-107.171	7.23	.33MDLA	....	..	81	WC	20	153	19.0	.15	.	.0	.0
341	1980 NOV 13	19:49:05.51	35.687	-106.342	.03	.60 NM	....	..	16	WC	7	231	8.0	.06	.	.0	.0
342	1980 NOV 17	21:06:49.60	35.659	-106.333	1.47	.50 NM	....	..	19	WC	7	236	11.0	.06	.	.0	.0
343	1980 NOV 18	14:20:52.49	35.851	-106.677	3.85	.53MDLA	....	..	30	WC	8	129	11.0	.20	.	.0	.0
344	1980 NOV 22	00:16:27.97	36.351	-106.916	12.42	1.47MDLA	....	..	77	WC	19	207	15.0	.10	.	.0	.0
345	1980 NOV 27	09:28:17.58	36.420	-105.468	10.12	1.08MDLA	....	..	103	WC	14	247	43.0	.08	.	.0	.0
346	1980 NOV 29	08:19:48.97	36.407	-105.519	14.85	1.70MDLA	....	..	98	WC	17	240	38.0	.10	.	.0	.0
347	1980 NOV 30	07:20:30.52	36.541	-106.649	15.22	.88MDLA	....	..	83	WC	21	195	17.0	.10	.	.0	.0
348	1980 DEC 18	17:11:12.60	36.324	-106.144	8.55	.10 NM	....	..	58	WC	8	93	21.0	.09	.	.0	.0
349	1980 DEC 23	02:02:57.14	35.742	-107.153	8.06	.26MDLA	....	..	73	WC	8	194	28.0	.20	.	.0	.0
350	1981 JAN 11	17:24:00.56	36.314	-106.573	7.59	.27MDLA	....	..	57	WC	15	149	22.0	.07	.	.0	.0
351	1981 FEB 23	13:41:38.12	36.037	-106.876	11.10	.25MDLA	....	..	53	WC	15	198	4.0	.10	.	.0	.0
352	1981 FEB 28	08:49:46.74	36.240	-106.221	21.31	.20 NM	....	..	47	WC	8	147	23.0	.08	.	.0	.0
353	1981 MAR 06	07:41:33.39	35.558	-107.006	8.80	.52MDLA	....	..	67	WC	11	164	28.0	.07	.	.0	.0
354	1981 MAR 08	02:21:21.70	36.335	-106.217	6.05	....	....	..	57	WC	13	180	28.0	.09	.	.0	.0
355	1981 MAR 15	12:44:35.56	35.907	-106.493	7.10	.10 NM	....	..	15	WC	7	266	20.0	.15	.	.0	.0
356	1981 MAR 20	13:57:40.26	36.285	-106.544	5.68	....	....	..	53	WC	10	143	26.0	.07	.	.0	.0
357	1981 MAR 24	21:48:51.05	35.548	-106.835	8.18	.79MDLA	....	..	54	WC	11	184	25.0	.17	.	.0	.0
358	1981 APR 05	04:14:14.78	35.872	-106.779	7.41	.48MDLA	....	..	39	WC	19	111	13.0	.13	.	.0	.0
359	1981 MAY 03	10:36:39.93	35.539	-106.239	7.33	.86MDLA	....	..	34	WC	10	239	25.0	.08	.	.0	.0
360	1981 AUG 03	05:11:42.81	35.693	-106.122	8.06	.57MDLA	....	..	26	WC	8	148	12.0	.06	.	.0	.0
361	1981 AUG 18	00:16:27.48	36.677	-106.716	6.05	1.18MDLA	....	..	100	WC	13	224	28.0	.11	.	.0	.0
362	1981 SEP 21	04:19:04.12	36.519	-106.647	13.86	.86MDLA	....	..	81	WC	23	187	15.0	.10	.	.0	.0
363	1981 SEP 26	02:15:59.46	36.514	-106.499	10.45	.40MDLA	....	..	77	WC	15	159	27.0	.21	.	.0	.0
364	1981 OCT 01	07:40:22.82	35.527	-106.443	7.69	.87MDLA	....	..	35	WC	19	187	23.0	.11	.	.0	.0
365	1981 OCT 21	08:41:48.69	36.465	-106.668	10.61	1.72MDLA	....	..	76	WC	22	166	11.0	.11	.	.0	.0
366	1981 NOV 02	06:22:41.21	35.454	-106.121	11.47	.62MDLA	....	..	47	WC	19	221	19.0	.11	.	.0	.0
367	1981 NOV 24	06:51:19.38	35.764	-106.760	10.52	1.29MDLA	....	..	38	WC	16	125	7.0	.12	.	.0	.0
368	1982 JAN 11	04:13:23.14	35.631	-106.627	9.43	.07MDLA	....	..	33	WC	12	215	25.0	.08	.	.0	.0
369	1982 FEB 26	20:22:50.58	35.175	-106.767	7.91	.72MDLA	....	..	82	WC	10	230	66.0	.24	.	.0	.0
370	1982 APR 06	11:53:21.87	36.293	-106.761	9.42	.30MDLA	....	..	63	WC	9	257	32.0	.08	.	.0	.0
371	1982 APR 19	07:34:46.75	36.316	-105.821	11.85	1.03MDLA	....	..	72	WC	11	193	9.0	.13	.	.0	.0
372	1982 APR 24	04:12:07.24	35.723	-106.708	9.94	.30MDLA	....	..	34	WC	13	188	13.0	.21	.	.0	.0
373	1982 MAY 26	20:39:44.68	36.515	-106.723	4.58	1.77MDLA	....	..	83	WC	10	125	57.0	.10	.	.0	.0
374	1982 MAY 27	03:32:41.78	36.646	-106.728	.06	....	....	..	97	WC	11	172	58.0	.23	.	.0	.0
375	1982 MAY 27	16:26:09.62	36.494	-106.741	10.01	1.23MDLA	....	..	82	WC	8	129	54.0	.04	.	.0	.0
376	1982 MAY 28	02:41:09.72	35.689	-107.036	16.33	....	....	..	64	WC	9	202	40.0	.25	.	.0	.0
377	1982 JUN 26	13:32:40.52	35.611	-106.798	9.05	.71MDLA	....	..	47	WC	9	270	18.0	.19	.	.0	.0
378	1982 JUN 29	11:57:23.91	36.657	-106.711	7.08	1.53MDLA	....	..	97	WC	10	124	59.0	.13	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Vert
379	1982 JUL 12	16:37:07.91	35.575	-107.120	8.27	2.61MDLA	....	..	75	WC	8	157	33.0	.11	.	.0	.0
380	1982 JUL 22	11:23:29.11	35.695	-106.941	.23	1.22MDLA	....	..	56	WC	14	146	12.0	.07	.	.0	.0
381	1982 JUL 22	12:46:23.99	35.695	-106.949	3.35	1.70MDLA	....	..	56	WC	24	146	13.0	.19	.	.0	.0
382	1982 JUL 22	20:51:01.22	35.457	-107.082	1.14	1.74MDLA	....	..	78	WC	6	205	41.0	.10	.	.0	.0
383	1982 AUG 07	04:48:01.08	36.703	-106.688	12.23	2.93MDLA	....	..	102	WC	5	133	58.0	.00	.	.0	.0
384	1982 AUG 08	17:08:40.33	36.729	-106.672	8.90	2.52MDLA	....	..	104	WC	5	139	58.0	.09	.	.0	.0
385	1982 AUG 09	02:22:25.13	36.687	-106.689	7.87	1.83MDLA	....	..	100	WC	7	130	59.0	.17	.	.0	.0
386	1982 AUG 10	08:11:03.56	36.677	-106.697	.75	1.50MDLA	....	..	99	WC	6	128	59.0	.04	.	.0	.0
387	1982 DEC 15	14:54:59.58	36.026	-106.852	8.13	.93MDLA	....	..	50	WC	10	191	2.0	.11	.	.0	.0
388	1982 DEC 16	04:08:03.68	35.691	-106.918	.51	.82MDLA	....	..	54	WC	16	148	11.0	.07	.	.0	.0
389	1982 DEC 24	19:08:45.28	35.214	-106.936	9.26	1.79MDLA	....	..	87	WC	11	216	60.0	.09	.	.0	.0
390	1982 DEC 30	02:24:12.99	36.506	-106.651	4.89	1.54MDLA	....	..	80	WC	7	217	57.0	.14	.	.0	.0
391	1983 FEB 04	18:14:38.80	35.916	-106.167	7.21	1.52MDLA	....	..	19	WC	8	219	25.0	.08	.	.0	.0
392	1983 FEB 11	04:19:20.18	35.930	-106.764	4.41	.49MDLA	....	..	39	WC	11	147	7.0	.10	.	.0	.0
393	1983 FEB 28	04:52:20.25	36.090	-106.227	.00	1.14MDLA	....	..	31	WC	8	134	6.0	.21	.	.0	.0
394	1983 MAR 15	04:28:43.86	36.077	-106.225	3.38	.99MDLA	....	..	30	WC	13	181	38.0	.10	.	.0	.0
395	1983 APR 06	10:39:44.74	36.078	-106.225	2.45	1.11MDLA	....	..	30	WC	15	117	38.0	.10	.	.0	.0
396	1983 JUN 24	06:28:50.28	36.463	-106.670	10.49	....	....	..	76	WC	13	214	52.0	.16	.	.0	.0
397	1983 JUN 27	01:51:05.36	36.196	-106.875	.97	.51MDLA	....	..	62	WC	11	267	20.0	.06	.	.0	.0
398	1983 JUL 08	09:49:14.43	35.919	-106.872	11.56	.35MDLA	....	..	48	WC	12	110	11.0	.07	.	.0	.0
399	1983 JUL 19	17:12:43.15	36.175	-106.848	5.62	.75MDLA	....	..	59	WC	9	262	18.0	.12	.	.0	.0
400	1983 JUL 20	10:11:53.36	36.347	-105.810	1.24	1.62MDLA	....	..	75	WC	15	196	52.0	.22	.	.0	.0
401	1983 AUG 03	09:17:29.81	36.088	-106.903	8.15	1.49MDLA	....	..	58	WC	17	222	10.0	.12	.	.0	.0
402	1983 AUG 11	15:09:22.29	36.343	-105.779	12.13	1.75MDLA	....	..	77	WC	12	200	14.0	.08	.	.0	.0
403	1983 AUG 14	14:45:02.45	35.813	-106.471	.12	1.79MDLA	....	..	11	WC	8	138	11.0	.07	.	.0	.0
404	1983 SEP 19	05:07:56.61	35.748	-106.098	5.26	1.08MDLA	....	..	25	WC	6	191	29.0	.05	.	.0	.0
405	1983 OCT 09	22:47:05.38	36.093	-106.536	1.85	1.73MDLA	....	..	34	WC	9	118	27.0	.02	.	.0	.0
406	1983 OCT 29	03:57:07.34	35.159	-106.536	2.54	1.40 NM	....	..	76	WC	12	232	73.0	.09	.	.0	.0
407	1983 NOV 28	17:31:12.61	36.512	-105.967	13.95	....	....	..	83	WC	9	175	26.0	.02	.	.0	.0
408	1983 DEC 02	22:10:00.33	35.257	-106.656	.48	.88MDLA	....	..	69	WC	5	286	59.0	.09	.	.0	.0
409	1983 DEC 02	22:44:08.57	35.312	-106.467	11.59	2.70MDLA	....	..	58	WC	6	217	61.0	.22	.	.0	.0
410	1984 JAN 28	20:45:45.41	35.498	-106.233	8.89	2.14MDLA	....	..	38	WC	6	240	56.0	.06	.	.0	.0
411	1984 FEB 05	09:05:24.37	36.006	-106.736	9.68	1.48MDLA	....	..	40	WC	12	204	15.0	.16	.	.0	.0
412	1984 APR 18	19:44:03.88	35.964	-106.273	8.93	1.80 NM	....	..	16	WC	7	155	48.0	.04	.	.0	.0
413	1984 JUN 30	12:02:52.80	36.545	-106.219	5.64	1.75MDLA	....	..	80	WC	11	134	40.0	.16	.	.0	.0
414	1984 JUL 19	16:50:20.52	36.058	-106.159	3.39	.83MDLA	....	..	31	WC	6	136	34.0	.22	.	.0	.0
415	1984 AUG 19	11:32:34.23	35.619	-106.868	7.94	1.11MDLA	....	..	52	WC	9	171	48.0	.13	.	.0	.0
416	1984 SEP 27	04:05:27.23	36.168	-106.882	3.26	1.82MDLA	....	..	61	WC	8	236	18.0	.08	.	.0	.0
417	1984 NOV 07	03:21:45.81	36.144	-106.268	11.22	.09MDLA	....	..	36	WC	6	170	36.0	.12	.	.0	.0
418	1984 NOV 18	14:14:13.11	35.793	-106.413	3.12	.90 NM	....	..	7	WC	9	240	46.0	.09	.	.0	.0
419	1984 NOV 20	00:48:23.97	35.783	-106.415	1.27	....	....	..	8	WC	7	242	46.0	.11	.	.0	.0
420	1984 NOV 20	01:21:42.46	35.792	-106.417	3.41	.69MDLA	....	..	7	WC	12	240	18.0	.11	.	.0	.0
421	1985 JAN 03	16:31:24.70	35.809	-106.960	7.67	1.34MDLA	....	..	55	WC	6	162	25.0	.12	.	.0	.0
422	1985 JAN 06	21:02:30.93	35.842	-106.741	7.48	2.51MDLA	....	..	35	WC	5	125	21.0	.12	.	.0	.0
423	1985 JAN 27	19:39:12.82	36.438	-106.826	10.11	1.07MDLA	....	..	80	WC	6	208	74.0	.09	.	.0	.0
424	1985 FEB 01	17:06:43.52	35.584	-107.121	5.03	1.34MDLA	....	..	75	WC	8	158	54.0	.11	.	.0	.0
425	1985 APR 07	19:01:46.87	36.122	-106.820	13.63	....	....	..	53	WC	11	184	84.0	.07	.	.0	.0
426	1985 APR 25	16:53:43.39	35.499	-106.844	8.12	.83MDLA	....	..	58	WC	9	192	52.0	.10	.	.0	.0
427	1985 MAY 01	18:46:47.10	36.017	-106.410	4.05	.93MDLA	....	..	21	WC	9	147	15.0	.10	.	.0	.0
428	1985 MAY 15	23:11:51.56	35.329	-105.979	7.62	1.90MDLA	....	..	65	WC	7	254	59.0	.14	.	.0	.0

Cat No.	Date year-mo-day	Time (GMT) hr-min-sec	Lat	Long	Depth (km)	Mag1	Mag2	Inten (MM)	Dist (km)	Data Srce	No. Arr	Az Gap	D-min (km)	RMS (sec)	Q	Std-Err Horiz	Std-Err Vert
429	1985 MAY 30	18:46:30.81	35.644	-106.556	25.86	1.46MDLA	....	..	28	WC	8	189	21.0	.23	.	.0	.0
430	1985 JUN 19	21:05:09.85	36.267	-106.235	14.31	1.74MDLA	....	..	50	WC	8	184	29.0	.06	.	.0	.0
431	1985 JUL 01	05:27:19.77	36.564	-106.242	4.46	....	....	..	82	WC	7	170	39.0	.03	.	.0	.0
432	1985 JUL 13	16:15:30.70	36.250	-106.436	5.63	.90MDLA	....	..	47	WC	12	154	38.0	.10	.	.0	.0
433	1986 APR 02	16:58:13.97	36.074	-106.400	1.39	1.90MDLA	....	..	27	WC	9	247	19.0	.04	.	.0	.0
434	1986 MAY 17	15:25:00.03	35.729	-106.147	.00	.92MDLA	....	..	22	WC	5	242	11.0	.16	.	.0	.0
435	1986 JUN 07	11:09:09.38	36.350	-105.786	10.97	.58MDLA	....	..	77	WC	7	259	13.0	.04	.	.0	.0
436	1986 JUL 04	05:49:25.72	36.134	-106.167	10.00	.46MDLA	....	..	38	WC	8	207	26.0	.04	.	.0	.0
437	1986 JUL 16	17:35:09.61	36.329	-105.786	9.28	1.30MDLA	....	..	75	WC	8	243	12.0	.03	.	.0	.0
438	1987 JAN 28	13:11:49.18	36.039	-106.276	9.47	.13MDLA	....	..	24	WC	8	208	13.0	.05	.	.0	.0
439	1987 MAR 11	06:08:43.40	35.942	-106.263	8.99	.15MDLA	....	..	15	WC	6	194	4.0	.08	.	.0	.0
440	1987 APR 18	07:50:12.33	36.343	-105.798	12.24	1.37MDLA	....	..	76	WC	7	254	12.0	.18	.	.0	.0
441	1987 SEP 03	17:48:59.17	36.470	-106.443	7.87	.72MDLA	....	..	72	WC	9	217	34.0	.08	.	.0	.0
442	1987 SEP 22	19:29:06.65	35.997	-106.601	36.88	2.10MDLA	....	..	29	WC	7	240	34.0	.20	.	.0	.0
443	1987 OCT 11	13:02:51.48	36.589	-106.523	8.72	.69MDLA	....	..	86	WC	9	246	30.0	.23	.	.0	.0
444	1987 OCT 14	07:22:15.31	36.386	-106.795	10.34	.63MDLA	....	..	74	WC	8	261	63.0	.12	.	.0	.0
445	1987 OCT 31	04:33:23.40	36.583	-106.466	9.34	.29MDLA	....	..	84	WC	7	236	26.0	.23	.	.0	.0
446	1987 DEC 19	09:18:14.52	36.283	-106.269	12.41	.22MDLA	....	..	51	WC	6	261	32.0	.19	.	.0	.0
447	1988 FEB 24	17:20:50.63	36.347	-105.787	8.48	1.14MDLA	....	..	77	WC	16	177	13.0	.07	.	.0	.0
448	1988 JUL 21	12:53:49.20	35.712	-106.050	15.11	.87MDLA	....	..	30	WC	10	269	19.0	.07	.	.0	.0
449	1988 DEC 07	22:08:45.88	36.122	-106.742	10.21	.83MDLA	....	..	48	WC	8	253	45.0	.15	.	.0	.0
450	1989 MAR 01	08:26:59.68	36.133	-106.678	6.95	.13MDLA	....	..	45	WC	8	244	42.0	.05	.	.0	.0
451	1989 MAR 22	04:20:07.29	36.332	-105.769	15.10	.17MDLA	....	..	76	WC	7	177	14.0	.05	.	.0	.0
452	1989 JUL 26	01:43:10.78	36.153	-106.250	27.31	.21MDLA	....	..	37	WC	6	228	30.0	.13	.	.0	.0

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APPENDIX J
CORE HOLE FIELD LOGS

SHB-1 (TA-55)

WOODWARD-CLYDE CONSULTANTS

Project Name: LANL Seismic Hazards Studies Task 2	Boring No. SHB-1 (TA-55)			Sheet 1 of 44	
Project No. 91C0509A	Task 0900	Elevation and Datum			
Boring Location: West of TA-55 Security gate		Date Started 10-18-91		Date Finished 11-8-91	
Drilling Co. PC Exploration - Salt Lake City, Utah	Driller Dean Walton w/ Daniel Bowden and Dale	Completion Depth 700		Rock Depth	
Drilling Eqpt. Ingersoll-Rand TH-60		No. of Samples	Dist.	Undist.	Core
Drilling Method: Air Rotary		Water —	First —	Compl. —	24 hrs. —
Core Barrel HX/HQ	Length 5 feet	Bit Diamond & Carbide	Logged by: SUSAN CHANG	Checked by:	
Casing Size —	Type	Depth			

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														10-18-91 START 9:55 a.m.
0–5	Silty Sand (SM) brown-pink, loose to medium dense, fine- to medium-grained, w/ coarse gravel and some low-plasticity clay, dry TSHIREGE MEMBER UNIT 3 (VANIMAN & WOHLETZ, 1990)	NR	(SM)	PC-1 (PC = punch core)	0.8'/5' = 16%									Loose & dry blown away by air
5														9:57 hole staying open 10:30
5–10		NR	(SM)	[redacted] [lexan liner]	3.2'/5' = 64%									
10	Rhyolite tuff - soft - in shoe													10:34 } time spent 1:10 } dealing w/ H&Safety inspections Now switching to HX coring Start 1:30
10–15		NR		HX-3	0'									Drillers not using a face discharge bit as requested - bits being flown in today.

WOODWARD-CLYDE CONSULTANTS

Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 2 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				ROCK CORE						SOIL SAMPLES				
14–15		NR		HQ-3	0'									Soft material being blown away. Switch back to punch core. 1:35 - fixing/untangling wireline
15–20	BANDELIER TUFF TSHIREGE MEMBER, PINKISH GRAY BROWN LARGELY FRIABLE			PC-4	2.2'/5' = 44%	0%								Asked driller to use less air pressure to keep from blowing away sample. 2:15 - 2:40 adjusting winch for air to foot-pedal. Start 2:50
	Ash - white, fine, Loose gray {													
20–25	Rhyolite tuff - gray, soft to medium hard, fine grained, dry, w/ fine to med grained glassy inclusions, slightly weathered			HQ-5 (Lined)	5'/5' = 100%	3'/5' = 60%	2							2:52 STOP FOR 10-18-91 DRILLERS GOING TO PICK UP BITS, SAFETY SUPPLIES. 10-19-91 START 7:54 USING "STRATIPAK" CARBIDE BIT
	BANDELIER, GRAY, APPEARS BANDED, LOW STRENGTH VOID													
25–30	— moderately welded, pumice clasts somewhat flattened,	NR		HQ-6	4.7'/5' = 94%	6"/5' = 10%								7:55 – 8:30 } fixing core barrel head. many pumice clasts eroded by air coring, leaving pits. 8:31

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 3 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Same as above	NR												8:45
	BANDELIER TUFF TSHIREGE MEMBER (Unit 3 of V&M, 1990)			HQ-7	2.8'/5' = 56%	1'/5' = 20%								
35		NR												8:46 8:56
		VOIDS 20° VOIDS 15° VOIDS 20°		HQ-8	4.7'/5' = 94%	2.8'/5' = 56%	1							
40														8:57 9:08
		NR		~~HQ-9~~ (lined)										10" in liner. Liner became "blocked" by core. Only retrieved 10" in liner. liner core Remainder of sample in shoe and sticking out of shoe. See core box
	Becomes pink, medium hard, highly fractured, w/ med grained glassy inclusions, thin clay-filled fracture													
45														9:09 9:16

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 4 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR												Soft material blown away by air
	Pink rhyolite tuff as above, subrounded fragments			HQ-10	1.3'/5' = 26%	0%								
50	Tuff - Dk brown/pink, medium hardness, slightly fractured and weathered, w/med grained glassy inclusions, moderately to densely welded, pumice clasts somewhat flattened	NR		HQ-11	4.9'/5' = 98%	3.6'/5' = 72%	1							9:17 9:28 driller wants to try drilling faster - see if recovery will improve
	Fe-stained fracture surface →	20°												
55		NR		HQ-12	4'/5' = 80%									9:29 9:35
	moderately wide clay filling in fracture													
60	Gray, medium hardness, Fe & Mn stains on some fracture faces, fine grained w/some med. grained glassy inclusions	NR 60°		HQ-13										9:36 9:49

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 5 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	TSHIREGE MEMBER (UNIT 3)	NR												
63				HQ-13	3.2'/5' = 64%	10"/5' = 17%	6							
		NR												
65	- becomes moderately welded													9:51 10:04
	Pink w/coarse glassy inclusions	NR		HQ-14 (liner)	0.9'/5' = 18%	0%								Catcher on core barrel caught in liner. Prevented core from going in
70														10:05 10:18
		NR		HQ-15	10"/5' = 17%	4"/5' = 7%								
	same as above													
75														10:20 10:29
	Fine pink ash in cuttings	NR		HQ-16	0	0%								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SH8-1 | Sheet 6 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	TSHIREGE MEMBER (UNIT 3)	NR		HQ-16	0	0%								
80	— ? — ? — ? —													10:30 10:44
	probable surge deposit (?) few sandstone-like clasts	NR		HQ-17	0	0								try drilling w/air on occasionally
	Ash - white, loose, dry													
85														11:00 11:05 try drilling w/very little air (150 psi)
	Ash in cuttings	NR		HQ-18	0	0								— last foot - core barrel pushed into formation by <u>weight</u> of rods
90	— ? — ? — ? —													11:06 11:20
	(UNIT 3b) NON WELDED UNIT OF VANIMAN & WOHLETZ, 1990'	NR		HQ-19	0	0								core barrel falling in hole

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No.: SHB-1 | Sheet 7 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		ROCK CORE								SOIL SAMPLES				
	Ash, white, loose	NR		HQ-19										
95														11:20
		NR		HQ-20	0'	0%								11:50 - 12:50 barrel stuck in hole - too much slough around outside of rods
100	Ash, light gray, Loose													11:22 12:50
		NR		HQ-21	0'	0%								didn't turn rods; took bag sample
105	same as above													12:52 1:18
		NR		[redacted] (lined)	0.8'/5' = 16%	0%								
110														1:19

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No.	1 (TA-55)	Sheet	8 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														1:45
	Light gray ash as above			HQ-23	1'/5' = 20%	0%								
115														1:47 2:00
	as above	NR		HQ-24	0									cuttings in bag
120														2:11 2:25
		NR		HQ-25	0									
125														2:27 2:30 Drillers left to call Larry Fleming re: recovery

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 9 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-26	0'	0%								Back at 3:30
130		NR		HQ-27	0'	0%								3:44
135	Rhyolite Tuff - Dark pink, moderately welded, w/med grained pumice fragments, and volcanic glass, low strength highly fractured (UNIT 2) VANIMAN & WOHLETZ 1990 lithic vesicular basalt fragments w/coarse grained pumice, flattened, moderate strength, moderately welded	NR		HQ-28	2.1'/5' = 42%	4"/5' = 7%								3:45 3:52
140	becoming lighter pink Rhyolite tuff - gray w/ light pink, compressed med to coarse pumice fragments, moderately hard, moderate strength	NR		HQ-29	3.4'/5' = 68%	4"/5' = 7%								3:55 4:05

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 10 of 44

DEPTH (feet)	DESCRIPTION	Run No.	Recov. (ft)	RQD	REMARKS
		HQ-29			
145	~~strongly~~ welded, high strength				4:08
	Gray, moderate strength, moderately welded to welded fewer pumice fragments				
	mechanical breaks; 45°	HQ-30 (liner)	5'/5' = 100%	3.2'/5' = 64%	
150					4:25
	mechanical break				
	3 cm lithic clast of dacite (?)	HQ-31	5'/5' = 100%	2.8'/5' = 56%	
155	Highly fractured, gray, moderately hard & moderately welded				
	highly plastic orange clay seam, 2 cm wide w/coarse round sand size	HQ-32	3.3'/5' = 66%	0%	

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 11 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-32										
160	Gray, moderately welded, moderate strength, w/coarse volcanic glass, sanidine and pumice fragments; mechanical breaks; mechanical breaks; core barrel over full			HQ-33	5'/5' = 100%	1.6'/5' or 3'								4:50 4:57
165	highly plastic orange clay seam; mechanical break	NR		HQ-34	4.5'/5' = 90%	3.9'/5' = 78%	0; 3							4:59; END 5:30 p.m 10-19-91
170	? — ? ; w/ brown low plasticity silty clay; orange low plasticity silty clay in fracture (2mm wide)	NR		HQ-35	3.1'/5' = 62%	0.5'/5' = 10%								START 8:16 on 10-20-91; 400 psi pressure in addition to rod weight

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 12 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				HQ-35										
175														8:18 8:29
		NR												
	@ 70°, 2mm thick orange siltyclay	40° 60°		HQ-36	2.8'/5' = 56%	0%								
180														8:30 8:43
		NR												
				HQ-37	2.9'/5' = 58%	0.4'/5' = 8%								
185														8:44 Asked driller to go slower to try to improve recovery
		NR												
				HQ-38	~~3.7'~~ 3.8'/5' = 76%	2.2'/5 = 44%								
190														

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 13 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-39	4.5'/5' = 90%	1.5'/5' = 30%								9:04 / 9:06
195	Light pink and gray, moderately welded, moderate strength, w/coarse pumice and lithic fragments, with med. to coarse grained sanidine, quartz, glass fragments	NR		HQ-40	4.1'/5' = 82%	1.7'/5' = 34%	7 / 0							9:19 still 400psi addtl pressure / 9:22
200	Same as above	NR		HQ-41	3.8'/5' = 76%	0%	8							9:32 / 9:34
205	Same as above						4							9:43 Asked driller to slow penetration rate

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) |

DEPTH (feet)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Recovery	REMARKS
	BANDILIER TUFF, LIGHT PINKISH GRAY, MODERATE PITTING OF SURFACE DUE TO AIR CORING			HQ-42	5.0/5.0 = 100%	4.0/5.0 = .80	0, 0, 0, 0	U.	MS					9:46
210	— ? — ? — ? — ?													9:55
	STRONGLY PITTED, LOW STRENGTH. Moderately welded more fines	NR		HQ-43	1.7/5.0 = 34%	.4/5.0 = 8%	0, 0, 0, 2, 4	U	LS					
	Unit 2 ↑													9.59
215	Light pinkish gray unconsolidated unwelded tuff	NR		HQ-44	0									10:07 Too soft for coring collected cuttings - unwelded tuff
220														10:15
	Same as above			HQ-45	0									drilled fast

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. 1 (TA-55)	Sheet 15 of 44

DEPTH (feet)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-45	0									Using 350 psi air - can't lower it or hole will plug up. Cuttings in core box. drilled 4' slowly pushed 1'
225	as above	NR		HQ-46 (lined)	0									10:30 10:55 cuttings in core box
230	as above	NR		HQ-47 (lined)	0									10:55 11:04 cuttings in core box
235	as above	NR		HQ-48 (lined)	0									11:05

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 16 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-48										
240														11:56
		NR		HQ-49 (lined)	0									
245														11:56
	Unwelded tuff as above pink, dry, w/ lithic clasts (dark)			HQ-50 (lined)	8"/5' = 13%	0%								12:00 stuck in hole - can't get circulation Free @ 1:50 Add ½ gallon REP 200 to 300 gallons of water. Start injecting foam @ 245. Cuttings blowing to side not up out of hole
250														
	Vapor phase tuff (?) ~~as above~~			HQ-51	1.2'/5' = 24%	0%								
255														Drilling dry 2:40 again ↓

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 17 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Unwelded tuff as above Vapor phase tuff?	NR		HQ-52	0.6'/5' = 12%	0%								2:52
260	light pink gray tuff - low strength, mod. welded w/ med-coarse pumice fragments, sanidine & quartz, light (weight), vapor phase	NR		HQ-53	1.6'/5' = 32%	0%								2:52 3:08
	Bottom of Tshirege (?)													
	light pink gray unwelded tuff													
265		NR		HQ-54	0									3:09 3:25
270	Cerro? Toledo? Ash and? Pumice (?)	NR												3:26 3:45

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No.	SH8-1	Sheet	18 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
					ROCK CORE					SOIL SAMPLES				
270–275	Unwelded ~~Tuff~~ ash as above but gray, few basaltic lithics; 3 to 4 cm pumice fragments	NR		HQ-55	1.6'/5' = 32%	0%								~150 psi; Drilling ~ 4'; Drilling ~1' w/o air; 3:46
275–280		NR		HQ-56	0									
280–285	Gray unwelded ~~tuff~~ ash air fall			[redacted] (lined)	1.2'/5' = 24%	0%								4:01; 4:14
285–		NR		HQ-58										4:15

Depth marks: 275, 280, 285

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 19 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Gray Pumice fragments → ; w/ 3 to 4 cm pumice fragments throughout	NR		HQ-58	1.5'/5' : 30%	0%								Drilling ~4' w/air; Drilling ~1' w/o air
290														
		NR		HQ-59	0									4:45
295														5:05
		NR		HQ-60	0									Drilled 3½' w/air; Drilled 1½' w/o air
300														STOPPED FOR DAY AT 5:30; 10-20-91
				HQ-61										7:45; 10-21-91; slow rate of rotation

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No.: 1 (TA-55) | Sheet 20 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														Drilling dry
~301–305	Gray unwelded tuff w/ 2 "intact" pieces fallout ash TSANKAWI PUMICE	NR		HQ-61	1.3'/5' = 26%	0%								Drilling (rotating) slowly w/air 4' 1' w/o air 7:50
305														
~308	— ? — ? —													
~308–310	Pumice - tan to light brown, low strength			HQ-62	2.3'/5' = 46%	0%								
310	— ? —													
~310–312	Cerro Toledo Rhyolite EPICLASTIC, REWORKED PYROCLASTICS	NR												
~312	— ? — ? —													
~312–315	reddish brown, low strength, unwelded slightly moist, w/ med-coarse gray pumice fragments (1mm to 1cm)			[redacted] (liner)	1.6'/5' = 32%	0%								
315														
~315–319	same as above			HQ-64	2.2'/5' = 44%	0%								↓

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				HQ-64										8:42
320	NUMEROUS SMALL (<1cm) PUMICE CLASTS IN A MOIST ORANGE-BRN, FINE-GRAINED MATRIX, LOW STRENGTH. DOUBTFUL THE SAMPLE REFLECTS APPEARANCE OF INSITU LITOLOGY – TO SOFT TO CORE WITHOUT SEPARATING MATRIX FROM PUMICE & LITHIC CLASTS			HQ-65	1.8/5' = 36%	0/5' = 0%								Drilling w/ slow rotation w/air for 4', w/o air for 1'
														9:00
325	CONTINUATION AS ABOVE. LAST .5' (329.5-330') PUMICE CLASTS DECREASE IN NUMBER LITHICS INCREASE, LOOKS LIKE CHANNEL SAND. Sand of fluvial origin (?) Lithic content high, moderately well sorted			HQ-66	1.9/5' = 38%	0%								9:14 ADDING FOAM LOSS OF CIRCULATION
														9:25
330	light brown Sand (fluvial?), high lithic content, moderately well sorted	NR		HQ-67	0									9:33
335														

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 22 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	As above NO RECOVERY			HQ-68	0									10 – lost circulation drill rod stuck Changed to surface set step-face discharge bit (diamond) ± 10' OF HOLE CAVED IN WHILE PULLING ROD TO CHANGE BIT 12:55
340	NO RECOVERY			HQ-69	0									
345	light brown fine sand w/quartz, feldspar, pumice, trace of lithics (cuttings sample)	NR		HQ-70	0	—								1:07 1:21 ADDING FOAM AND H_2O LOSS OF CIRCULATION. 1:30 – RIG DOWN, FOAM INJECTION HOSE RUPTURED
350														2:10

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 23 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-71	0									2:15-3 Blowing out hole, fixing foam injection hose. INJECTING "FLUIDRIL" VISCOSIFIER. 2 cups REP200 + 1 cup FLUIDRIL IN 300 gallons of water to stop caving of hole
355		NR		HQ-72	0.7'/5' = 14%	0%								3:05
	Dacite Gravel sand size to 1½" size pieces, black w/ Fe staining on faces, porphyritic - w/ phenocrysts of feldspar, hard, some surface are polished (stream?)													
360		NR		HQ-73	1.6/5' = 32%	0%								3:25
	Dacite gravel as above, Sandy	red brown; black												
365				HQ-74										4:30 adding foam to get circulation back

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 24 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Dacite gravel as above, very sandy													
	PUMICE / ASH FALL → tan med grained sand.			HQ-74	1.8'/5' = 36%	0%								
370														4:45
		NR		HQ 75	0									hard drilling
375														hard drilling Poor Return of air. 8:37 Rig Down Striped Rod Coupler Down Hole while Rotating & stroking Hole to Recover Air Return Another Rod Stripped at 10.
		NR		HQ-76 (lined)	0									
380														7:40 / END 10-21-91 START 10-22-91
		NR		HQ-77	0									drilling w/ air only

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 25 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-77 (lined)	0'									hard ↓ hard drilling
385		NR		HQ-78 (lined)	0'									liner was deformed, prevented core from going up.
390		NR		HQ-79 (lined)	0									10:55 drilling w/ water & no air. About 75 psi. hard drilling. 11:00 ran out of water. 11:55 used 300 gallons (some of it went into filling up rods)
	Sandy Gravel, silty, gray w/black and orange, subangular to subrounded. Lt. brown { Sand, silt, Sand }. Gray, med. dense, fine to medium grained sand, silt, silt. Pumice - gray fine to coarse grained, low strength. Lt. Brown Sand			HQ-80	2.6'/3' = 87%	0%								11 - 1155 - water Swivel broken, Used ~50 gallons water. All water lost in hole. 1200 1110
395		NR		HQ-81	0									12-1 fixing water swivel

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 26 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-81										Drillers forgot to put core tube down hole before coring. 1:15 Pulled up 5'. Had 1' slough at bottom of hole.
400	Pumice Sand - light gray, medium dense, med to coarse grained, fluvial origin, trace of lithics			HQ-82	2.5'/3' = 83%	0%								HQ-82 is a 3' run - tube is blocked off. 1:50
	Sand - black, white and tan, subangular to subrounded, well-sorted, medium dense, w/ quartz, feldspar, dacite (?) as above but siltier	NR; Sandy Silt, Lt. brown, med dense		HQ-83	1.4'/2'	0%								2:20 2:50-4 core tube retrieved not working properly
405														4:10
		NR		HQ-84										water pressure went up - core blocked? 4:15
410														4:35
		NR		HQ-85										
415														4:40 END 10-22-91

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. (TA-55) | Sheet 27 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Silty sand, lt. brown and gray fine to med grained, med. dense to dense, tr of fine gravel			HQ-86	.08'/1'	0%								START 10-23-91 Pulled up rod & changed bit to diamond impreg. 9:22 Try thickening fluid
	DIAMOND IMPREG PARTS OF STEPFACE BIT													5:04 WATER PRESSURING UP SLOWING PENETRATION RATE
	becomes loose to medium dense			HQ-87	2.6'/4' = 65%	0%								5:20 - MAYBE CORE BLOCK, FEED PRESSURE TO HIGH
	Altered Otowi (?) Brownish gray, w/gray pumice fragments, low strength, loose to med dense													5:30 CORE TUBE OPEN, NO BLOCK 10-22-91
420														10:16 Pulled out bit, completely worn away. Prob. cracked when dropped. Replaced w/ diamond impreg bit, series 6
		NR		HQ-88										9:05 9:15 waiting for water truck. Road block on Pajarito Road. Driver said he was delayed ~ 2 minutes. Some sand grains in core tube
425														10:25 10:45 using thick mud
		NR		HQ-89										NO RECOVERY
430														11:00 11:18 USING THICK VISCOSIFIER MUD

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 28 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-90										DECREASED INJECTION VOLUME, DRILLER REPORTS HARD ROCK? 11:25
	EPICLASTIC BROWN-GRAY SILTY, PUMICE & LITHIC, SILTY SAND, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, TRACE OF LOW PLASTICITY CLAY			HQ-91	2.5/3' = 83%	0/3' = 0								11:40 H2O PRESSURE UP, OFTEN HOLDING 600 PSI DOWN FEED 500 PSI DRILLER THINKS WE ARE IN SANDY UNIT. 3:15 - PULLED UP STRING - NEW BIT WORN AWAY - 11:56 PROBABLY CORING THROUGH REMAINS
435														12:20 OF PREVIOUS BIT 3:15-4:00 DRILLERS LEFT TO CALL BOSS, CAME BACK & PUT "GREEN" DIAMOND IMPREG BIT ON - HARDEST. 5:00 TRIPPED IN, ROD SEPARATED DOWN THE HOLE
	EPICLASTIC - REWORKED PUMICE & LITHIC SAND & GRAVEL, TRACE OF LOW PLASTICITY CLAY MEDIUM DENSE, BROWN GRAY			HQ-92	2/5' = 40%	0/5' = 0								5:30 DRILLERS ATTEMPTING TO RETRIEVE RODS 10/24 - 7:30 - 9:30 TRIPPED OUT, FINE SAND PLUGGED BIT - NEW BIT BADLY WORN 10:15-11:00 - TRIPPED IN w/ STRATAPAK. BIT, 80' OF SLUFF TRIPPED OUT. STRATAPACK BIT WORN OUT. 12:25
440														12:52 RECOVERED CIRCULAR PIECE OF PREV. DIAMOND IMPREG BIT ◎ - WEAKENED? WHEN ROD PIN AND BOX SEPARATED DROPPING REMAINING ROD WITH BIT TO BOTTOM
				HQ-93										1:05 - 2:00 TRIPPING OUT & INNER TUBE STUCK 10/24
	PINKISH GRAY TUFF? EPICLASTIC? APPROXIMATELY 2' OF COARSE "FLOW" SAND (SAND ENTERING CORE TUBE BEFORE BIT REACHES BOTTOM) ABOVE HQ.94 ± 2" RUN — HQ-94													10/30 - 7:15 - 10:40, ICE IN CONTROL LINE. 10:40 - 12:00 RE-ENTERED HOLE w/ HASTILITE BIT (CARBIDE CHIPS BRAZED TO SHORT PIECE OF HQ ROD) TO "PUNCH THROUGH SLUFF" CONTAINING
	OTOWI (?)			HQ-95	NR									DEBRIS FROM OTHER BITS 12:55 RECOVERED DEBRIS. 2:30 RE-ENTERING HOLE W/ STEP-FACED, SURFACE-SET BIT
445										D-1				3:55 - 4:40 RIG & 10/30 TAKE DRIVE SAMP D-1 10/31
														8:00 AM - 10:15 DE-ICING AIR LINES BEGAN CORING 10:20 HOLE BECOMES TIGHT STROKING

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Project Name: LANL Seismic Hazards Studies Task 2	Boring No. SHB-1	Sheet 29 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	ROCK CORE (Sketch through Strength); SOIL SAMPLES (No. through Recovery)													
448	TUFF ? SAMPLE DROPPED FROM TUBE AT SURFACE POWDERY TUFF			HQ-96										SHORT RUN - POOR AIR CIRCULATION - WILL USE AIR, WATER & FOAM NEXT RUN 10:25
451	TUFF, SALMON COLORED, FRIABLE OTOWI MEMBER OF BANDELIER TUFF			HQ-97	1.3/3 = 43%	1.3/3 = 43%								11:50 BLOCKED OFF 12:10
455		NR		HQ-98										12:30 COMPRESSOR AIR ICING UP 1:20 CORE TUBE STUCK 1:30 FREE, BIT AIR WAYS PLUGGED, 1:50 REINSERT CORE TUBE 2:00 STILL BLOCKED. 2:20 ADDED FOAM & POLYMER, RESET TUBE 2:35 STILL PLUGGED REMOVE CORE TUBE REGAINED CIRCULATION 2:55 CORING - NO RECOVERY OF CORE 3:10
458		NR		HQ-99										3:30 BEGAN DRILLING WITH POLYMER MUD ONLY 3:55
463		NR		HQ-100										4:00 SWITCHED TO AIR, WATER & FOAM - STILL NO RECOVERY 4:30 10/31

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 30 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-101										11/1/91
465		NR		HQ-102										10:10
470		NR		HQ-103										10:20
	Tuff - greyish brown, lithic (dacite) rich, soft, gravel size fragments up to 1-inch, nonstained pumice fragments, rich in quartz & sanidine crystals, nonwelded	NR		HQ-104	0.4'/3' = 13%									1:05 using "Green" bit 1:10
475	same as above			HQ-105	1.5'/1.5'									1:30 water pressure ~200psi 1:55
		NR		HQ-106										water pressure up to 400psi

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No.	SHB-1	Sheet 31 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-106										
480														2:05
		NR		HQ-107										
485		NR												4:00
	same as above lithic rich, nonwelded, weathered ~~tuff~~ pumice fragments	O O O O O O		HQ-108	4.9'/5' = 98%	4.9/5 = 98%								
490														4:30
		NR		HQ-109 (lined)										liner distorted after run
495														end 11-1-91

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1(TA-55) |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														11-2-91
	TUFF, GRAY-BROWN, FRIABLE, WITH LARGE (3-4 cm) PUMICE & ONE LARGE DACITE LITHIC (6-7 cm)			HQ-110	.2/5.0 = 4%	0/5.0								9:00 APPEARS TO BE GOOD RUN, H2O PRESSURE BELOW 200 PSI
500		VVV												9:35 10:05
	Tuff as above w/smaller lithics, soft. Banded dacite, hard → { red brown w/ bands of gray, bottom surface appears smooth	NR		HQ-111										bottom of sample may have dropped back in hole 10:15
505	Tuff-gray brown, low strength w/large pumice clasts and dacite lithics	NR		HQ-112	4.6/5' = 92%	4.6' = 92%								11:15, easy soft drilling
510		NR		HQ-113										11:20 11:50

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 33 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-113										drilling slowly
515	tuff as above large lithics & pumice fragments, pumice is weathered (orange), soft			HQ-114	2.6/5' = 52%	2.6 = 52%								12:00 12:20
520	Tuff - pumice is gray, gray brown tuff, low ~~strength~~ lightly ~~to moderately~~ welded. dacite lithic; unwelded			HQ-115	4.1'/5' = 82%	4.1'/5' = 82%								
525				HQ-116										2:00 2:20

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 34 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	TUFF, GRAY-BROWN, PUMICE & LITHIC RICH, LIGHTLY WELDED, NO VISIBLE SORTING OR BEDDING			HQ-116	5'/5' 100%	5'/5' = 100%	0	U	LS					2:30
530		NR		HQ-117										3:00 PRESSURING UP TO 400 PSI NOTE, HIGH MUD PRESSURE MAY BE DISAGGREGATING SAMPLE 3:10
535	AS ABOVE TUBE SAMPLE			[illegible]			0							3:40 H_2O PRESSURE 100-200 PULL DOWN FEED HIGH - STOPPED RUN @ 4' SAMPLE IN PLASTIC TUBE 4:00
539	TUFF, GRAY-BROWN, PUMICE & LITHIC RICH. PUMICE ARE UN WEATHERED			HQ-19	5'/6' = 83%	5'/6' = 83%	0	U	LS					4:15

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-1	Sheet 35 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	LARGE LITHIC - DACITE 5-7 CM			HQ-119										4:30 11/2/91
545	large % of large pumice fragments % of lithics dropping, soft, gray brown, unwelded f-coarse			HQ-120	5' = 100%	5' = 100%								8 11/3/91 Water pressure @ 1380 psi
550	~~brown~~ gray brown unwelded, soft, few lithics, grain size decreasing, pumice is weathered to tan (dacite 3cm)	NR		HQ-121										8:10 8:45
555	? — ? — ?			HQ-122	5' = 100%	5' = 100%								8:50 w/ light downpressure

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				HQ-122										10:00
560	tuff as above - ~~brown gray~~ graybrown soft, unwelded, few lithics, pumice is weathered to yellow and rust, fine to medium grained			HQ-123	5' = 100%	5' = 100%								10:30 / 10:40
565	same as above			HQ-124	5' = 100%	5' = 100%								11:05 / 11:15
570	same as above	NR		HQ-125	4' = 80%	4' = 80%								11:35 / 11:45
575														

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 37 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	same as above			HQ-126	4.6 = 92%	4.6 = 92%								12:15
580														12:30 1:05
		NR												
	lightly welded, lithic rich, low strength, pumice weathered to yellow			HQ-127	3.2' = 64%	3.2' = 64%								
	soft, gray brown, fine to med grained, some lithics unwelded													
585														1:20 1:45
	soft, unwelded as above			HQ-128	5' = 100%	5' = 100%								
590				HQ-129										2:00 2:15

ROCK CORE: Sketch, Lithology, Run No., Recov. (ft), RQD, Fractures / ft, Weathering, Strength. SOIL SAMPLES: No., Type, Blow Count, Recovery.

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 38 of 44

DEPTH (feet)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Recovery	REMARKS
		NR		HQ-129										
595														2:25 END 11/3/91 START 11/4/91 7:45
		NR	HQ-130											
600														8 a.m. 10:30
		NR	HQ-131											
605	Base of Otowi													10:37 11:20 Rotation ± 80 Pull down = 0 Mud pressure = 0-50 Driller reports Sand may be
		NR	HQ-132											

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
–610		NR		HQ-132										SEPARATING CORE TUBE HALVES? TRY THICKENING POLYMER MUD FOR NEXT RUN. 11:25 1:30
610–615	TRAPPED IN CORE CATCHER WAS COARSE SAND SIZE, PUMICE, CRYSTALS & LITHICS 90% crystalline quartz, sanidine sand size, light gray, airfall pumice, plinian (Guaje Pumice?)	NR		HQ-133	2.7'/5' = 54%	2.7 = 54%								PUMPED IN 150± GAL OF THICK POLYMER WITHOUT CORE TUBE IN, TOOK MUD AT BEAN MAX PUMP RATE WITHOUT PRESSURING UP. CORE TUBE NOT LATCHING - FINES GOING UP ROD? - FLOW SAND? PUMPED 750 GAL OF MUD. 1' SLUFF. BEAN AT 15± GAL MIN. 1:40
615–620	light brown tuff w/ large gray pumice fragments, some coarse dacite Pumice, gray, airfall (?), w/ subst. quartz & sanidine, w/ coarse dacite lithics	NR		HQ-134	1.5'/5' = 30%	0.6' = 12%								TRIPPING ROD ~2:00 CORE TUBE RETRIEVAL CABLE SNAPPED. HOLE SANDING IN. 3:50 getting sample out putting on Longyear Series 2 Diamond impreg Green bit was still ok. Start 11/5/91
620–625	same as above	NR		HQ-135	3.3' = 66%	3.3' = 66%								9:00

Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 40 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				HQ-135	3.3'									
625	pumice as above			HQ-136	5' = 100 %	5' = 100 %								10:00 10:18 50 psi water pressure
630	Base of Guaje (Cerros del Rio) Basaltic Sediment w/black basalt moderate to high plasticity brown silty clay & shale is mod. hard & fractures easily, clay is soft	NR		HQ-137 (liner)	0.5' = 20 %	0'								10:20 10:42 Stopped @ 2½' Blocked off Took sample out of liner 10:50
	tan & brown silty clay, sandy w/abun K-spar as above w/ increasing basalt content			HQ-138										11:16
635				HQ-139	0.9/1'									11:35 12:00 STOP 11-5-91
	Silty clay, sandy, medium stiff, red brown, w/coarse red and black basalt fragments, Some basalt is weathered to tan			HQ-140	2½/2' = 100									12:15 - stopped clay blocking bit. Water pressure @ 1000 psi START 11-6-91 8:10 tube stuck trying to f. it
		NR		HQ-141										8:20 9:05 tube is plugged

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 41 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
640	Stiff to v. stiff silty clay, sandy, red brown w/light brown, w/large basalt cobbles, black			HQ-141	2.2/3' = 73%									
	Conglomerate cobble, hard, red-brown, fine-grained													9:45 10:00
	Silty clay sandy, very stiff to hard, red brown, w/ med to coarse basalt fragments	NR		HQ-142	2.2'/4' = 55%	0.6' = 12%								
645	Basalt - hard, slightly fractured, black, iron staining on fracture faces; highly fractured, w/ iron staining													10:10 10:30
	Basalt - hard, black, as above, w/some clay on fracture faces, clay is similar to above material	NR		HQ-143 (lined)	1.4'/5' = 28%	0.4 = 8%								basalt fragments distorted liner & prevented full recovery.
650														10:45 11:10
	Basalt as above; mechan. break; mechan. break; thin zones of mod. plastic brown silty clay	NR		HQ-144	4'/5' = 80%	0.8' = 16%								
655														11:20

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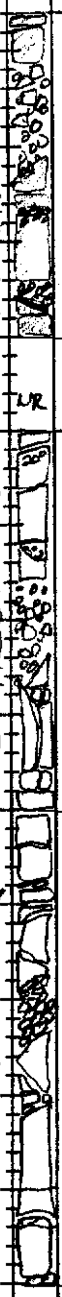
Project Name: LANL Seismic Hazards Studies Task 2 | **Boring No.** 1 (TA-55) | **Sheet** 42 **of** 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Basalt as above sl. to mod fractured; mechan. break; shear zone? clay in fractures; sheared "; clayey	NR		HQ-145	3.4'/5' = 68 %	1' = 20 %								11:45
660														11:55 12:10
	Basalt as above; mechan break; shear zone w/ clay; thin clay filled fractures	NR		HQ-146	4'/5' = 80 %	0.9' = 18 %								
665														12:30
	Black basalt, trace of clay in some fractures, hard; oxidized ~~bade~~ ~~baked~~ (?) red basalt; w/fine crystals of mica & hornblende hard, brittle			HQ-147	5'/5' = 100 %	2.3' = 46 %								ran out of water, waited for truck
670		NR		HQ-148										1:45 2:15



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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 1 (TA-55) | Sheet 43 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	red-oxidized as above brittle; black basalt hard as above; clayey; sheared			HQ-148	3.9'/5' = 78%	0.4' = 8%								core bulging core-lifted in barrel trying to split it.
675		NR			2.4'/4 = 60%	0'								2:55 3:30 sand on sample hole from sitting in hole overnight STOP 11-6-91 START 11-7-91 can't pull out core tube problem w/ latch. Helper says it's caused by vibrations
	Basalt as above; clayey, black; pvc fragments; red, clayey; clay on fracture face, black			HQ-149										3:35 11-7-91 10:35
680	NR	NR												changed to Green bit Same one we used before the longyear Series 2
	Basalt, black, hard as above. mechanical break; Becomes highly fractured; clayey; red			HQ-150	2.3'/4' = 57%	0.4' = 8%								
	NR	NR												10:45
	mod. hard, brittle, red; black, hard			HQ-151	3.2'/3.5' = 91%	0%								core blocking up
685	mod hard, brittle, dk brown, clayey													
				HQ-152										11:~~40~~ 4:30

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-1 | Sheet 44 of 44

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Basalt as above			HQ-152	1'	0%								4:55 ran out of water waited 10 min for water truck 5:05
	trace of clay & iron staining on fracture faces, highly fractured; w/coarse quartz ~~[illegible]~~ crystals; st. red; trace of clay			HQ-153	1.6'/2.5'	0%								
690	Black, hard, basalt													END 11-7-91 5:35
	fragments are angular to subangular; Basalt fragments	NR		HQ-154										7:55 11-8-91 had 1' slough before drilling HQ-154; pulled rod up 3'. 1' slough in hole
		NR		HQ-155	0.2'	0%								8:17 Going thru gravel
695	Black basalt as above, hard, tr. of clay on fracture face; red; 60°; Basalt - no clay, hard; 30°			HQ-156	3'/3' = 100%	1.4'								9:15 hard drilling
	Basalt highly fractured along plane at 30°; trace of clay, mod weathered; hard, brittle, black; 38°	NR		HQ-157	2.8/3.5' 80%									10:00
700														10:30

RECOV. TOT 261.5

SHB-2 (TA-3)

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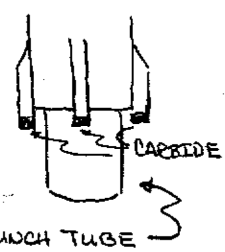
Project Name: LANL Seismic Hazards Studies Task 2	Boring No. SHB-2 (TA-3)		Sheet 1 of 13
Project No. 91C0509A	Task 0900	Elevation and Datum	
Boring Location: TA-3 PARKING LOT		Date Started 11/20/91	Date Finished 11/21/91
Drilling Co. PC Exploration - Salt Lake City, Utah	Driller: DEAN / DAN	Completion Depth 200'	Rock Depth 4.5'
Drilling Eqpt. T.R. CYCLONE		No. of Samples 5 / Dist.	Undist. / Core
Drilling Method: PUNCH CORE TO THEN AIR ROTARY W/ CARBIDE STRATAPACK		Water / First	Compl. / 24 hrs.
Core Barrel HX / Length 5 feet	Bit Diamond	Logged by: T.R. KOLBE	Checked by:
Casing Size OPEN HOLE / Type NA	Depth NA		

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
0–4.5		NR		1										9:45 AM STARTED HOLE W/A CARBIDE TIPPED STRATOPACK BIT (STRATAPAK?)
														
														CARBIDE IN TWO LEVELS – CHISEL SHAPED
4.5–5	LOOSE REDDISH BROWN SOIL			2	1/1=100%			M	F					11:30 SWITCHED TO PUNCH CORE METHOD
5–10.5	BANDELIER TUFF, PINKISH BROWN NON WELDED, LITHICS ARE SMALL (<.3-INCHES), FREQUENTLY ROTTEN WITH Fe STAINED RIND. PUMICE ARE LARGE (.5 to 1-INCH) OFTEN PURPLE IN COLOR, FRIABLE. LIGHT, VAPOR PHASE ALTERATION? JOINT. 60°, mw, C-Sd, F, P, S			3	5/5=100%	5/5=100%		M	F					
10.5–15	SAMPLE #1	IN SAMPLE TUBE		4	1.5/5=30%									

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 2 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
15				4										
				5	3.3/5 = 66 %			m	F					
20														12:40
	TUFF BECOMES STRONGER AND GRAYER AT ABOUT 22 FEET - STILL CORE COMES OUT AS DISK-LIKE WAFFERS TO SHORT (± 3.5-INCH) SEGMENTS CONTINUES TO BE <u>NON WELDED</u> AND FRIABLE LITHICS CONTINUE TO BE ROTTEN AND Fe STAINED			6	4.5/4.5 = 100 %	0/4.5 = 0	MULTIPLE	m / S	F / LS					
25	Fe STAINING DECREASES. ROCK BECOMES MORE GRAYISH. PUMICE STILL PURPLE IN COLOR AND ROTTEN.			7	2.8/5	2/5			LS / F / F					MORE DOWN PRESSURE NEEDED TO PUNCH THROUGH ROCK
30														

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 3 of 13

DEPTH (feet)	DESCRIPTION	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	REMARKS
30	TUFF BECOMES LIGHTLY WELDED LESS BROWNISH, NOW PINKISH GRAY PUMICE ARE SOFT, SOMEWHAT FLATTENED, SMALL TO LARGE (< .5-INCH TO 1.5-INCH)	8	5/5 = 100 %	3.2/5 = 64 %	3, 5, 2, 0, 2	U	LS	CHANGED FROM PUNCH CORE TO TO STRATOPACK BIT
	SAMPLE #2 LIGHTLY WELDED LOW STRENGTH (sketch: 2)							
35	ROCK CONTINUES TO BE OF LOW STRENGTH. (GOUGED DEEPLY WITH KNIFE) BUT INCREASING IN STRENGTH OVER PREVIOUS RUN. PUMICE INCREASINGLY FLATTENED AND GRAYER	9	5/5 = 100 %	2.7/5 = 54 %	1, 2, 4, 3, 2	U	LS	
40	GRADATIONAL FROM LIGHT TO NOW MODERATE WELDING, LOW TO MODERATE STRENGTH (READILY SCRATCHED WITH KNIFE BLADE.	10	4/5 = 80 %	.7/5 = 14 %	5, 3, MULT., 3	U	LS → MS	
45								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 4 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
45–50				11	5/5 = 100%	4/5 = 80%	1, 0, 0, 4	U	MS					
50–55	SAMPLE #3 MODERATELY WELDED AND OF MODERATE STRENGTH → S	3		12	5/5 = 100%	3.5/5 = 70%	0, 0, 0, 0, MULT.	U	MS					
55–60	TUFF IS DECREASING IN STRENGTH AT ± 57' PUMICE CLASTS BECOME LESS FLATTENED TO NON FLATTNED.			13	5/5 = 100%	3.5/5 = 70%	1, 3, 4, MULT., 2	U	MS ↓ LS					
60–	AT ± 60' ROCK BECOMES PINK, OF LOW STRENGTH GRADING TO FRIABLE	NR		14					LS ↓					

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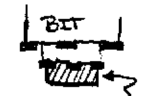
Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 5 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
60–65			v v	14	2.3/5 = 46%	0/5 = 0	MULTIPLE	U	LS → F					
65–70	NON WELDED UNIT? OXIDIZED AND ALTERED MODERATELY WELDED UNIT? COULD BE TOP OF COOLING UNIT?		v v	15	.3/5 =	0/5 = 0	MULT.		F					
70–75		NR	v v	16										
75–78		NR	v v	17										CHANGED CORE TUBE SHOE TO ONE THAT EXTENDS PAST BIT FACE



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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 6 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
77–80		NR		17										
80–85	TUFF IS NOW DISTINCTLY GRAY WITH NO PINK HUE. COARSE GRAINED, CRYSTAL RICH. LIGHT TO MODERATE WELDING. LITHICS ARE SMALL (<.2-INCH) AND SOME APPEAR OXIDIZED? PUMICE ARE FEW AND SOMEWHAT FLATTENED ROCK IS STRONGLY PITTED.			18	1/5' = 20%	1/5' = 20%	1	U	LS					11/21/91 - 7:50 AM CORE DROPPED OUT OF TUBE, WENT BACK DOWN AND RECOVERED 1 FOOT.
85–90	PITTING IS DUE TO DIFFERENTIAL EROSION OF SOFTER MATRIX MATERIAL DURING AIR ROTARY CORING. THE DEGREE OF PITTING SHOULD, THEREFORE, BE AN INDICATOR OF ROCK STRENGTH.			19	1/5' = 20%	0/5' = 0	MULT	U	LS					
90–95	STRENGTH INCREASES TO MODERATE LIGHT TO MODERATE WELDING. ROCK CONTINUES TO BE PITTED.			20	5/5 = 100%	2.1/5' = 42%			LS → MS					

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No.: SHB-2 | Sheet 7 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
95	STRENGTH INCREASING, MODERATE WELDING. LITHICS ARE SMALL, ANGULAR, AND OFTEN HAVE Fe STAINED RIM. ROCK IS LESS PITTED. PUMICE ARE DISTINCTLY FLATTENED. BECOMES MODERATE TO DENSELY WELDED			21	5/5 = 100 %	3.6/5 = 72 %	2, 3, 3, 4, 0	U	M					CHANGED BACK TO REGULAR CORE TUBE SHOE - DOES NOT EXTEND "PUNCH" BEFORE BIT. (CARBIDE STRATOPACK)
100				22	4.4/5 = 88 %	1.1/5 = 22 %	2, 4, 5, 2, 3	U	M					
105	TUFF BECOMES DENSELY WELDED AND TAKES ON A MORE PINKISH CAST. ROCK IS NOT PITTED AND OF HIGH STRENGTH (SCRATCHED WITH DIFFICULTY) PUMICE ARE OFTEN FLATTENED TO NARROW STREAKS			23	5/5 = 100 %	2.5/5 = 50 %	4, 3, 2, 3, 4	U	M → HS					
110														

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 8 of 13

DEPTH (feet)	DESCRIPTION	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
110	SURFACE PITTING INCREASES STRENGTH DECREASING AT ABOUT 113-FEET. WITH MODERATE TO PRONOUNCED FLATTENING OF PUMICE.	24	5/5 = 100 %	2.8/5 = 56 %	3, 3, 3, 1, 6	U	HS ↓ M					
115	PITTING INCREASING. STRENGTH STILL MODERATE WITH MODERATE WELDING PUMICE LESS FLATTENED, COLOR STILL PINKISH GRAY. ⟨SAMPLE # 4 MODERATELY WELDED⟩	25	5/5 = 100 %	3/5 = 60 %	6, 4, 2, 1, 0	U	M					
120	DECREASING STRENGTH	26	5/5 = 100 %	2.5/5 = 50 %	5, 5, 5, 3, 2	U	M					
125		27			4							

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 9 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				27	5/5' = 100%	3.1/5' = 62%	4, 0, 0, 1	U	M					
130	CONTINUES TO BE CRYSTAL RICH (LIKE COARSE SANDSTONE - SURGE DEPOSITS?)			28	5/5 = 100%	2.7/5' = 54%	3, 4, 2, 0, MULT	U	M					
135	DECREASING TO LOW STRENGTH PITTED, LIGHT TO MODERATE WELDING			29	3.8/5' = 76%	1.8/5' = 36%	mult, 5, 3, 6	U	LS					
140		NR		30										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 10 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		30										
145	COOLING UNIT BREAK ? UN WELDED?	NR		31										
150	BECOMES LIGHT GRAY, CRYSTAL RICH, STRONGLY PITTED AND OF LOW STRENGTH LIGHTLY WELDED. SAMPLE #5 LIGHTLY WELDED	SAMP 5		32	4.6/5' = 92%	3.4/5' = 68%	1, 0, 0, 1, 3	U	LS					REPLACED REGULAR CORE TUBE SHOE WITH EXTENDED "PUNCH" SHOE
155		NR		33										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 11 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		33										
160		NR		34										LOST CIRCULATION
165	CONTINUES, LOW STRENGTH, LIGHT GRAY, CRYSTAL RICH. LIGHTLY WELDED			35	3.5/5 = 70%	2.1/5 = 42%	1, 3, 1, 4	U	LS					
170		NR		36										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 12 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
			ROCK CORE							SOIL SAMPLES				
		NR		36										
175–180	INCREASING IN STRENGTH, STILL PITTED, LIGHT TO MODERATE WELDING. BECOMES PINKISH, REMAINS CRYSTAL RICH			37	2.3/5 = 46%	1.3/5 = 26%	4, 4	U	M					
180–185				38	.2/5 = 04%	0/5		U	M					HARD CORE SEGMENT BLOCKED TUBE AND MAY HAVE PULVERIZED REMAINING CORE RUN.
185–190	CONTINUED AS ABOVE			39	4/5 = 80%	2.5/5 = 50%	mult., 4, 2, 2, 2	U	M					CHANGED BACK TO STANDARD CORE-TUBE SHOE

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-2 | Sheet 13 of 13

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	STRENGTH INCREASES, LIGHT TO MODERATE WELDING, PITTING DECREASING, PUMICE INCREASING/FLATTENED, REMAINS CRYSTAL RICH			40	5/5 = 100%	3.6/5 =	mult. 0 0 1		LS – MS					
195	INCREASING IN STRENGTH MODERATE TO DENSELY WELDED PUMICE ARE FLATTENED. NO PITTING			41	5/5 = 100	.4/5	multiple	U	MS – HS					
200														1:30 PM 11/21 BORING COMPLETE PVC DOWN TO 200'

Tot Rec 124.5

SHB-3 (TA-16)

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-3		Sheet 1 of 53
Project No. 91C0509A	Task 0900	Elevation and Datum	
Boring Location TA-16		Date Started 12/6/91	Date Finished 01/22/92
Drilling Co. PC Exploration - Salt Lake City, Utah	Driller DEAN / DAN	Completion Depth 848	Rock Depth .3
Drilling Eqpt. I.R. CYCLONE TH-60		No. of Samples / Dist.	Undist. / Core
Drilling Method PUNCH CORE / AIR ROTARY CORING / MUD ROTARY		Water / First	Compl. / 24 hrs.
Core Barrel HX / Length 5 feet	Bit CARBIDE/Diamond	Logged by: SUSAN CHANG / TOM KOLBE	Checked by:
Casing Size 7" diam. / Type Steel	Depth 6 feet		

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														START 12-6-91
	SILTY CLAY TOPSOIL - Dk brown, damp, v. stiff, low plasticity, w/roots & grass	NR												7:48 fault breaks the soil
	becomes red-brown w/ fine- to med. grained sand, cataclastic breccia, white mineralization & Fe staining in Fault gouge			PC-1	2.4'/5' = 48%									
	Bandelier Tuff - Tshirege Member (?) Gray brown, low strength, (w/fine to med. grained quartz & sanidine crystals, pulverized													
	moderate strength													
5	Low strength w/red-brown low plasticity silty clay			R-2	3.7'/3' = 123%									7:50 8:56 drillers left site @ 7:55 to get core barrel off truck @ TA-55 using step-face discharge carbide bit
	moderate strength, gray w/ coarse pumice clasts and numerous fine quartz & sanidine, slightly pitted surface													0.7' from prev. run 9:00
	Moderate strength to strong, gray, with occasional coarse dacite lithics			R-3	5'/5' = 100%	100%								9:06
10	thin clay seam													
	w/ brown pumice clasts and some coarse lithics			R-4										9:10

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 2 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
15	Bandelier Tuff as above (Tshirege Member)			R-4	5' = 100%	3.3'/5' = 66%								
	red-brown low plasticity silty clay seam; sandy													silty clay is probable fault gouge
	Silty clay, red brown, damp, v. stiff, (CL) FAULT GOUGE	NR	40°											
20	Bandelier Tuff, gray, strong, few ~~brown~~ pumice clasts w/medium grained quartz; slightly pitted surface			R-5	3.7'/5' = 74%									
25		NR												
	Fault gouge - Clay seam as above			R-6	2.2'/5' = 44%	0'								prob. fault gouge
	Moderately strong to strong, gray, highly fractured, numerous quartz & sanidine crystals													
	Fault gouge as above	70°												10:10 prob. fault gouge
30	few fine brown pumice clasts, coarse quartz crystals, mod. strong to strong, gray, moderately fractured			R-7	5/5' = 100%	3.75' = 75%								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 3 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	Bandelier tuff as above			R-7	5'/5' = 100%	3.75' = 75%								10:20
35	Gray, mod. strength ~~to strong~~, some fine brown pumice, some gray med. grained pumice, some fine quartz & sanidine Red brown silty clay on surface	NR		R-8	2.2'/5' = 44%	10" = 16%								10:30
40	Tuff - highly weathered, brown-orange, stiff. w/ silty clay as above (v. stiff, red-brown)	NR		R-9	0.2'/5' = 4%	0%								
45		0.50 NR		R-10	0'/5'									12:10 putting punch shoe on end of core tube 11:15 core barrel pushed past end of bit, had to fish for tube 12:10 put on newer carbide bit

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 4 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		R-10										using punch shoe - pushed down w/ no recovery
														12:15
50	moderately strong, gray, fractures easily, numerous fine to med quartz & sanidine, few fine brown pumice clasts			R-11	0.25'/5' = 5%									using punch shoe; drillers left for ~½ hour to call boss.
														1:35
55	becomes strong, with med to coarse gray pumice clasts, numerous quartz & sanidine			R-12	1'/5' = 20%	.8/5 = 16%								using punch shoe
														1:40
60	— ? — ? — very strong, with thin flat pumice, quartz & sanidine, gray	NR		R-13	6"/5' = 10%	0%								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 3 | Sheet 5 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR		R-13										
	very hard, w/coarse gray pumice	NR		R-14	4/6"	0%								1:45 carbide bit won't cut it.
	very hard, w/flattened gray pumice, core surface smooth			R-15	6/6"	100%								2:55 2:15 trip out to change bit. Carbide teeth worn completely away. 2:45 putting on Christiansen surface set bit
65	very hard, densely welded, gray numerous fine to coarse pumice, w/quartz & sanidine; Fe & Mn stains on fracture faces			R-16	5'/5' = 100%	4.8' = 96%								END 12-6-91; ST. 12-8-91 9:00 9:50; Mud Rotary (water only)
70	lots of quartz & sanidine, densely welded as above, Fe/Mn stains on fract.; highly weath & fractured; brown-red, w/white & Fe colored pumice fragments	20°		R-17	5'/5' = 100%	4.5' = 90%								
75	densely welded w/tan flat pumice, wh. quartz med gr.; w/sand & med plast. silty clay			R-18	5'/5' = 100%	5'/? = 85%								

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No. 3	Sheet 6 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														290
80	densely welded w/coarse graypumice clasts			R-19	5' = 100%	55" = 92%								
	sandy w/some tan clay, lowplasticity													300
85	w/numerous gray flattened pumice clasts			R-20	5'/5' = 100%	5'/5' = 100%								
														325
90	as above			R-21	5' = 100 %	4'8" = 96 %								
														335

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. 3 | Sheet 7 of 63

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
95	w/tan-orange mod plastic clay densely welded as above, w/coarse gray pumice w/clay as above			R-22	5' = 100%	53" = 88%								400
100	tan orange clay → densely welded as above			R-23	5' = 100%	49" = 82%								
105	densely welded as above, some tan coarse pumice along w/gray mod. plast. orange silty clay w/highly weath. tuff			R-24	5' = 100%	54" = 90%								cataclastic breccia 420 SURGE DEPOSIT?
110														

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-3	Sheet 8 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	densely welded as above platy, altered highly fract & weath, w/pink nod. plastic silty clay pinkish gray, moderately strength & fractured, w/fine-med gr. lithics,			R-25	5'/5' = 100%	25" = 42%								losing water ~113' 435 END 12-9-91
115	densely welded, gray iron stained fracture, trace of orange silty clay in fractures, with flatered pumice, some coarse gray pumice, some quartz & sanidine, smooth surface, few fine rust colored lithics			R-26	5'/5' = 100%	59" = 98%								START 12-10-91 7:50 using water only instead of bentonite slurry
120	as above but no rust colored lithics, slightly banded w/few rust colored streaks	NR		R-27	58"/5' = 97%	56" = 96%								8:05
125	slightly banded w/few pink streaks, densely welded, Fe stains on fracture faces, little gray round pumice, w/some rust colored lithics			R-28	5'/5' = 100%	50" = 83%								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 9 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		ROCK CORE								SOIL SAMPLES				
	orange silty clay in fracture →			R-28										
130														9:00 added ~1 cup polymer (Alcomer 120LS). Rods vibrating against hole.
	FAULT GOUGE - highly fract. & weath. → moderately plastic orange silty clay seams, ~½ cm wide	80°		R-29	5'/5' = 100%	33" = 55%								Fault
135		80°												Fault
	clayey, sandy seam			R-30	5'/5' = 100%									
140				R-31	5'/5' = 100%	55" = 92%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 10 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	hard FAULT clay on fracture face — ~½cm clay seam		30°	R-31										Fault 9:50
145	w/orange silty clay becomes lighter gray, highly fract., w/quartz & sanidine, some rust colored fine lithics, moderately hard			R-32	5'/5' = 100%	41" = 68%								10:10
150	as above — becomes mod. hard to soft	NR		R-33	4'3"/4.5' = 97%	5" = 9%								platy jointing, very densely welded 10:25
155	highly fract, becomes sandy			R-34	5'/5' = 100%	6" = 10%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 11 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														10:50
	moderate strength to soft as above, w/ med gr. quartz & sanidine													platy jointing
160				R-35										
														11:10
	same as above	NR												
165				R-36	58" = 97%	0%								
	w/ numerous quartz & sanidine, moderately fractured													
170	soft, w/ pink mod. plastic silty clay													
	moderate strength to soft w/ trace of pink silty clay,			R-37	5'/5' = 100%	10" = 16%								
	moderate strength to hard Fe staining on fracture faces													11:45

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 12 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
175	pink brown, moderate strength, numerous med to coarse quartz & sanidine, fine-med gray pumice, tr of coarse lithics; w/pink silty clay (CL)			R-38	5'/5' = 100%	46" = 77%								
180	pink brown, densely welded w/tr. of coarse gray pumice and subst, coarse quartz & sanidine med to. moderate strength highly fract., some med. gr. lithics; soft w/ some pink, silty clay, sandy; orange highly plastic silty clay, stiff			R-39	5'/5' = 100%	14" = 23%								12:20
185	densely welded; highly fractured. moderate strength to soft numerous med to coarse quartz & sanidine; mod strength to soft, tr of coarse lithics; welded			R-40	5'/5' = 100%	14" = 23%								12:35; another zone of intense platy jointing to ~~203~~' 198.5
190	moderate strength to soft, some coarse tan potted pumice; densely welded			R-41										12:45

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	moderate strength to soft, highly fractured, w/ gray med gr. lithics, lots of med. gr. quartz & sanidine, tr. of gray pumice, angular particles pink brown as above			R-41	5/5' = 100%	4.5" = 7%								RQD = 4.5" 1:05
195	as above w/ pink silty clay (CL)			R-42	5' = 100%	9" = 13%								
200	brown-pink densely welded, med to coarse lithics, few med pumiceclasts, lots of quartz & sanidine			R-43	4'/5' = 80%	44" = 73%								
		NR												1:50
205	densely welded, w/ coarse lithics, few pumice clasts, sl. weathered, trace of Fe stains on sides of core			R-44	5'/5' = 100%	21" = 35%								2:00

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	moderate strength, highly fractured, w/ lots of quartz & sanidine; silty, sandy, mod. welded to soft			R-44										platy zone (to ~222 ft)
														2:05
														2:20
210	moderate strength as above			R-45	5' = 100%	0%								
	highly fract., sandy													
	pink brown ?	NR												2:45
215	coarse grained, coarse lithics, ~~some~~ little pink clay throughout, & infractures ~~sand~~ w/ quartz & sanidine, moderate strength			R-46	55"/5' = 92%	18" = 30%								
														2:50
	NON WELDED WEATHERED	NR												
220														
	gray highly weathered and fractured tuff, some pink med grained pumice, mod. hard to soft			R-47	3'/5' = 60%	0%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 15 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	gray, f-m. grained sand, tr. of coarse lithics, looks med. dense			R-47										
225	no recovery - sand zone (?)	NR		R-48										platy zone
														3:20
230		NR		R-49	22"/5' = 37 %	0'								
	sand as above													
	becomes red-brown, highly weathered, few fragments are moderately hard, remaining is sand w/quartz & sanidine, becomes clayey @ bottom													
														3:35
235				R-50										

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 16 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				R-50										
240	80° 1/3 cm clay filled fracture			R-51	5' = 100%	0'								platy zone; 4:30 END 12-10-91
245	red-brown [illegible] dense [illegible] w/ coarse [illegible] & flat gray pumice, lots of med. quartz & sanidine			R-52	5' = 100%	5' = 100%								
250				R-53	5' = 100%	4' = 80%								
				R-54										

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-3	Sheet 17 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	orange silty clay seam, soft, mod. plasticity													from fault 5.5
255	densely welded as above			R-54										
260	densely welded as above, moderately fractured			R-55	5'/5' = 100%	2.2'/5' = 43%								10-11-12 tube stuck 12 (back) 1:30 tripped out
					93%									12/11/91 END 2:00
	same as above NR													8:45 Start 12/12/91 8:30 rods tripped in
265	soft highly plastic orange silty clay in thin seam PROBABLE FAULT (?)		80°	R-56	3'2"/3.5' = 90%	3' = 86%								blocked off; Fault
														9:50 9:15
	densely welded as above w/ coarse lithics to 1½" (10", 34")			R-57	4'4"/4' = 108%	4'2" = 105%								add'l from prev. core run
270														

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Project Name **LANL Seismic Hazards Studies Task 2** | Boring No. SHB-3 | Sheet 18 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				R-57	/4'									
	2"													9:20
	same as above			R-58	28" = 100%	28" = 100%								
														9:45
	highly fractured													platy zone
275	densely welded as above w/coarse lithics			R-59	5'/5' = 100%	3.7'/5' = 74%								
														10:10
280				R-60	5'/5' = 100%	38" /5' = 63%								
														10:20
285				R-61	5'/5' = 100%	42" = 70%								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 19 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	densely welded as above			R-61										
	as above but w/ fewer coarse lithics													
290				R-62	5' = 100%	59" = 98%								11:05
	↓ becoming orange brown	30°												
295				R-63	5'/5' = ~~100%~~	50" = 83%								
	thin orange clay seam →	50°												11:20
300	as above			R-64	5' = 100%	5' = 100%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 20 of 53

DEPTH (feet)	DESCRIPTION	Run No.	Recov. (ft)	RQD	REMARKS
		R-64			11:30
					platy zone
305	densely welded as above, becoming orange-brown	R-65	5' = 100%	3.3' = 66%	
					11:50
310		R-66	5' = 100%	3.5' = 70%	
	as above				
	— ? — ? — ? —				
315	becomes moderate strength to soft, sandy, friable, orange-brown	R-67	5' = 100%	16" = 27%	

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-3	Sheet 21 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				R-67										
320	BOTTOM OF TSHIREGE as above w/some orange med plastic clay			R-68	1/3' = 33%	0%								
	~~"Cerro Toledo Sequence"~~ OK			R-68										
325	Andesite? DACITE? Gray, hard, w/ brown orange & black lithics little sandy clay on fracture face →			R-69	3/5' = 5%	0								slow drilling 100
330				R-70	0/5'									no recovery [illegible]
		NR		R-71										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 22 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
335	Soil (?) SEDEMENT (?) dk brown, severely weathered (saprolitic), sandy w/ trace of clay (CL), some med gr. lithics, mod. hard to soft	NR		R-71	2"/1' = 4% (?)	0%								
	same as above	NR		R-72	3"/2' = 12%	0%								2:10
	Stiff brown, highly plastic clay in bit waterways	NR		R-73	0/1	#								2:30 5:00 (?) [illegible] Bit plugged 3' [illegible]
340		NR		R-74	2.5'/5' = 50%	5" = 8%								
	— ? — ? — Hard, dk brown w/ clay as above	60°												
	— ? — ? — ? Andesite Gray, hard, highly fract & weath, orange fracture faces, w/ clayey med gr. sand													4:40 END 12/12/91 7:55 12/13/91
345	Sand & Boulders (?)	NR		R-75	0.8' = 16%	4" = 6%								
	slightly cemented f-coarse sand, dk brown & orange, tr. of clay													
	grays hard as above, weath fract. faces													8:05
350		NR		R-76										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 23 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	sand, gravel & boulders as above 340-353	NR		R-76	0.5' = 10%	0								
355	orange sandy clay, medium stiff, moderate plasticity, numerous med. gr. white quartz crystals	NR		R-77	0.5' = 10%	0								w/ polymer added
360	no recovery, ~~little~~ trace of orange clayey sand in catcher 353-368 PEBBLY MUDSTONE	NR		R-78	0'									9:15
365		NR		R-79	1.9'/5' = 38%									9:40

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 24 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	clayey sand w/some coarse ^clayey gravel, low plasticity, orange, w/white med gr. quartz.	NR		R-79 (lined)	1.9'/5'									10:20
	— ? — ? — ? —													
370	no recovery ^yellowtan trace of sand in catcher	NR		R-80	0'									10:30
375	silty sand, tan w/ black and quartz crystals, med. dense, tr. of clay (CL), no cementation.	NR		R-81 (lined)	1.4' = 28%	0'								10:32
380		NR		R-82										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 25 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	no recovery - trace of tan sand grains in catcher	NR		R-82										11:00
		NR		R-83 (lined)	0.7'	0								
385	grading from orange to ? gray ? ?													0.5' sand slough on top of 0.7' sample
	Gray pumice sand w/ light Fe stains, trace of clay (CL), some fine to med. dark lithics. medium dense fall deposit, obsidian fragments. RABBIT MT TUFF (?)		?	R-84	3'/3'	0								
390	no recovery trace of gray sand in catcher	NR		R-85	0'/5'									
395	no recovery	NR		R-86	0'/5'									

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No.	SHB-3	Sheet 26 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														12:45
400	fluvial sand - f-coarse	NR		R-87 (lined)	1.5'/5' = 30%	0								
	becomes finer, sl. stained w/orange, more dark fragments													1:30
405	fluvial sand orange w/ tan rotted pumice fragments, fine to medium grained, mod. grained quartz & f-m. dk. lithics, loose to med. dense	NR		R-88	2'/5' = 40%	0%								1:45
410	as above, lightly wacked, darker orange, w/ dark gravel	NR		R-89	0.6'/5' = 12%	0								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 27 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
415	orange, moderately welded, some med. gr. lithics, little brown pumice to 1/4", w/ med to coarse quartz	NR		R-90	0.3' = 6%	0'								
420	as above	NR		R-91	0.4'/5' = 8%	0'								
425	Otowi w/ intense clay alteration to 448' (ALL OF OTOWI MEMBER (TO ± 590 FEET) APPEARS TO BE LITHIFIED, BUT NON WELDED. OBSERVATIONS OF J. GARDNER AND T. KOLBE.) pink brown, moderately strength ~~welded~~, highly fractured, med. to coarse lithics becomes soft, ~~welded~~ fine - m. pumice & quartz	NR		R-92	2.5'/5' = 50%	0'								3:50
430	soft as above w/ occ. mod. welded zones.			R-93	3'/3'	0								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				R-93										
	pink brown, moderate [redacted] strength [redacted], med gr. lithics, little pumice	NR		R-94	0.6'/3' = 20%	0.6' = 20%								4:05
														END 12/13/91 START 12/14/91 8:20 no water in boring
435	no recovery	NR		R-95	0'/5'									
440	pink-brown, lightly welded to unwelded, soft little gray pumice to 1/4", w/ dark fine lithics, fine-med quartz & sanidine tr. of clay (cc)			R-96	5'/5' = 100%	0								9:10 core tube sanded in; 9:15 blocked off at 5'
445	becomes more clayey, w/ med. gravel size lithics; becomes red brown and clayey			R-97	5'/5' = 100%	0								

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 29 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	- grading to ~~brown~~ pink-brown w/ intense clay alteration			R-97										10:20
450	Rubble; moderately welded, pink-brown ~~brown~~; trace of brown silty clay (CL) on fracture faces, abundant med gr quartz & sanidine, few lithics, no apparent pumice; loose	NR; 80°		R-98	1.7'/5' = 34%	0								
	moderately welded to soft			R-99	1'/1'									blocked off
455	Alternating hard & soft zones. Soft mat'l being washed away. moderately welded as above	NR		R-100	0.1'/4' = 2%	0								11:00
460		NR		R-101	0.5'/5' = 10%	0.4' = 8%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	pink- moderately welded, brown as above, tr. of gray pumice to ~1/4" size tr. of orange silty clay on fracture face	NR		R-101	0.5'/5'									
465	as above - mod. welded to soft	NR		R-102	2.7'/5' = 54%	0.9' = 18%								
470	moderately welded to densely welded, with fine-med lithics, little brown pumice	NR		R-103	0.33'/5' = 54%	4" = 6%								End 11/14/91, ST 11/15/91
475	nonwelded, ~~prominent~~ ~~less welded~~ ~~vapo~~ ~~soft to moderately welded,~~ as above, tr. of clay on fracture faces, friable	NR		R-104	1.3'/5' = 26%	0								1:30 - drill rods stuck in hole; 2:20 HQ rod became uncoupled ~10' above drill table; 3:00 rods rotating but still can't pull out. Trying to air, water; 4:00 Trying to air, air.

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5.

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Project Name	LANL Seismic Hazards Studies Task 2	Boring No.	SHB-3	Sheet	31	of	53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
														7-990-rods on
480	friable { moderately welded ↓ soft, unwelded w/ f-m. quartz, sanidine & lithics little brown & tan pumice up to 1/4" size	NR		R-105	3'/5' = 60%	0								3:15 too tight (from trying to get them unstuck yesterday). 930 - tripping out - core tube stuck 11:00 Left to call L. Fleming regarding getting more HX rod. Driller afraid HQ rod will get stuck in hole. 1230 Returned. Fleming said to go as far as possible w/ what they have. Changing bit to "Green." Weeded out 50' of bad
485	soft, lightly to unwelded, as above	NR		R-106	2.8'/5' = 56%	0'								3:20 HQ rod - flared ends. 2:45 - tripped in & flushing out hole
	as above			R-107 (lined)	1.5'/1.5'	0								4:10
490		NR		R-108	0.4'/5' = 8%	0								4:15 4:30

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 32 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	soft to moderately welded, friable	NR		R-108										4:40 END 12/15/91
495		NR												START 12/16/91
	nonwelded ~~unwelded to lightly welded~~, few tan & dk brown pumice clasts, friable, few moderately welded pieces, w/quartz & sanidine, some lithics			R-109	2.7'/5' = 54%	0								498' prominent vapor phase alteration of pumice
500	Becomes light ~~orange brown~~ w/vapor phase ~~alteration~~ throughout, lithic rich nonwelded, pumice not flattened	NR												8:00
	lightly to moderately welded, w/dk brown pumice clasts to 1", fine-med quartz, sanidine & lithics, pumice is "rotted" med gr. dark			R-110	2.3'/5' = 46%	4" = 6%								
	soft {													8:45-drillers left site to call in their time. Back ~9:25
505	lightly welded, friable, lithics & pumice as above, trace of silty clay (CL) between fractures			R-111	5'/5' = 100%	1.6'/5' = 32%								
510														

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Project Name: LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 (TA-16) | Sheet 33 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
		NR												9:35
	lightly to moderately welded breaks apart w/some effort, light Fe stains on some fracture faces, pumice, lithics as above		Tb	R-112	4'/5' = 80%	1' = 20%								
515	lightly to moderately welded as above			R-113	5'/5' = 100%	2.7' = 54%								
520		NR												10:15
	as above			R-114	2.5'/5' = 50%									
525		NR												10:20

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. 3 (TA-16) | Sheet 34 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	moderately welded, pumice & lithics as above slightly pitted core surface		30°	R-115	4.5'/5' = 90%	2' = 40%								
530		NR		R-116	2.4'/5' = 48%	0'								11:00
	moderately welded & fractured large (coarse) lithics, Fe stains on fracture faces													11:10
535	w/orange low plasticity silty clay { as above	NR	30° 40°	R-117	4.6'/5' = 92%	1.2' = 24%								11:20 blocked off & pulled up 2' from previous run 11:50
540	moderately welded as above	NR	60°	R-118	1'/1'	0								12:00 blocked off

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 35 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	moderately welded as above	NR		R-119	2.4' = 48%									
545	as above; PROBABLE FAULT; silty clay (CH); orange, soft	NR; 80°		R-120	3.1'/5' = 62%									1:05
550	moderately welded as above; thin seam of orange silty clay (CH)	40°		R-121	4.7' = 94%	4" = 6%								1:30
555	as above	NR; 60°		R-122	5'/5' = 100%									2:00

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
				R-122										
560	Becomes tan, moderately welded, rust pumice fragments to 3/4", sl. weathered, numerous lithics (dacite?) to 3/4", tr. of orang silty clay (CL) BASE OF VAPOR PHASE ALTERED PUMICE													several pieces of bit in core 2:15
	many w/dark Fe stained lithics to 3", becomes tan-gray, lightly to moderately welded, rust-brown pumice	NR	50° 86° 50°	R-123	2.9'/5' = 58%	0'								2:30 tripping out End 12/16/91 Start 12/17/91 Finished tripping out, change to green bit & trip in by 10:15
	FAULT / unwelded to moderately welded, clayey, orange silty clay (CH), soft, tan tuff, few dark lithics to 1", numerous f-m lithics, highly weathered dark													
565	moderate to densely welded	NR												
	slightly weath, pumice fragments are rust-colored, f-m quartz & sanidine, moderate to lightly welded	sandy	50°	R-124	4.8'/5' = 96%	4.8' = 96%								
570	moderate to lightly welded, rust colored pumice to 1" size, dark lithics to 1", friable (STRENGTH DECREASES AT ± 573)	NR		R-125	4.2'/5' = 84%	2.7' = 54%								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 37 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
			ROCK CORE							SOIL SAMPLES				
				R-125										11:25
575		NR												
	lightly welded to nonwelded w/rust colored pumice to 1½ dark lithics to 1" trace of orange silty clay			R-126	2.4'/5' = 54%	1' = 20%								
580	STRENGTH													11:50
		NR		R-127	1' = 20%									matl in hole tightening up around rods. Trying to flush out w/ air & water. Not working. Left @ 1 to call boss. Ret @ 2:30 w/hammer
	nonwelded as above													
585	(CH) - soft, orange gray, hard, w/few fine, dark lithics, Fe stain on faces													12:10 Attached to top of rods. Rods freed @ 3. Add 2 bags bentonite to water & put in hole. Need to get return to flush out cuttings or at least keep hole open.
	12:30 JAN 6 1992 REENTERING HOLE WITH LONGYEAR STEP-FACED, SURFACE SET Bit. JAN 7			R128	36/3 120%	36/3 120%								330 - bentonite slurry pumped down hole
590	TUFF LITHIC & PUMICE RICH, PUMICE ARE Fe STAINED, LITHICS ARE DACITE (?), BROWNISH ORANGE. FRIABLE UNWELDED DRILLING w/ BENTONITE			R129										Rods started rotating, then became stuck again. 400 trying to use air

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Project Name LANL Seismic Hazards Studies Task 2	Boring No. SHB-3	Sheet 38 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	TUFF, CONTINUES BROWNIS-ORANGE LITHIC RICH, LITHICS ARE DACITE, ANGULAR AND UP TO 4 CM IN DIAMETER, PUMICE ARE NUMEROUS, OFTEN ROTTEN AND IRON STAINED. ROCK IS OF LOW STRENGTH - FRIABLE			R129	3.7/5 = 74%	3.7/5 = 74%								11/18 - rods still stuck. Added 3 gal. foam (8:30). BEGAN DRILLING WITH MUD AT 585'. MIX IS 2 SACKS OF BENTONITE / 300 GAL OF WATER FOR EACH 5' RUN. SOME VISCOSIFIER IS ALSO ADDED. NO DISCHARGE TO SURFACE.
595	CONTINUES			R130	.9/5 = 18%	.9/5 = 18%								CORING WITHOUT PROBLEM
600	CONTINUES AS ABOVE, but less FRIABLE - LOW STRENGTH, CAN BE BROKEN APART EASILY BY HAND			R131	5/5' 100%	5/5' 100%								
605	TUFF CONTINUES, BROWNIS-ORANGE LITHIC & PUMICE RICH, LOW STRENGTH TO FRIABLE, PUMICE ARE ROTTEN AND FE STAINED			R132	1/5 = 20%	0/5 = 0								

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 39 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	LITHICS (up to 8 cm) WITH BROWNISH-ORANGE, CLAY-RICH MATRIX MATERIAL			R-133	.5/5 10 %	0/5								
610														
	POSSIBLE FAULT?													
615				NR R134										
620				NR R135										

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Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 40 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
	ROCK CORE									SOIL SAMPLES				
	TUFF, BROWNISH ORANGE, LITHIC & PUMICE RICH, LITHICS ARE BASALTIC, PUMICE ARE ROTTEN & IRON STAINED. ROCK IS FRIABLE			R 136	2.5/3	2.2/3			F					JAN 8 9:30 EASY DRILLING
625														
	AS ABOVE BUT BECOMES MORE RED - BETWEEN LT BROWNISH GRAY to REDDISH BROWN SAMPLE			R 137	5/5 = 100 %	5/5 = 100 %								
630														
	AS ABOVE WITH STRENGTH INCREASING SLIGHTLY AT ± 633 LITHICS DECREASE			R138	5/5 = 100 %	5/5 = 100 %								
635														
	AS ABOVE, BUT NOW FRIABLE			R 139	3.3/3 = 110 %	3.3/3 = 110 %								

WOODWARD-CLYDE CONSULTANTS

Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 | Sheet 41 of 53

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
									F					
640	UNWELDED TUFF DARK REDDISH BROWN to BROWNISH GRAY PUMICE RICH, FEW LITHICS, PUMICE ARE ROTTEN AND FE STAINED, ROCK IS FRIABLE			R-140	3.8/4 = 95%	3/4 = 75%								
645	AS ABOVE PUMICE INCREASING			R-141	5/5 = 100%	5/5 = 100%								
650	AS ABOVE			R142	4.8/5 = 96%	4.8/5 = 96%								

WOODWARD-CLYDE CONSULTANTS

Project Name LANL Seismic Hazards Studies Task 2 | Boring No. SHB-3 |

DEPTH (feet)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. (ft)	RQD	Fractures / ft	Weathering	Strength	No.	Type	Blow Count	Recovery	REMARKS
655	CONTINUES AS UNWELDED TUFF. BROWNISH GRAY TO REDDISH BROWN PUMICE ARE NUMEROUS ROTTEN AND IRON STAINED. STRENGTH INCREASES BELOW 655 FEET.			R143	5/5 = 100 %	5/5 = 100 %			F					NO PROBLEMS
660	STRENGTH INCREASING BROWNISH GRAY			R144	4.8/5 = 96 %	4.8/5 = 96 %								
665	STRENGTH DECREASES CORE IS FRIABLE, NO. OF PUMICE DECREASE. NO OXIDIZED & ROTTEN PUMICE BELOW 665 TEXTURE IS THAT OF ALLUVIAL SAND? POSSIBLE SURGE? TO 669			R145	4.7/5' = 94 %	4/5' = 80 %								
670	UNWELDED TUFF STRENGTH INCREASES, PUMICE INCREASES OXIDIZED & ROTTEN REDDISH BROWN.			R146	5/5' = 100%	5/5 = 100%								

CORE LOG

Project Name: LANL SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 43 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
				R 146					F					
	UNWELDED TUFF. LOW STRENGTH BUT NOT FRIABLE, EASILY BROKEN BY HAND. LITHICS INCREASE (± 1cm) PUMICE NUMEROUS AND IRON STAINED													JAN 9
675				R147	4.4/5 = 88%	4/5 = 80%								
	CONTINUES LOW STRENGTH, BROWN TO REDDISH BROWN. PUMICE CONTINUE TO BE OXIDIZED.													
680				R 148	4/5 = 80%	3.5/5 = 70%								
	LARGE DACITE LITHIC →													
	TUFF AS ABOVE CONTINUES, LITHICS INCREASE													
685				R149	4.4/5 = 88%	3.5/5 = 70%			↓					
	LARGE DACITE LITHIC →													

CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. 3 (TA-16) | Sheet 44 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	LARGE DACITE LITHIC →								F					
690	LARGE DACITE LITHICS → TUFF, BROWN to REDDISH BRN. PUMICE CONTINUE to BE IRON STAINED. ROCK IS LOW STRENGTH But NOT FRIABLE. ROCK IS EASILY BROKEN BY HAND But HOLDS A "STICK"			R150	4.7/5 = 94%	4.5/5 = 90%								
695	CONTINUES AS ABOVE			R151	5/5 = 100%	5/5 = 100%								
700	AS ABOVE But LOWER STRENGTH.			R152	1.2/5 = 24%	.5/5 = 10%								

CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 45 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
705	UNWELDED TUFF, LOW STRENGTH LIGHT BROWNISH GRAY, SOME PUMICE ROTTEN & IRON STAINED OTHERS FRESH, LITHICS SMALL (<1cm) AND FEW SAMPLE			R153	4.3/5' = 86%	3.4/5' = 68%			F					No PROBLEMS
710	LIGHT BROWNISH GRAY, STRENGTH DECREASES FEW IRON STAINED PUMICE, LITHICS ARE NUMEROUS AND SMALL (<1cm)			R154	3.3/5' = 66%	3.3/5' = 66%								
715	LITHIC RICH, LIGHT BROWNISH GRAY, MOST PUMICE FREE OF IRON STAINING.			R155	4/5 = 80%	3.5/5' = 70%								
720	AS ABOVE BUT BECOMES IRON STAINED & MORE GRANULAR AT 722.			R156	3.1/5' = 62%	2.8/5' = 56%								

Oak 986

CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 46 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	YELLOW ALTERATION SOME CLAY WITH SLICKENSIDES? PROBABLE FAULT 723			R156										
725	CLAY-RICH CLODS → LIGHT BROWNISH GRAY UNWELDED TUFF, PUMICE BECOME IRON STAINED			R157	2/5' = 40%	1.5/5' = 30%								
730	PUMICE BECOME LESS IRON STAINED LITHICS ARE NUMEROUS AND SMALL (<1Cm)			R158	3.4/5' = 68%	2.9/5' = 58%								
735	UNWELDED TUFF BECOMES MORE PINKISH. MOST PUMICE ARE IRON STAINED. LITHICS CONTINUE TO BE NUMEROUS AND SMALL ROCK IS LOW STRENGTH.			R159	4.6/5 = 92%	4.4/5 = 92%								

CORE LOG

Project Name LAWL SEISMIC HAZARDS	Field Log of Boring No. SHB-3	Sheet 47 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
740	FIVE FOOT STICK - UNWELDED TUFF LIGHT BROWNISH GRAY TO PINKISH GRAY, LITHIC AND PUMICE RICH, LOW STRENGTH, PUMICE HAVE A TINT OF IRON OXIDE COLORING			R160	5/5' = 100%	5/5' = 100%			F					
745	CONTINUES AS ABOVE			R161	4.9/5' = 98%	4.9/5 = 98%								JAN 10
750	NO CHANGE			R162	2.5/5' = 50%	2.5/5' = 50%								
				R163										

Oak 988

CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 48 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
755	UNWELDED TUFF, LIGHT BROWNISH GRAY, LITHIC RICH (< 2 cm) NUMBER & SIZE OF PUMICE DECREASES LOW STRENGTH — FRIABLE			R163	5/5' = 100	5/5' = 100								
760	NUMBER OF PUMICE INCREASE AT 761 TRACE to NO IRON STAINING LITHIC CONTENT DECREASES			R164	3.2/5' = 64%	3.2/5' = 64%								
765	BECOMES LIGHTER to LIGHT GRAY. DECREASED NUMBER OF LITHICS. AIR FALL PUMICE? GRADATIONAL CHANGE to LIGHTER GRAY. PUMICE ARE YELLOWISH TO WHITE			R165	4.8/5' = 96%	4.8/5' = 96%								
770	PUMICE RICH TUFF			R166	1.9/5' = 38%	1.9/5' = 38%								

CORE LOG

Project Name LAUX SEISMIC HAZARDS	Field Log of Boring No. SHB-3	Sheet 49 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	REDDISH-BROWN, CLAY-RICH SOIL? SANDY CLAY? FRACTURE FILLING? SEDIMENT? GOUGE? FAULT?													NO PROBLEMS
775	ONE SOLID STICK UNWELDED TUFF, LIGHT BROWN-GRAY, PUMICE RICH, SOME SMALL LITHICS (<1CM) ROCK IS EASILY GOUGED WITH KNIFE AND CAN BE BROKEN BY HAND. PUMICE CONTENT INCREASING			R167	4.3/5 = 86%	4.3/5 = 86%								
780	CONTINUES AS ABOVE. STRENGTH INCREASES SLIGHTLY BELOW 780 FEET.			R168	4.4/5 = 88%	4.4/5 = 88%								
785	LITHIC CONTENT INCREASES SLIGHTLY, STRENGTH DECREASES			R169	4.5/5 = 90%	4.2/5 = 84%								

CORE LOG

Project Name LANL SEISMIC HAZARDS	Field Log of Boring No. SHB-3	Sheet 50 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	STRENGTH INCREASES SLIGHTLY AT END OF RUN.													
790				R170	2.5/5' = 50%	2/5' = 40%								
795				R171	4.7/5' = 94%	4.7/5' = 94%								
	LARGE LITHIC →													
	UNWELDED TUFF CONTINUES LIGHT BROWNISH GRAY, PUMICE AND LITHIC RICH, LOW STRENGTH													
800				R172	3/5' = 60%	2.8/5' = 56%								
	AS ABOVE CONTINUES													
805				R173	4.4/5' = 88%	4.2/5' = 84%								

CORE LOG

Project Name LAKE SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 51 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
				R173										
810	UNWELDED TUFF, BROWNISH GRAY LARGE DACITE LITHICS CORE WIDTH IN SIZE			R174	2.2/5 = 44%	2.2/5 = 44%								
815	ZONE OF LARGE PUMICE LITHICS DECREASE, PUMICE INCREASE AT 818 Almost Totally PUMICE AIR FALL? COLOR CHANGES FROM LIGHT BROWNISH GRAY to LIGHT GRAY GRADE PUMICE BED?			R175	5/5 = 100%	5/5 = 100%								
820	UNWELDED TUFF, LIGHT BROWNISH GRAY. LITHIC CONTENT INCREASES AT 820 FEET. STRENGTH DECREASES - FRIABLE. STILL PUMICE RICH			R176	4.9/5	4.7/5								JAN 11

Oak 986

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CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. SHB-3 | Sheet 52 of 53

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
		ROCK CORE								SOIL SAMPLES				
825	CONTINUES, UNWELDED TUFF LIGHT BROWNISH GRAY, PUMICE RICH, FEW LITHICS, LOW STRENGTH			R 177	2.2/5 = 44%	2.2/5 = 44%								
830	CONTINUES AS ABOVE			R 178	4.2/5 = 84%	4.2/5 = 84%								
835	CONTINUES PUMICE RICH (ASH FALL ?) WITH NUMEROUS LITHICS AT 838 FEET			R179	1/5 = 20%	.7/5 = 14%								DRILLER REPORTS WATER PRESSURE DROP AND ROTATION TORQUE FLUCTUATING.
	LIGHT GRAY ASH FALL PUMICE FEW LITHICS ?			R180	4.7/5 = 94%	1/5 = 20%								
	PUYE FANGLOMERATE ? COCHITI? REDDISH-BROWN, SANDY CLAY													

CORE LOG

Project Name: LAUL SEISMIC HAZARDS	Field Log of Boring No. SHB-3	Sheet 53 of 53

DEPTH (FEET)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Drilling Rate/Time	REMARKS
840	REDDISH-BROWN, SAND GRAVEL & CLAY DACITE COBBLES WITH CLAY FILLING INTERSTITIAL SPACES ROUNDED GRAVEL & CLAY			R180										
845	PLUVIE? DACITE FANGLOMERATE COBBLES, GRAVEL, CLAY DACIT COBBLES & GRAVEL			R181	3.4/5' = 68%	.6/5' = 12%								LOOSE SAND AND GRAVEL BULGING CORE TUBE - GOOD TIME TO CALL IT A COMPLETED HOLE
	HOLE COMPLETE 848'													12:30 PM JAN 11 PVC DOWN TO 860 FEET _ VOID BLOW OUT ??

1st Ro ...

SHB-4 (TA-18)

CORE LOG

Project Name LANL SEISMIC HAZARDS	Field Log of Boring No. SHD-4		Sheet 1 of 12
Project No. 9160509A	Task 0900	Elevation and Datum	
Boring Location TA-18		Date Started 01/23/92	Date Finished 01/25/92
Drilling Agency PC EXPLORATION	Driller DEAN/DALE	Completion Depth 201	Rock Depth 1 Foot
Drilling Equipment INGERSOLL-RAND CYCLONE TH 60		No. of Samples / Dist.	Undist. / Core
Drilling Method AIR ROTARY CORING		Water / First	Compl. / 24 hrs.
Core Barrel NQ / Length 5'	Bit CARBIDE / DIAMOND IMPREG	Logged by: T.R. KOLBE	Checked by:
Casing Size NA / Type NA	Depth NA		

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	ASPHALT ROAD BASE													12:30 01/23/92 USING LONGYEAR STEP-FACED, SIDE-DISCHARGE, CARBIDE BIT
	BEDROCK NEXT TO BORING IS BANDELIER TUFF, UNWELDED, LIGHT BROWNISH-GRAY IN COLOR. RETURNED CUTTINGS ARE TUFF VAPOR PHASE ALTERED PUMICE-BED PUMICE		NR	1										
5														
														DECREASED AIR
	CUTTINGS ARE TUFF		NR	2										
10														
				3										
	LARGE, 6-8 cm, LITHIC	D												USING EXTENDED SHOE 1" LONGER THAN BIT - PUNCH SHOE

SF-1087-1

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CORE LOG

Project Name: LANL SEISMIC HAZARDS | Field Log of Boring No. SHD-4 |

DEPTH (FEET)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Drilling Rate/Time	REMARKS
15	TUFF, UNWELDED, LIGHT BROWNISH GRAY TO LIGHT PINKISH GRAY, PUMICE ARE IRON STAINED AND ROTTEN. LITHICS ARE VARIABLE IN SIZE FROM 2mm – 6/8 cm, most ARE SMALL AND ANGULAR. LOW STRENG			3	2.2/5 = 44%	0/5			LS					
20	TUFF AS ABOVE - SLIGHTLY HIGHER STRENGTH			4	3/5 = 60%	1.5/5 = 30%			LS					SWITCHED BACK TO SIMPLE, SHOLDERED SHOE – DOES NOT EXTEND PAST BIT.
25		NR		5										
30	TUFF AS ABOVE			6	2.4/5 = 48%	1.5/5 = 30%			LS					

CORE LOG

Project Name LANL SEISMIC HAZARDS	Field Log of Boring No. SHD-4	Sheet 3 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	TUFF, UNWELDED, LIGHT PINKISH GRAY (SALMON) PUMICE ARE IRON STAINED AN ROTTEN, LITHICS ARE SMALL (<1cm) SLIGHTLY MOIST.			7	3/5 = 60%	3/5 = 60%			LS					
35														
	TUFF, CONTINUES MOIST, WITH INCREASING IRON OXIDATION BELOW 38 FEET. COLOR IS DISTINCTLY REDDISH-ORANGE. PUMICE BECOME GRAYER, BUT STILL FRIABLE, LITHICS ARE COMMON.			8	4/5 = 80%	3.7/5 = 74%			LS					
40														
	CONTINUES REDDISH-ORANGE, STRENGTH INCREASES, PUMICE ARE LIGHT BROWN AND OF LOW STRENGTH.			9	1.6/5 = 32%	1/5 = 20%								
45	SAMPLE 1								LS					
				10										

CORE LOG

Project Name LANL SEISMIC HAZARDS	Field Log of Boring No. SHD-4	Sheet 4 of 12

DEPTH (FEET)	DESCRIPTION	ROCK CORE: Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	SOIL SAMPLES: No.	Type	Blow Count	Drilling Rate/Time	REMARKS
50	COOLING UNIT? BREAK	NR		10										CORE DID NOT CATCH. MAY BE 1 FOOT OR MORE IN TUBE. WILL MAKE 4' RUN
		NR		11										
55	DRILL CUTTINGS ARE A MEDIUM SAND COMPOSED OF CRYSTALS & ROUNDED TUFF FRAGMENTS	NR		12										WITH DRILL ROD OPEN AIR (ACCUMULATING AND STORED IN THE FORMATION DURING DRILLING) DISCHARGES STEADILY FROM ROD. A SOUNDS LIKE WATER ENTERING THE DRILL ROD CAN BE HEARD. HOWEVER, NO WATER IS BLOWN TO THE SURFACE DURING CORING, AND THE SAND SIZE CUTTINGS ARE ONLY SLIGHTLY MOIST
0														
60		NR		13										
65														

CORE LOG

Project Name UCAL SEISMIC HAZARDS | Field Log of Boring No. SHB ÷4 | Sheet 5 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
65–70	TUFF, UNWELDED, RUST COLORED, FRIABLE. NOT AS ORANGE – LESS OXIDIZED			14	1.3/5 = 26%	.4/5 = 8%			LS					01/24/91 NO AIR IS DISCHARGING FROM THE OPEN DRILL ROD. PRIOR TO COMMENCEMENT OF DRILLING HOLE IS DRY AND NO SOUND OF WATER CAN BE HEARD. SWITCHED TO PUNCH CORE SHOE. DRILLING BECAME HARDER AT ± 69 FEET.
70–75				15	.8/5 = 16%	0/5			LS					
75–80	COOLING UNIT BREAK? ±0 97	NR		16										SWITCHED BACK TO REGULAR CORE TUBE SHOE. PULL-DOWN PRESSURE AT 1000 WITH PUNCH SHOE. AIR CONTINUES TO DISCHARGE FROM OPEN ROD. CUTTINGS ONLY SLIGHTLY MOIST.
80–		NR		17										

CORE LOG

Project Name UANL SEISMIC HAZARDS	Field Log of Boring No. SHD-4	Sheet 6 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
				17										
85														SWITCHED BACK TO PUNCH-CORE SHOE
		NR		18										
90														
		NR		19										
														SWITCHED BACK TO STANDARD SHOE 1000 lbs down PRESSURE ON PUNCH SHOE & IT WOULD NOT GO
95		NR		20										NO AIR DISCHARGING FROM OPEN ROD
	CUTTINGS ARE FROM LIGHT BROWNISH GRAY TUFF													Put 2 GAL OF FOAM DOWN HOLE
		NR		21										

Oak 986

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CORE LOG

Project Name: UNK SEISMIC HAZARDS | Field Log of Boring No. SHD-4 | Sheet 7 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
100		NR		21										HAVING TRUBLE MAINTAINING CIRCULATION.
105		NR		22										
		NR		23										WILL TRY PUNCH-CORE SHOE AGAIN. DID NOT WORK - COULD NOT ADVANCE PUNCH PAST 2'
110	CUTTINGS INDICATE, LIGHT BROWNISH-GRAY, UNWELDED TUFF	NR		24										WILL TRY SURFACE-SET DIAMOND IMPREG BIT. TRIPPING OUT OF HOLE
115														

Oak 986

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CORE LOG

Project Name LANL SEISMIC HAZARDS | Field Log of Boring No. SHD-4 | Sheet 8 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
	TUFF UNWELDED, LIGHT BROWNISH GRAY, VERY WEAK, CRYSTAL RICH WITH FEW LITHICS. PUMICE ARE LIGHT BROWN, SOFT & UNWEATHERED ALL PUMICE FRAGMENTS PUMICE FALL, BASE OF TSHIREGE?			25	1.9/5 = 38%	1/5 = 20%			LS					DRILLING LAST FOOT WITHOUT AIR
120		NR		26										CONTINUED METHOD OF CORING LAST FOOT WITHOUT AIR AIR DISCHARGING FROM OPEN ROD WITH SOUND OF H2O ENTERING ROD, BUT CUTTINGS ARE ONLY SLIGHTLY MOIST.
125	UNWELDED TUFF AS ABOVE			27	.2/5 = 4%	0/5			LS					SAMPLE WAS WET, CORE TUBE WAS WET, BUT CUTTINGS SLIGHTLY MOIST.
130	LOOSE, LIGHT BROWNISH-GRAY TUFF FRAGMENTS. MOIST AND VERY WEAK - CAN BE EASILY CRUSHED BETWEEN FINGERS SOME CLAY -			28	1/5 = 20%	0/5								

CORE LOG

Project Name: LANL SEISMIC HAZARDS | Field Log of Boring No.: SHD-4 | Sheet 9 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
135		NR		29										USING PUNCH-CORE SHOE WITH DIAM. IMPREG BIT
140	TUFF, UNWELDED, LIGHT BROWNISH-GRAY, WET, VERY LOW STRENGTH, FEW LITHICS, SOME IRON STAINING SAMPLE 2 →		2	30	4/5' = 80%	3.5/5' = 70%			LS					GOING BACK TO STANDARD SHOE.
	COOLING BREAK ?													
145		NR		31										CORE TUBE COMES UP WET. AIR DISCHARGES STEADILY FROM OPEN CORE ROD
150														

Oak 986

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CORE LOG

Project Name: LANL Seismic Hazards | Field Log of Boring No. SHO-4 | Sheet 10 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
		NR		32										POOR CIRCULATION, AIR DISCHARGING STEADILY FROM OPEN CORE ROD
155	AIR-FALL PUMICE? SAMPLE IS ALMOST EXCLUSIVELY GROUND UP PUMICE AND PUMICE FRAGMENTS			33	4/5 = 80%	0/5								INJECTING 4 GAL OF FOAM TO CLEAN HOLE
160	CUTTINGS ARE LIGHT GRAY TO LIGHT BROWNISH GRAY, CRYSTAL RICH - LOOKS LIKE COARSE SAND	NR		34										01/25/92
165		NR		35										DRILLING LAST FOOT WITHOUT AIR TO TRY AND FORCE THE LOOSE MATERIAL UP THE TUBE

CORE LOG

Project Name: UNLV SEISMIC HAZARDS | Field Log of Boring No. SHD-4 | Sheet 11 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
				35										
170	TUFF, PUMICE RICH, BROWN, MOIST, VERY LOW STRENGTH.			36	.2/5 = 4%	0/5			LS					SWITCHING TO PUNCH-CORE SHOE
175		NR		37										
180		NR		38										SWITCHING BACK TO STANDARD CORE SHOE DRILLING LAST FOOT WITHOUT AIR

CORE LOG

Project Name: LANL SEISMIC HAZARDS | Field Log of Boring No. SHD-4 | Sheet 12 of 12

DEPTH (FEET)	DESCRIPTION	Sketch	Lithology	Run No.	Recov. ft.	RQD	Fractures/ft.	Weathering	Strength	No.	Type	Blow Count	Drilling Rate/Time	REMARKS
185	CUTTINGS ARE CRYSTAL RICH, LIGHT GRAY	NR		39										POOR CIRCULATION AIR DISCHARGES FROM OPEN CORE ROD
190				40	.7/5' = 14%	.7/5' = 14%								DRILLING HARD AT BOTTOM, STOPPED WITH 4.5 FOOT RUN
	BASALTIC ANDESITE? DARK GRAY, VERY HIGH STRENGTH. MAYBE LARGE LITHIC?								VHS					
195		NR		41										EASY DRILLING
200														PVC DOWN TO ±192'. OPEN HOLE IN CONCRETE TO 195' 10:40 AM

APPENDIX K
SUBSURFACE GEOLOGICAL AND GEOTECHNICAL DATA IN THE LANL REGION

TECHNICAL AREAS (TA-2)

No geotechnical, foundation, or soil reports were found for any of the facilities at TA-2. However, according to M. Dean Keller, co-author of a seismic investigation of Omega West reactor (ENG-1-4242, October 10, 1970) at TA-2, the Omega reactor site is located on tuff bedrock on the north side of Los Alamos Canyon. TA-41 is located just to the west of TA-2 and on the same side of the canyon. Thus subsurface investigations at TA-41 should be a reasonable analog for the TA-2 Omega site.

TECHNICAL AREAS (TA-3)

AUTHOR: SHB AGRA, INC.
YEAR: 1994
TITLE: NMR Spectroscopy Laboratory, Bldg. 562
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 12013; SHB AGRA Job No. E94-1065
PAGES: 14
NOTES: This report includes results of four test borings (21 to 31 feet), laboratory analyses, and recommended criteria for foundation design and slab support. **Standard Penetration** testing was performed and the soils encountered were continuously examined and visually classified. **Moisture content** determinations, **grain-size analysis** and **Atterberg, Limits** tests were performed. At the time of the investigation, the site consisted of native vegetal cover. The subsoils underlying the site consist of 0 to 4 feet of nonplastic and firm silty sands. This surficial soil is underlain by Bandelier Tuff which is hard from an engineering standpoint. **Unconfined Compressive Strengths** determined from other projects at LANL have yielded strengths from 290 to 2,100 psi.

AUTHOR: SHB AGRA, INC.
YEAR: 1993
TITLE: Conceptual Design CMR Building Upgrades, Bldg. SM-29
TYPE: Geotechnical Investigation Report
REPORT No: SHB AGRA Job No. E93-1230
PAGES: 78
NOTES: This report includes results of 13 test borings (20 to 50 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **dry densities, grain-size analysis** and **Atterberg Limits** tests, **standard penetration** tests and **unconfined compression** tests. In addition, a Dynamic Materials Properties Investigation was conducted which included analysis of previous work and **refraction seismic testing**. At the time of the field investigation the site was occupied by the existing 2-story CMR Building.

AUTHOR: SHB AGRA, INC.
YEAR: 1993
TITLE: Industrial Partnership Center, Bldg. 561
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 12956; SHB AGRA Job No. E93-1212
PAGES: 10
NOTES: This report includes results of three test borings (8 to 26 feet), laboratory analyses, and recommended criteria for foundation design slab support and paving. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **dry densities, grain-size analysis, Atterberg Limits**, and **standard penetration** tests.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1990
TITLE: Advanced Computer Laboratory TA-3
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 10187 (reel 528, location 3); SHB Job No. E89-1252
PAGES: 16
NOTES: This report includes results of four test borings (19.9 to 29.6 feet), laboratory analyses, and recommended criteria for foundation design and slab support and paving. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **dry densities**, **grain-size analysis**, **Atterberg Limits**, and **standard penetration** tests. At the time of the investigation, the site was an asphalt covered parking area. The subsurface consisted of a 1.0 to 1.5 feet layer of silty sands and sandy gravel overlying tuff. This tuff is hard from an engineering standpoint and **unconfined compression Tests** determined from other projects have yielded strengths from 290 to 2,100 psi.

AUTHOR: Professional Service Industries, Inc.
YEAR: 1989
TITLE: OS Storage Facility
TYPE: Soils exploration
REPORT No: Lab Job 10453; PSI File Number 535-95011
PAGES: 15
NOTES: This report includes results of four 20 foot test borings, laboratory testing and engineering analysis and evaluation of the foundation materials. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **grain-size analysis**, **Atterberg Limits**, and **standard penetration** tests.

AUTHOR: Sergent, Hauskins and Beckwith
YEAR: 1989
TITLE: Materials Science laboratory
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 6917; SHB Job No. E89-1097
PAGES: 31
NOTES: This report includes results of 14 test borings (10 to 41 feet), laboratory analyses, and recommended criteria for foundation design and slab support and paving. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **dry densities**, **grain-size analysis**, **Atterberg Limits**, **standard penetration**, and **consolidation** tests. At the time of the field study the site was a parking lot and storage area. The subsoils underlying the site consist of low to high plasticity clay and silt and silty sand. The clays range in thickness from several inches to 13 feet. Some of the surface soils are very soft to very firm. This surficial soil is underlain by Bandelier Tuff which is hard from an engineering standpoint. **Unconfined compression** strengths determined from other projects have yielded strengths from 290 to 2,100 psi.

AUTHOR: Uhl & Lopez, Inc.
YEAR: 1988
TITLE: 13.2KV Switchgear Replacement Project, Bldg. SM-1682
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 8031 (reel 0665, location 2); U & L Job No. 1-80101
PAGES: 12
NOTES: This report includes results of five test borings (12.5 to 22.5 feet), laboratory analyses, and recommended criteria for foundation design. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **dry densities**, **grain-size analysis**, **Atterberg Limits**, and **standard penetration** tests. At the time of the field investigation, the site consisted of a previously-graded site which had been cut and filled in some areas. Soils overlying the site consist of man-made moderately firm fill of silty sands, silty clays, and clayey sands.

AUTHOR: Professional Services Industries, Inc.
YEAR: 1987
TITLE: CNLS Office Building SM 1690
TYPE: Soils exploration
REPORT No: Lab Job 8547; PSI No. 532-75017
PAGES: 23
NOTES: This report includes results of three 15.3 feet deep test borings, laboratory analyses, and recommended criteria for foundation design. Evaluation of engineering properties of the subsurface soils include **moisture content** determinations, **moisture-density relationships, grain-size analysis**, and **standard penetration** tests. At the time of this investigation the site was covered by asphaltic concrete pavement. An idealized soil profile at this site consisted of approximately 1.0 foot of clayey sand overlying a very dense tuff.

AUTHOR: Pan Am World Services, Inc.
YEAR: 1987
TITLE: Shop Addition to SM-66
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 7910; Pan Am work order No. 5-84-0001
PAGES: 7
NOTES: This report includes results of three test borings (20.2 to 25 feet). Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests. At the time of this investigation the site was covered by native grasses. The subsurface soil at this site consisted of 13 to 20 feet of sandy clay and clayey sand.

AUTHOR: Sergent, Hauskins and Beckwith
YEAR: 1986
TITLE: Experimental Metals Science Facility
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 7999; SHB Job No. E86-1201
PAGES: 17
NOTES: This report includes results of three test borings (24.6 to 24.7 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the field study the majority of the site was covered by asphalt pavement. The subsoils underlying the site consist of approximately three feet of sandy clay in boring No. 3. Relatively sound tuff was encountered in all borings. The tuff is hard from an engineering standpoint, and **unconfined compression** strengths determined from other areas at LANL have yielded strengths which range from 290 to as high as 1,150 psi.

AUTHOR: Professional Service Industries, Inc.
YEAR: 1986
TITLE: T-Division Third Party Financed Building, Bldg. SM-475
TYPE: Soils Exploration and Foundation Evaluation Report
REPORT No: Lab Job 7378 (reel 9976, location 1335); PSI File No. 532-65108
PAGES: 17
NOTES: This report includes results of six test borings (20.2 to 20.4 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **moisture-density relationships**. At the time of the field study the site was covered by asphalt pavement. The idealized subsoil profile underlying the site consists of an upper layer of fill, which is approximately 2.5 to 5.0 feet of dense to very dense medium grained sand with silt and clay. Very dense tuff with low compressibility was encountered in all borings.

AUTHOR: The ZIA Company
YEAR: 1985
TITLE: Technical Area 3, Building SM-170 Renovation Project
TYPE: Soils Engineering Investigation
REPORT No: Lab Job 7344 (reel 9995, location 255) W.O. #5-62-0016
PAGES: 9
NOTES: This report includes results of one trench excavation (10 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **grain-size analysis** and **pocket penetrometer** measurements. At the time of the field study the site was covered by asphalt pavement. In general, 7 feet of wet clay overlays a 1.5 feet layer of fluid silt which rests on welded tuff.

AUTHOR: Western Technologies, Inc.
YEAR: 1986
TITLE: Laboratory Data Communications Center (Bldg. 1498)
TYPE: Geotechnical Engineering Evaluation
REPORT No: Lab Job 7050; WT Job No. 3226J067
PAGES: 27
NOTES: This report includes results of eight test borings (20 to 40 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **liquid limit, plasticity index**, and **gradation**. At the time of the field study the site was undeveloped, except for some trailer facilities at the southwest corner and covered with trees and grasses. The idealized subsoil profile underlying the site consist of 1 to 12 feet of sandy clays and silty sands with varying amounts of gravel.

AUTHOR: The Zia Company
YEAR: 1983
TITLE: Test Fabrication Facility, Phase 1 (Sigma Mesa)
TYPE: Soil and Foundation Investigation
REPORT No: Lab Job 7026 (reel 9349, location 805)
PAGES: 19
NOTES: This report includes results of seven test borings (9 to 108 feet), two test pits, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis, Atterberg Limits**, and **unconfined compression** tests. At the time of the field study the site was covered by native vegetation. The idealized subsoil profile underlying the site consists of between 3 to 6 feet of moderately firm to firm silty sands with some clay. These soils directly overlie moderately welded, firm-to-hard tuff.

AUTHOR: FOX Consulting Engineers and Geologists
YEAR: 1982
TITLE: Health Research Laboratory
TYPE: Subsoil Investigation
REPORT No: Lab Job 6397 (reel 9328, location 1341)
PAGES: 12
NOTES: This report includes results of two test borings (23 and 24 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis, Atterberg Limits**, and **confined compression** tests. At the time of the field study the site was covered by native vegetation. The idealized subsoil profile underlying the site consist of between 3 to 6 feet of moderately firm to firm silty sands with some clay. These soils directly overlie moderately welded, firm-to-hard tuff.

AUTHOR: ATL Engineering Services
YEAR: 1980
TITLE: Neutron Calibration Facility, TA-53 General Laboratory Building & WNR Bldg.
TYPE: Geotechnical Investigation
REPORT No: Lab Job 6596 (reel 7168, location 0955); ATL Job No. 8081b
PAGES: 21
NOTES: This report includes results of two test borings (23 and 24 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis, Atterberg Limits**, and **confined compression** tests. At the time of the field study the site was covered by native vegetation. The idealized subsoil profile underlying the site consist of between 3 to 6 feet of moderately firm to firm silty sands with some clay. These soils directly overlie moderately welded, firm-to-hard tuff.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1979
TITLE: Laboratory Support Complex Phase one
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 5481 (reel 7151, location 1344)
PAGES: 20
NOTES: This report includes results of eight test borings (25 and 40 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the field study the site was covered by lawn-type grasses. The idealized subsoil profile underlying the site consist of between 9.5 to 24.5 feet of low to medium plasticity, moderately firm to hard interbedded sandy clays, clayey sands, sandy and clayey silts. These soils directly overlie relatively weathered tuff that becomes firm to hard with depth.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1978
TITLE: High Energy Laboratory Facility
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 5449 (reel 6940, location 2039); SHB Job No. E78-1083
PAGES: 15
NOTES: This report includes results of eight test borings (25 and 40 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the field study the site was covered by lawn-type grasses. The idealized subsoil profile underlying the site consist of between 3.5 to 6 feet of, nonplastic to low plasticity, very firm silty sands and silty clays. These soils directly overlie very firm to hard tuff.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1977
TITLE: University House
TYPE: Foundation Investigation Report
REPORT No: Lab Job 5090 (reel 4159 location 848); ATL No. 3823s
PAGES: 8
NOTES: This report includes results of eight test borings (25 and 40 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the field study the site was covered by lawn-type grasses. The idealized subsoil profile underlying the site consist of between 3.5 to 6 feet of, nonplastic to low plasticity, very firm silty sands and silty clays. These soils directly overlie very firm to hard tuff.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1975
TITLE: Proposed General Office Building (Bldg. 422)
TYPE: Foundation Investigation Report
REPORT No: ATL No. 3513s; Los Alamos P.). # LY6-32301-1
PAGES:
NOTES: This report includes results of four 15 feet deep test borings, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **dry densities**, **grain-size analysis**, **unconfined compression**, and **Atterberg Limits** tests. The idealized subsoil profile underlying the site consisted of approximately 4.5 feet of medium dense, silty, sandy clays and clayey, silty sands. This soil directly overlies tuff which is relatively weathered near the surface and becomes less weathered with depth.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1975
TITLE: Proposed Technical Support Relocation
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 6925 (reel 6925, location 1348); SHB Job No. E75-1091
PAGES: 23
NOTES: This report includes results of 12 test borings (14.9 to 21 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis, Atterberg Limits** tests, **dry densities,** and **expansion** tests. At the time of the field study the site was covered by native vegetation. The idealized subsoil profile underlying the site consist of approximately 1 to 9 feet of soft to moderately firm silty and clayey sands and sandy clays. This soil directly overlies tuff which is relatively weathered in some locations, but generally very firm to hard with depth. From an engineering standpoint the tuff is very firm to hard.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1975
TITLE: ZIA Office Building Addition (Bldg. 38)
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 4577 (reel 6925 location 1348); SHB Job No. E75-1042
PAGES: 19
NOTES: This report includes results of 3 test borings (29.9 to 41 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the field study the site was covered by asphalt parking. The idealized subsoil profile underlying the site consist of approximately 1 to 2 feet of sandy clays which overlie silty sands with small amounts of broken tuff that extend to between 1 and 10.5 feet below existing grade. This soil directly overlies welded highly weathered tuff.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1974
TITLE: National Security and Resources Study Center (Bldg. 207)
TYPE: Soil and Foundation Investigation Report
REPORT No: Lab Job 3186 (reel 5212, location 1026) SHB Job No. E74-1086
PAGES: 29
NOTES: This report includes results of six 60 feet deep test borings, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture content** determinations, grain-size analysis, **Atterberg Limits** tests, **consolidation**, **expansion** and **direct shear** tests. At the time of the field study the site was covered by asphalt paving. The idealized subsoil profile underlying the site consists of soft to moderately firm silty and clayey sands with lesser amounts of sandy clays between 7 and 14 feet below existing grade. This soil directly overlies relatively weathered tuff that becomes firm to hard with depth.

AUTHOR: McMillan & Associates, Inc.
YEAR: 1970
TITLE: Central Computing Facility Expansion
TYPE: Soil Investigation
REPORT No: Lab Job 3594 (reel 6910, location 746
PAGES:
NOTES: This report includes results of three test borings (18.6 to 18.8 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests. At the time of the field study the site was covered by asphalt paving. The idealized subsoil profile underlying the site consist of 1 to 8.5 feet of silty, clayey sand. This soil directly overlies tuff.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1968
TITLE: Proposed Southeast Addition to Central Computing Facilities, Bldg. 132
TYPE: Soil Investigation
REPORT No: Lab Job 3768 (reel 3745, location 761)
PAGES: 5
NOTES: This report includes results of four test borings (20 to 25 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests, **moisture contents**, **grain-size analysis**, and **dry density** values. The idealized subsoil profile underlying the site consists of 1 to 3.5 feet of loose, sandy and clayey silt. This soil directly overlies tuff.

AUTHOR: (?)
YEAR: (?)
TITLE: Proposed Addition to the Physics Building, SM 40
TYPE: Soil Investigation Report
REPORT No: Lab Job 3071 (reel 898, location 4384)
PAGES: 3
NOTES: This report includes results of four test borings (15 to 30 feet deep). Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests and **moisture contents**. The idealized subsoil profile underlying the site consists of 0 to 12 feet of sandy, silty clay of low to medium plasticity. This soil directly overlies tuff.

AUTHOR: (?)
YEAR: 1964
TITLE: Addition to Administration and Computer Buildings (SM-43 and 132)
TYPE: Boring log graph of test holes
REPORT No: Lab Job 2740 (reel 922, location 672)
PAGES: 2
NOTES: This report includes results of eight test borings (10 to 15 feet deep). Evaluation of engineering properties of the subsurface consisted of **standard penetration** tests and **moisture contents**. The idealized subsoil profile underlying the site consists of 1 to 4.5 feet of sandy, clayey silt. This soil directly overlies tuff.

TECHNICAL AREAS (TA-16)

AUTHOR: SHB AGRA, INC.
YEAR: 1993
TITLE: WETF Shipping & Receiving Addition
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 12012; SHB AGRA Job No. E92-1230
PAGES: 27
NOTES: This report includes results of three test borings (19.5 to 24.9 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of asphalt paving. The subsoils underlying the site consist of 2.5 to 7.5 feet of very soft to very firm, low plasticity, silty sand man-made fill. This surficial soil is underlain by Bandelier Tuff which is hard from an engineering standpoint.

AUTHOR: Pan Am World Services, Inc.
YEAR: 1989
TITLE: W-X 4 Office Building
TYPE: Foundation Investigation Report
REPORT No: Lab Job 9641; SHB AGRA Job No. E92-1230
PAGES: 27
NOTES: This report includes results of five test borings (21 to 41 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content**, **dry density** and **specific gravities** determinations, **grain-size analysis**, **Atterberg Limits**, **direct shear**, **consolidation** tests, and **California Bearing Ratio** tests. At the time of the investigation, the site consisted of asphalt paving. The subsoils underlying the site consist of up to 39.5 feet of sandy clays, clayey silts, sandy silts and silty sands. Tuff was only encountered at a depth of 39.5 feet in Borehole No. 3.

AUTHOR: Pan Am World Services, Inc.
YEAR: 1986
TITLE: Solid Waste Fired Boiler Facility
TYPE: Foundation Investigation Report
REPORT No: Lab Job 7415; W.O. #5-55-0125
PAGES: (?)
NOTES: This report is apparently available from the contract administrator, however, it could not be located.

AUTHOR: FOX Consulting Engineers and Geologists.
YEAR: 1981
TITLE: Tritium Processing Facility
TYPE: Subsoil Investigation
REPORT No: Lab Job 6785 and 6919 (reel 9976, location 14); FOX Job No. 312310803000
PAGES: 18
NOTES: This report includes results of four test borings (17 to 23.5 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **swell-consolidation tests**, **moisture content**, **dry density**, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of natural vegetation. The subsoils underlying the site consist of between 0.7 to 2 feet of sandy organic topsoils and some sand and clay. This surficial soil is underlain by Bandelier Tuff which is weathered near the surface, but becomes harder with depth.

AUTHOR: ATL Engineering Services
YEAR: 1980
TITLE: Proposed D.O.E. Program Support Facility
TYPE: Geotechnical Investigation
REPORT No: Lab Job 6825, 6657, 5823 & 8425 (reel 8898, location 1639); ATL Job No. 3081a
PAGES: 17
NOTES: This report includes results of three 15 foot deep test borings, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content**, **dry density**, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, approximately 3 to 4 feet man-made fill soils exist in the proposed building area. The man-made and natural soils underlying the site consist of between 7 to 9 feet of man-made and natural, very soft to moderately firm, silty, sandy clay, sandy silt, and silty, clayey sand. This surficial soil is underlain by Bandelier Tuff. Beneath the tuff layer is a moderately firm, silty, clayey sand to sandy clay.

AUTHOR: Kistner, Curtis & Wright
YEAR: 1951
TITLE: Service Area-Project "N", TA-16 Phase A Structural Building 16-200 Administration Foundation Plan
TYPE: Architects foundation drawing which includes boring logs and location
REPORT No: Job No. 509 Drawing No. SFA-JR3/11.1, sheet 66 of 144
PAGES: 1 drawing
NOTES: This drawing includes logs of five test borings (50 to 55 feet deep) and foundation plan with boring locations. The boring logs contain lithologic and stratigraphic information only, no geotechnical information is given.

TECHNICAL AREAS (TA-18)

AUTHOR:	Sergent, Hauskins & Beckwith, INC.
YEAR:	1988
TITLE:	Accelerator Development Laboratory TA-18
TYPE:	Geotechnical Investigation Report
REPORT No:	SHB Job No. E88-1071
PAGES:	25
NOTES:	This report includes results of two test borings (41 to 41.8 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis** and **Atterberg Limits** tests. At the time of the investigation, the site consisted of an equipment storage yard. The subsoils underlying the site consist of 5 to 5.5 feet of very soft to soft, nonplastic silty sand that could represent man-made fill. This strata is underlain by a silty to clean sand and gravel to a depth of 15 feet. The surficial soil is underlain by Bandelier Tuff which is hard from an engineering standpoint and in other areas of LANL have yielded strengths from 290 to 2,100 psi. Perched groundwater was encountered at 13.5 to 14 feet.

TECHNICAL AREAS (TA-21)

AUTHOR: FOX Consulting Engineers and Geologists
YEAR: 1982
TITLE: Steam Plant and Parking area, Bldg. 357
TYPE: Subsoil Investigation Report
REPORT No: Lab Job 7060 (reel 9337 location 459); FOX Job No. 0109370
PAGES: 10
NOTES: This report includes results of five test borings (24 to 25 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits**, and **consolidation** tests. At the time of the investigation, the site consisted of an equipment storage yard. The subsoils underlying the site consist of 1 to 2 feet of loose silty sand. Hole No. 1 encountered 4 feet of sandy clay. These surficial soils are underlain by Bandelier Tuff.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1969
TITLE: Dry Box Facility
TYPE: Soil Investigation Report
REPORT No: Lab Job 3973 (reel 2461 location 1193); ATL Job No. 9900
PAGES: 10
NOTES: This report includes results of five test borings (20.3 to 21 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content**, **dry density**, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of an asphalt-covered lot. The subsoils underlying the site consist of 1.5 to 3.5 feet of silty, clayey sand and sandy, clayey silts with broken and weathered pieces of tuff loose silty sand. These surficial soils are underlain by Bandelier Tuff.

AUTHOR: Purtymun, W.D.
YEAR: 1969
TITLE: Geology at disposal area near Bldg. 257, TA-21
TYPE: Memo
REPORT No: Memo to C.W. Christenson; ER Record I.D. #0001978
PAGES: 3
NOTES: This report includes one pit cross-section and a brief discussion of the near-surface geology of the site.

TECHNICAL AREAS (TA-35)

AUTHOR: Pan AM World Services Inc.
YEAR: 1987
TITLE: CPRF Generator at TA-35
TYPE: Geotechnical Report
REPORT No: W.O. #6-5509-44
PAGES: 78
NOTES: This report includes results of four test borings (20 to 22 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils included **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits**, **tri-axial shear** tests, and **ground motion** and **vibration** studies.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1976
TITLE: High Energy Gas Laser Facility
TYPE: Soil and Foundation Investigation Report
REPORT No: SHB Job No. E76-1042
PAGES: 55
NOTES: This report includes results of 15 test borings (20 to 46 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits** and **direct shear** tests.

AUTHOR: Leroy Crandall and Associates
YEAR: 1973
TITLE: Proposed Laser Fusion Laboratory
TYPE: Report of Foundation Investigation
REPORT No: Lab Job 4640 (reel 5361, location 141)
PAGES: 35
NOTES: This report includes results of 21 test pits (4 to 46 10), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include moisture **content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits**, **confined consolidation**, and **direct shear** tests.

TECHNICAL AREAS (TA-41)

AUTHOR: Pan AM World Services, Inc.
YEAR: 1988
TITLE: Replacing Ventilation Systems at TA-41
TYPE: Geotechnical Investigation
REPORT No: W.O. # 6-8403-08
PAGES: 12
NOTES: This report includes results of one 6.5 foot deep test pit. Four different stratum were encountered. The first consists of silty sand with some traces of gravel and extended to a depth of about 1.6 feet. The second consists of clayey silt with some tuff fragments and low plasticity and extended to a depth of 4 feet. A **soils penetrometer** measurement recorded an approximate bearing capacity of 1500 lbs/sq. ft. At 5.5 feet, the third layer consisted of non-plastic to low plasticity clayey sand with traces of gravel, cobbles and tuff fragments. A **soils penetrometer** measurement recorded an approximate bearing capacity of 2000 lbs/sq. ft. At 6.5 feet hard digging was encountered. Large chunks of welded tuff were found. A **soils penetrometer** measurement recorded an approximate bearing capacity of 8000 lbs/sq. ft.

AUTHOR: ATL Engineering Services
YEAR: 1977
TITLE: Proposed New Tritium Facility
TYPE: Geotechnical Investigation
REPORT No: Lab Job 5783 (reel 7024, location 1977); ATL Job No. 6010
PAGES: 12
NOTES: This report includes results of three test borings (20 to 30 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content**, **dry density,** and **grain-size analysis**. The site is located in the bottom of a steep, narrow canyon which contains a small, intermittently flowing stream. The subsoils underlying the site consist of between 3 to 6 feet of talus slope deposits. This surficial soil is underlain by non-welded pumice and ash. Primarily an air-fall deposit, this material is very easy to drill although standard penetration tests show it to be very dense.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1957
TITLE: Engineering and Laboratory Building, TA-41 Buildings W30 and W4-Annex
TYPE: Soil Analysis
REPORT No: Lab Job 1849 (reel 856, location 831); ATL Job No. 4220
PAGES: 7
NOTES: This report includes results of four test borings (30 to 32 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content**, and **grain-size analysis**. The site is located in the bottom of a steep, narrow canyon which contains a small, intermittently flowing stream. The subsoils underlying the site consist for the most part of about 8 feet of surface fill deposits underlain by water-deposited silty gravelly sands of volcanic origin.

TECHNICAL AREAS (TA-46)

AUTHOR:	Sergent, Hauskins & Beckwith
YEAR:	1990
TITLE:	Technical Support Facility
TYPE:	Geotechnical Investigation Report
REPORT No:	Lab Job 10575; SHB Job No. E90-5707
PAGES:	(?)
NOTES:	This report is apparently available from the Contract Administrator, however, it could not be located.

AUTHOR:	Sergent, Hauskins & Beckwith
YEAR:	1990
TITLE:	Advanced Chemical Diagnostics Facility Bldg. 250
TYPE:	Geotechnical Investigation Report
REPORT No:	Lab Job 9079; SHB Job No. E89-1250
PAGES:	22
NOTES:	This report includes results of five test borings (3 to 26 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soil include **standard penetration** tests, **moisture content determinations**, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of unpaved parking with native vegetation. The subsoils underlying the site consists of 2 to 3 feet of fine grain, moderately firm, silty sand, clayey sand and clay. This surficial soil is underlain by Bandelier Tuff which is hard from an engineering standpoint. Unconfined compressive strengths determined from other areas within the lab yielded strengths from 290 to 2,100 psi.

AUTHOR:	ATL Engineering Services
YEAR:	1982
TITLE:	Isotopes Research & Development Lab.
TYPE:	Geotechnical Investigation Report
REPORT No:	Lab Job 5243; ATL Job No. 1289-82
PAGES:	11
NOTES:	This report includes results of two 25 feet deep test borings, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soil include **standard penetration** tests, **moisture content determinations**, **grain-size analysis**, and **Atterberg Limits** tests. The subsoils underlying the site consists of .5 to 1 feet of silty sand with considerable tuff particles. This surficial soil is underlain by fairly competent Bandelier Tuff.

AUTHOR:	ATL Engineering Services
YEAR:	1981
TITLE:	Isotope Facility
TYPE:	Geotechnical Investigation Report
REPORT No:	Lab Job 5243 (reel 6931, location 1225); ATL Job No. 3291
PAGES:	29
NOTES:	This report includes results of 11 test borings (10 to 40 feet deep), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soil include **standard penetration** tests, **moisture content determinations**, **dry densities**, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of native vegetation. The subsoils underlying the site consists of 1 to 4 feet of loose to medium dense silty, clayey sand and moderately firm to firm sandy clay. This surficial soil is underlain by hard Bandelier Tuff.

AUTHOR: ATL Engineering Services
YEAR: 1979
TITLE: Compressor-LIS Building and the Proposed Laser Isotope Enrichment Facility
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job 6507 and 5926 (reel 5499, location 562); ATL Job No. 5069
PAGES: 11
NOTES: This report includes results of three 15 feet deep test borings, laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soil include **standard penetration** tests, **moisture content determinations, dry densities, grain-size analysis, Atterberg Limits** tests, and **modified proctor compaction** tests. At the time of the investigation, the site consisted of native vegetation. The subsoils underlying the site consists of 0 to 2 feet of man-made silty, clayey, gravelly sand fill. This surficial soil is underlain by weathered Bandelier Tuff.

AUTHOR: ZIA Company
YEAR: 1967
TITLE: Proposed New Building WA-89
TYPE: Foundation Investigation
REPORT No: Lab Job 3092 (reel 899, location 3321); ATL Job No. 5069
PAGES: 2
NOTES: This report includes results of three 36 inch diameter test borings. The subsoils underlying the site consists of 3 to 5 feet of man-made fill. This surficial soil is underlain by 2 feet of weathered Bandelier Tuff followed by unweathered tuff.

TECHNICAL AREAS (TA-55)

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1989
TITLE: Nuclear Safeguards Technology Laboratory
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job. 5814; SHB Job No. E89-1138
PAGES: (?)
NOTES: This report is apparently available from the Contract Administrator, however, it could not be located.

AUTHOR: Geo-Test Inc.
YEAR: 1989
TITLE: Special Nuclear Materials R&D Laboratory
TYPE: Geotechnical Investigation Report
REPORT No: Lab Job. 7264 (reel 937 location 1018); Geo-Test Job No. 1-80908
PAGES: 94
NOTES: This report includes results of three 10 borings (28 to 41.5 feet), 16 test pits (6.9 to 10.3 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **seismic refraction** surveys, **Standard Penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits**, **consolidation**, and **unconsolidated-undrained triaxial** tests. At the time of the investigation, some earthwork had been done over the northern portion of the site and the southeastern portion was covered with native vegetation. The subsoils underlying the site consist of up to 8 feet of man-made fill consisting of fine grained silty sand to clayey sandy silt with varying amounts of tuff cobbles and gravel. This fill material overlies 2 to 9 feet of native soil consisting of sandy clay to sandy silt and silty sand. These surficial soils are underlain by moderately welded, and soft to moderately hard Bandelier Tuff and intercalated sandstone.

AUTHOR: Pan AM World Services, Inc.
YEAR: 1987
TITLE: Addition to PF-4 at TA-55
TYPE: Foundation Investigation Report
REPORT No: Lab Job 82 79 (reel 9695 location 2004) W.O. # 5-55-0142
PAGES: 16
NOTES: This report includes results of four test borings (20.2 to 22 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **RQD** determinations, and **unconfined compression** tests. At the time of the investigation, the site was partially paved. The subsoils underlying the site consist of 5.5 to 19 feet of soil and man-made fill. This surficial soil is underlain by Bandelier Tuff.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1986
TITLE: Additions to PF-5, TA-55
TYPE: Geotechnical Investigation Report
REPORT No: SHB Job No. E86-1050
PAGES: 32
NOTES: This report includes results of three test borings (29.8 to 31 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, **Atterberg Limits**, and **consolidation** tests. At the time of the investigation, the site consisted of irrigated lawn on the north and grass and weeds elsewhere. The subsoils underlying the site consist of 9 to 13 feet of silty sand man-made fill which overlies non plastic to low plasticity silty sand to 17 to 18 feet. These surficial soils are underlain by weathered Bandelier Tuff which becomes less weathered and more competent with depth. Tuff cores from other areas at the lab have yielded strengths from 290 to 1,500 psi.

AUTHOR: Zia Company
YEAR: 1986
TITLE: Building PF 5 Expansion at TA-55; MST Training Center
TYPE: Geotechnical Testing Report
REPORT No: Lab Job. 7330 (reel 9990, location 814; also used for Lab Jobs 8185 and 8885)
PAGES: 23
NOTES: This report includes results of eight test borings (20.2 to 31 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, and **unconfined compression** tests. At the time of the investigation, the site was covered with grasses. The subsoils underlying the site consist of 5 to 17.5 feet man-made fill and natural soil. These surficial soils are underlain by weathered Bandelier Tuff.

AUTHOR: Sergent, Hauskins & Beckwith
YEAR: 1984
TITLE: Nuclear Materials Storage Facility
TYPE: Sub-surface Exploration Data
REPORT No: Lab Job. 6481; SHB Job No. E84-1044
PAGES: 26
NOTES: This partial report includes results of 24 test borings (4.9 to 39.6 feet). Engineering properties of the subsurface soils include **standard penetration** testing, and **moisture content** determinations. The subsoils underlying the site consist of 0 to 7 feet of low plasticity clayey sand. This surficial soil is underlain by weathered Bandelier Tuff.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1980
TITLE: Proposed Nuclear Materials Building PF-28
TYPE: Sub-surface Exploration Data
REPORT No: Lab Job. 5983 (reel 7641, location 1869)
PAGES: 6
NOTES: This partial report includes results of two test borings (29.8 to 31 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, and **Atterberg Limits** tests. The subsoils underlying the site consist of 6 to 11.5 feet of clay, sand, and silt with tuff fragments. Possibly man-made fill to about 3 feet in depth. These surficial soils are underlain by weathered Bandelier Tuff which becomes less weathered and more competent with depth.

AUTHOR: Albuquerque Testing Laboratory
YEAR: 1974
TITLE: Transuranic Treatment Development Facility
TYPE: Foundation Investigation Report
REPORT No: ATL Job No. 6214
PAGES: 7
NOTES: This report includes results of two test borings (25 to 30 feet), laboratory analyses, and recommended criteria for foundation design and slab support. Evaluation of engineering properties of the subsurface soils include **standard penetration** testing, **moisture content** and **dry density** determinations, **grain-size analysis**, and **Atterberg Limits** tests. At the time of the investigation, the site consisted of asphalt paving. The subsoils underlying the site consist of 10 to 13.5 feet of relatively loose sandy, clayey silts; clayey, silty sands and weathered, broken tuff rock. This surficial soil is underlain by porous welded Bandelier Tuff which is hard from an engineering standpoint.

TEST HOLES, CORE HOLES, AND WATER WELLS

AUTHOR: Broxton et al.
YEAR: 1993
TITLE: Preliminary drilling results for boreholes LADP-3 and LADP-4 at Technical Area 21, Los Alamos National Laboratory, New Mexico
TYPE: Unpublished LANL report
REPORT No:
PAGES: 17
NOTES: This report discusses the subsurface geology of TA-21 resulting from two boreholes drilled to identify potential transport pathways in the vadose zone and to characterize vertical and lateral variations in the geohydrologic properties.

AUTHOR: Broxton et al.
YEAR: 1993
TITLE: Stratigraphy, petrography, and mineralogy of tuffs at Technical Area 21, Los Alamos National Laboratory, New Mexico
TYPE: In preparation for inclusion in LA-MS report
REPORT No: LAUR93-2029 (in press)
PAGES: 31
NOTES: This report discusses the development of conceptual models for the hydrogeology of TA-21, evaluation of potential transport pathways and processes, and provides bounds on parameters used in models to evaluate the migration of water and contaminants.

AUTHOR: Budding, A. J. and Beers, C. A.
YEAR: 1973
TITLE: Faults in the Los Alamos area and their relation to seismicity
TYPE:
REPORT No: ER Record I.D.# 0008421
PAGES: 14
NOTES: This report discusses how fault lengths and displacement were determined from areal photographs and then used to estimate the seismicity of LANL area.

AUTHOR: Cooper, J.B., Purtymun, W.D. and John, E.C.
YEAR: 1965
TITLE: Records of water-supply wells Guaje Canyon 6, Pajarito Mesa 1 and 2
TYPE: Basic Data Report
REPORT No: ER Record I.D. # 0008582
PAGES: 15
NOTES: This Appendix includes descriptive logs of drill cuttings for wells Guaje Canyon 6 and Pajarito Mesa 1 and 2.

AUTHOR: Gardner, J. N., et al.
YEAR: 1993
TITLE: Geology, Drilling, and some Hydrologic Aspects of Seismic Hazards Program Core Holes, Los Alamos National Laboratory, New Mexico
TYPE: Lab Report
REPORT No: LA-12460-MS
PAGES: 19
NOTES: This report contains lithologies, general aspects of drilling, and some hydrologic implications of the core holes advanced as part of the on going seismic evaluation of LANL. Locations include TA-16, TA-3, TA-18, and TA-55.

AUTHOR: Gordon Herkenoff & Associates, Inc.
YEAR: 1982
TITLE: Control System Methodology Phase V of Water System Upgrading Project
TYPE: Title II Report
REPORT No: Lab Job 5785 (reel 8676, location 1502)
PAGES: 12
NOTES: This report includes a description and map of the LANL water systems including the Guaje Canyon, Los Alamos Canyon, Pajarito Mesa well fields.

AUTHOR: John, E.C., Enyart, E., and Purtymun, W.D.
YEAR: 1967
TITLE: Records of wells, test holes, springs and surface-water stations in the Los Alamos area New Mexico
TYPE: U.S.G.S. Open File Report
REPORT No: Lab Job 3274 (reel 8964, location 537)
PAGES: 125
NOTES: This report is a compilation and summarization of the geologic and hydrologic data on all wells, test holes, springs, and surface-water sampling points collected to date in the Los Alamos area.

AUTHOR: Krier, D.
YEAR: 1990
TITLE: TA-55 Seismic Hazards Study: Geologic Cross Sections
TYPE: Memo to Jamie Gardner
REPORT No: Document No. EES1-SH 90-15; ER Record I.D.# 0021543
PAGES: 6
NOTES: This memo includes three new geologic cross sections through the Pajarito Plateau showing significant subsurface stratigraphic separation along the Rendija Canyon and Guaje Mountain faults based on subsurface information provided by logs from Test holes TW-4, TW-8, TW-2, H-19, PM-2 and HH (EGH-LA-1).

AUTHOR: Purtymun, W.D.
YEAR: 1993
TITLE: Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations at Los Alamos; with Reference to the Geology and Hydrology
TYPE: Draft Manuscript
REPORT No:
PAGES: 378
NOTES: This manuscript summarizes a substantial body of work on the geology and hydrology of the Los Alamos area. It includes the location and logs of test holes, wells, observation wells, core holes and moisture access holes.

AUTHOR: Purtymun, W. D.
YEAR: 1987
TITLE: Geologic Data, TA-21
TYPE: Memo to Thomas C. Gunderson
REPORT No: ER Record I.D.# 0001790
PAGES: 3
NOTES: This report includes a discussion and cross section of the subsurface geology at TA-21 based on boring data from test well TW-3.

AUTHOR: Purtymun, W. D., and Kennedy, W. R.
YEAR: 1971
TITLE: Geology and Hydrology of Mesita del Buey
TYPE: Lab Report
REPORT No: LA-4660
PAGES: 8
NOTES: This report includes a discussion of subsurface geology including geologic cross sections based on boring data from well PM-2 and test wells T-6 and T-5.

AUTHOR: Weir, J. E., Jr., and Purtymun, W.D.
YEAR: 1962
TITLE: Geology and hydrology of Technical Area 49, Frijoles Mesa, Los Alamos County, New Mexico
TYPE: Draft Manuscript
REPORT No: For administration release only to the Atomic Energy Commission
PAGES: 225
NOTES: This manuscript summarizes a study of the possible contamination of ground water by radioactive wastes. It includes a discussion of the local geologic and hydrologic setting as well as drill logs and related discussion from deep test holes DT 5, 5A, 5P, 9, 10, and core holes CH 1,2,3, and 4.

AUTHOR:
YEAR: 1955 and 1963
TITLE: Geology and Pumping Tests of Guaje Canyon Wells
TYPE: Lab Report
REPORT No: ER Record I.D. 0011891
PAGES: 6 and 39
NOTES: These two reports includes a description of drill cuttings from Guaje Canyon supply wells G-1A, G-1, G-2, G-3, G-4 and G-5.

AUTHOR:
YEAR: 1963
TITLE: Geology and Pumping Tests of Los Alamos Canyon Wells
TYPE: Lab Report
REPORT No: Reel 8676, location 1405
PAGES: 11
NOTES: This report includes a description of drill cuttings from Los Alamos Canyon supply wells LA-1 through LA-6.

AUTHOR:
YEAR: 1963
TITLE: Logs, Casing Schedules and Initial Pumping Tests, Guaje Valley Wells
TYPE: Appendix E
REPORT No: (reel 8676, location 1430)
PAGES: 40
NOTES: This appendix includes geologist's logs for Guaje Mountain Wells G1-G5.

AUTHOR:
YEAR: 1963
TITLE: Logs, Casing Schedules and Initial Pumping Tests, LA Canyon Well Field
TYPE: Appendix C
REPORT No: (reel 8676, location 1405)
PAGES: 11
NOTES: This appendix includes geologist's logs for LA Canyon Wells LA-1-LA-6.

AUTHOR:
YEAR:
TITLE: Los Alamos Alternate Energy Hole Sigma Mesa
TYPE:
REPORT No:
PAGES: 5
NOTES: These pages contain no text, however, one figure contains a simplified log of the Sigma Mesa (HH) hole.

GEOPHYSICAL

AUTHOR: Begay, S.K.
YEAR: 1990
TITLE: Omega West Reactor Seismic Analysis Report
TYPE: Engineering Report
REPORT No: Lab Job 10820
PAGES: 120
NOTES: This report is a synopsis of the seismic analysis study of the Omega West Reactor using a finite element computer program. This report also includes a previous seismic investigation conducted by Donham and Keller dated October 10, 1970.

AUTHOR: Budding, A. J.
YEAR: 1978
TITLE: Gravity Survey of the Pajarito Plateau Los Alamos and Santa Fe Counties, New Mexico
TYPE: LA Report
REPORT No: LA-7419-MS; ER Record I.D. # 0011657
PAGES: 38
NOTES: This report merges seismic reflection, gravity data and computer modeling to profile subsurface stratigraphy beneath the Pajarito Plateau.

AUTHOR: Newton, C. A., et al.
YEAR: 1978
TITLE: LASL Seismic Programs in the Vicinity of Los Alamos, New Mexico
TYPE: LA Report
REPORT No: UC-11; ER Record I.D. # 0005563
PAGES: 42
NOTES: This report discusses contemporary tectonic activity near the Valles Caldera and the Rio Grande Rift by monitoring a network of 12 short period seismic stations within 150 km of LA.

AUTHOR: Keller, M. D., et al.
YEAR: 1969
TITLE: Ground Vibration Characteristics of Mesita de Los Alamos
TYPE: Engineering Report
REPORT No: ER Record I.D. # 0005793
PAGES: 12
NOTES: This report discusses the results of a gravity survey which suggests a NNE-trending graben may exist beneath the Pajarito Plateau. This investigation combines gravity and borehole data to develop geologic cross sections beneath the Pajarito Plateau. Boring data included wells PM-2, PM-3, G-1, LA4, and test hole H-19.

AUTHOR: Keller, M. D.
YEAR: 1968
TITLE: Geologic Studies and Material Properties Investigations of Mesita de Los Alamos
TYPE: LANL Report
REPORT No: LA-3728
PAGES: 49
NOTES: This report discusses investigations conducted to verify the competence of foundation material for the Meson Physics Facility at TA-53. These investigation included geologic history, seismic probability, physical characteristics, and deformation characteristics.

AUTHOR:	Keller, M. D.
YEAR:	1968
TITLE:	Deformation Characteristics of the Bandelier Tuff
TYPE:	LANL Engineering Report
REPORT No:	ENG-1-Rp-2
PAGES:	49
NOTES:	This report discusses investigations conducted to quantify the load bearing qualities of the Bandelier tuff beneath the proposed Meson Physics Facility at TA-53. These investigations included a determination of the relationship of deformation to stress and to distance from a loaded area and the change in deformation through time.

AUTHOR:	Reynolds C. B.
YEAR:	
TITLE:	Experimental Shallow Seismic Reflection Survey Los Alamos Area, New Mexico
TYPE:	LA Report
REPORT No:	ER Record I.D. # 0011852
PAGES:	23
NOTES:	This report discusses the results from an experimental seismic reflection survey from four seismic lines located at TA-49, TA-44, Los Alamos Canyon, and State Road 4 near TA-16.

AUTHOR:	Williams, L.M.
YEAR:	1979
TITLE:	Gravity Survey of the Los Alamos Area, New Mexico
TYPE:	LA Report
REPORT No:	LA-8154-MS; ER Record I.D. # 0005959
PAGES:	16
NOTES:	This report discusses investigations conducted to evaluate physical properties.

AUTHOR:	
YEAR:	
TITLE:	Seismic and Geological Reports on Mesita de Los Alamos
TYPE:	Lab Report
REPORT No:	Lab Job. 3274
PAGES:	180
NOTES:	This report consists of five reports: 1) Study of the Possibility of Seismic Hazards in the Vicinity of Los Alamos, New Mexico by Willden, R. and Cariley E.E., 2) Ground Vibration Characteristics of Mesita de Los Alamos by Keller, M. D. et al., 3) Deformation Characteristics of the Bandelier Tuff by Keller, M. D., 4) Geology and Physical Properties of the Near Surface Rocks at Mesita de Los Alamos by Purtymun, W. D., and 5) Response of the Mesita de Los Alamos to the Gasbuggy Experiment and Induced Vibrations by Mickey, W.V. et al. The Gasbuggy experiment involved the detonation of a 26 kt device 123.5 km northwest of Los Alamos at the bottom of a 4,250 deep gas well to test the feasibility of stimulating gas production from formations of low permeability. The objective of the Coast Survey at the Mesita de Los Alamos was to measure ground motions from the experiment.

SOILS

AUTHOR: Abeele, W. V.
YEAR: 1984
TITLE: Geotechnical Aspects of Hackroy Sandy Loam and Crushed Tuff
TYPE: LANL Report
REPORT No: LA-9916-MS
PAGES: 20
NOTES: This Report concentrates on consolidation and shear stress of the Hackroy Sandy Loam, the soil that is mapped as mantling most of the mesa tops within LANL.

AUTHOR: Nyhan, J. W. et al.
YEAR: 1978
TITLE: Soil Survey of Los Alamos County, New Mexico
TYPE: LANL Report
REPORT No: LA-6779-MS
PAGES: 113
NOTES: This report covers an intensive soil survey of about 79% of Los Alamos County. It contains maps and general information about soils and their formation as well as detailed descriptions and classification of soils of the area according to the current system of soil classification.

APPENDIX L
EMPIRICAL ATTENUATION RELATIONSHIPS

APPENDIX L
EMPIRICAL ATTENUATION RELATIONSHIPS

In this appendix, the empirical attenuation relationships used in both the deterministic and probabilistic ground motion estimates are described and the equations are presented.

Joyner and Boore (1988)

Joyner and Boore developed attenuation relationships for peak acceleration (1981) and response spectral values (1982) based on the available data at that time. Subsequently, Joyner and Fumal (1985) developed modified factors for soil sites based on the measured shear wave velocities. Joyner and Boore (1988) summarized these and other relationships. The equation is of the form:

$$\log y = a + b(M\text{-}6) + c(M\text{-}6)^2 + d \log r + k\, r + s$$

$$5.0 \le M \le 7.7$$

$$r = (r_0^{\,2} + h^2)^{1/2}$$

where y is the peak acceleration (g) or pseudo-velocity response (cm/sec), M is M_w, r_0 is the shortest distance (km) from the recording site to the vertical projection of the earthquake rupture plane on the earth's surface, and *a, b, c, d, k, s, and h* are coefficients given in the table below for the randomly oriented horizontal component. The *s* factor represents the soil conditions and is multiplied by 0 for rock and 1 for deep soil. An alternative *s* factor can be found based on the shear wave velocity profile of the site. For peak acceleration, *s* is equal to 0 because Joyner and Boore found no statistically significant differences between rock and soil sites.

In this study, we are using the relationships for the randomly oriented horizontal component. They have also developed relationships for the larger of the two horizontal components. For the sites classified as soil sites, we used the standard soil factors, *s*, to calculate response spectra instead of the Joyner and Fumal (1985) factors based on the shear wave velocities.

Period (sec)	*a*	*b*	*c*	*h* (km)	*d*	*k*	*s*	σ
Peak Acceleration	0.43	0.23	0.00	8.0	-1.0	-0.0027	0.0	0.28
0.10	2.16	0.25	-0.06	11.3	-1.0	-0.0073	-0.02	0.28
0.15	2.40	0.30	-0.08	10.8	-1.0	-0.0067	-0.02	0.28
0.20	2.46	0.35	-0.09	9.6	-1.0	-0.0063	-0.01	0.28
0.30	2.47	0.42	-0.11	6.9	-1.0	-0.0058	0.04	0.28
0.40	2.44	0.47	-0.13	5.7	-1.0	-0.0054	0.10	0.31
0.50	2.41	0.52	-0.14	5.1	-1.0	-0.0051	0.14	0.33
0.75	2.34	0.60	-0.16	4.8	-1.0	-0.0045	0.23	0.33
1.00	2.28	0.67	-0.17	4.7	-1.0	-0.0039	0.27	0.33
1.50	2.19	0.74	-0.19	4.7	-1.0	-0.0026	0.31	0.33
2.00	2.12	0.79	-0.20	4.7	-1.0	-0.0015	0.32	0.33
3.00	2.02	0.85	-0.22	4.7	-0.98	0	0.32	0.33
4.00	1.96	0.88	-0.24	4.7	-0.95	0	0.29	0.33

Sadigh et al. (1987)

Sadigh et al. (1987) developed attenuation relationships for soil and rock sites. These relationships are presented in Youngs et al. (1987) and in Joyner and Boore (1988). For this study, we are using the soil relationships which have the following form of equation.

$$\ln y = a + 1.1\ M + c_1\ (8.5 - M)^{2.5} - 1.75\ \ln[R + h_1\ \exp(h_2\ M)]$$

where y is the peak acceleration or response spectral accelerations in g's, M is M_w, R is the closest distance (km) to the rupture surface, and a, c_1, h_1, h_2, and $\sigma_{\ln y}$ are coefficients given in the following table. The values of $\sigma_{\ln y}$ are taken from Sadigh et al. (1991) generally referred to as the CALTRANS relationship.

Period (sec)	a	c_1	M < 6.5		M > 6.5		
			h_1	h_2	h_1	h_2	$\sigma_{\ln y}$
Peak Acceleration	-2.611	0	0.8217	0.4814	0.3157	0.6286	1.39-0.14*M; 0.38 for M≥7.25
0.1	-2.024	0.007	0.8217	0.4814	0.3157	0.6286	1.41-0.14*M; 0.40 for M≥7.25
0.2	-1.696	0	0.8217	0.4814	0.3157	0.6286	1.43-0.14*M; 0.42 for M≥7.25
0.3	-1.638	-0.008	0.8217	0.4814	0.3157	0.6286	1.45-0.14*M; 0.44 for M≥7.25
0.5	-1.659	-0.025	0.8217	0.4814	0.3157	0.6286	1.50-0.14*M; 0.49 for M≥7.25
1.0	-1.975	-0.060	0.8217	0.4814	0.3157	0.6286	1.53-0.14*M; 0.52 for M≥7.25
2.0	-2.414	-0.105	0.8217	0.4814	0.3157	0.6286	1.53-0.14*M; 0.52 for M≥7.25
4.0	-3.068	-0.160	0.8217	0.4814	0.3157	0.6286	1.53-0.14*M; 0.52 for M≥7.25

Campbell (1993)

Campbell has produced a number of attenuation relationships over the last 10 to 15 years, continually updating his relationships as more recorded data becomes available. To compute response spectra, Campbell (EQE, personal communication, 1994) recommends the use of the peak acceleration relationship found in Campbell and Bozorgnia (1994) and the spectral acceleration relationship in Campbell (1989) for alluvium and soft rock sites. The former is given by the expression:

$$\begin{aligned}\ln(PGA) = & -3.512 + 0.904M - 1.328\ln\sqrt{R_s^2+[0.149\exp(0.647M)]^2} \\ & +[1.125-0.112\ln(R_s) - 0.0957M]F \\ & +[0.440-0.171\ln(R_s)]S_{sr}+[0.405 - 0.222\ln(R_s)]S_{hr}+\varepsilon\end{aligned}$$

where PGA is the geometric mean of the two horizontal components of peak ground acceleration (g); M is M_w; R_s is the closest distance to seismogenic rupture on the fault (km); $F = 0$ for strike-slip and normal faulting earthquakes and 1 for reverse, reverse-oblique, and thrust faulting earthquakes; $S_{sr} = 1$ for soft-rock sites, $S_{hr} = 1$ for hard-rock sites, and $S_{sr} = S_{hr} = 0$ for alluvial sites; and ε is a random error term with zero mean and standard deviation equal to $\sigma_{\ln(PGA)}$, the standard error of estimate of ln(PGA).

The relationship for the spectral ordinates:

$$\ln Y = a + bM + d\ln\left[R + c_1 \exp(c_2 M)\right] + eF$$

$$+ f_1 \tanh\left[f_2(M + f_3)\right] + g_1 \tanh(g_2 D) + \sum_{i=1}^{3} h_i K_i + \varepsilon$$

where M is M_L for $M < 6.0$ and M_s for $M \geq 6.0$; R is distance to seismogenic rupture in km; F is a parameter representing the style of faulting [$F = 0$ for strike-slip faults, $F = 1$ for reverse, reverse-oblique, thrust, and thrust-oblique faults]; D is depth to basement rock (sediment depth) in km; K_i is a parameter representing building effects ($K_1 = 1$ for embedded buildings 3-11 stories in height, $K_2 = 1$ for embedded buildings greater than 11 stories in height, $K_3 = 1$ for nonembedded buildings greater than 2 stories in height, $K_1 = K_2 = K_3 = 0$ for all other recording sites); ε is a random error term with a mean of zero and a standard deviation of σ, the standard error of regression; tanh (*) is the hyperbolic tangent function; and a, b, ..., h_i are the regression coefficients. The following coefficients are for pseudo-relative spectral velocity (PRV). Pseudo-spectral accelerations (PSA) can be obtained using the equation PSA = 2π PRV/981T where PSA is in g's, PRV is in cm/sec, and T is period.

Period (sec)	a	b	c_1	c_2	d	e	f_1	f_2	f_3	g_1	g_2	σ
0.04	-0.648	1.08	0.311	0.597	-1.81	0.382						0.42
0.05	-0.379	1.08	0.311	0.597	-1.81	0.382						0.44
0.075	0.251	1.08	0.311	0.597	-1.81	0.382						0.46
0.10	0.754	1.08	0.311	0.597	-1.81	0.382						0.48
0.15	1.424	1.08	0.311	0.597	-1.81	0.382						0.50

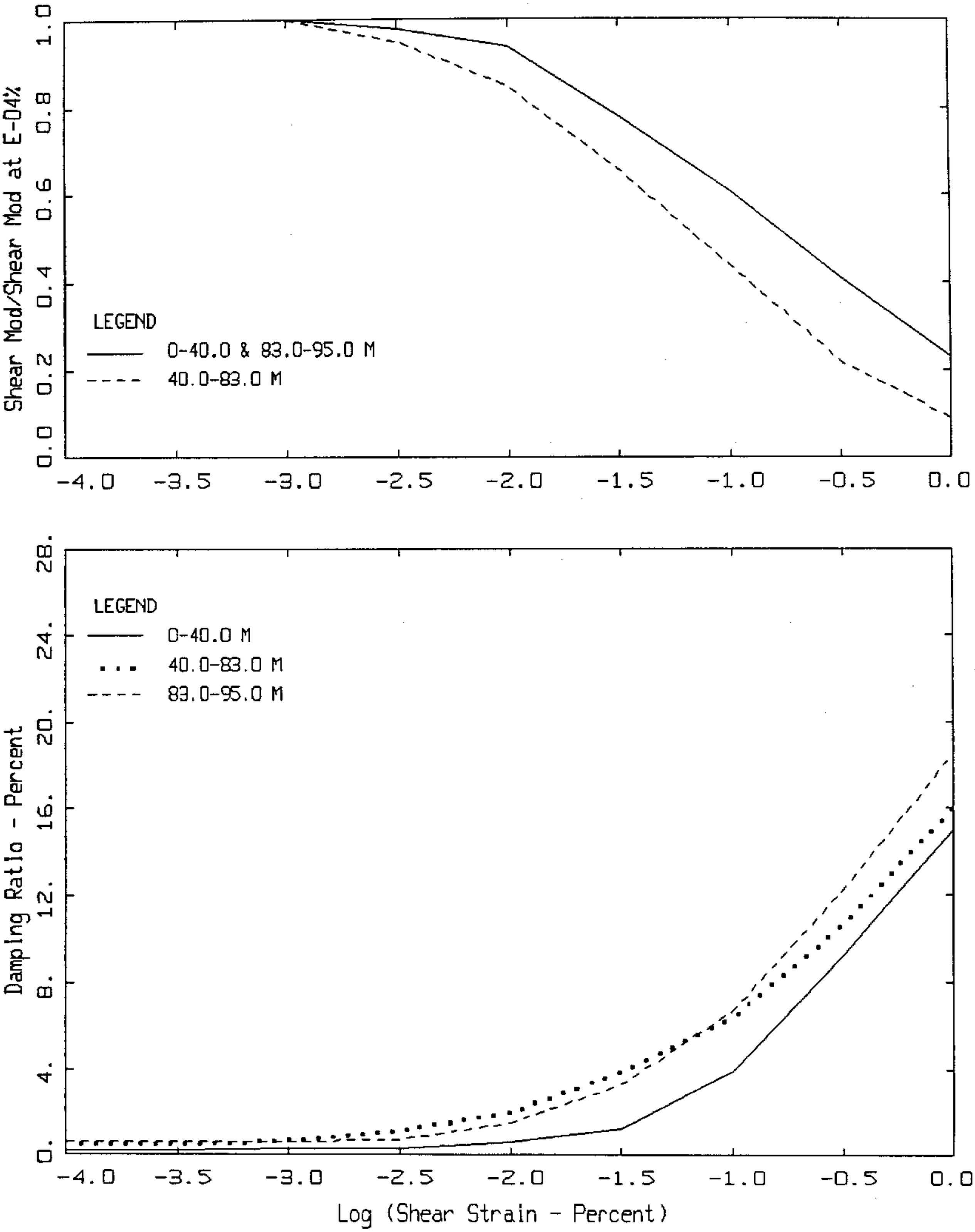
Period (sec)	a	b	c_1	c_2	d	e	f_1	f_2	f_3	g_1	g_2	σ
0.20	1.788	1.08	0.311	0.597	-1.81	0.382						0.50
0.30	2.170	1.08	0.311	0.597	-1.81	0.382						0.50
0.40	2.009	1.08	0.311	0.597	-1.81	0.382	0.425	0.570	-4.7			0.50
0.50	1.930	1.08	0.311	0.597	-1.81	0.382	0.685	0.570	-4.7			0.50
0.75	1.612	1.08	0.311	0.597	-1.81	0.382	1.27	0.570	-4.7			0.50
1.0	1.268	1.08	0.311	0.597	-1.81	0.382	1.74	0.570	-4.7			0.50
1.5	0.487	1.08	0.311	0.597	-1.81	0.382	2.43	0.570	-4.7	0.344	0.553	0.50
2.0	0.040	1.08	0.311	0.597	-1.81	0.382	2.83	0.570	-4.7	0.469	0.553	0.50
3.0	-0.576	1.08	0.311	0.597	-1.81	0.382	3.17	0.570	-4.7	0.623	0.553	0.50
4.0	-0.766	1.08	0.311	0.597	-1.81	0.382	3.08	0.570	-4.7	0.857	0.553	0.50

For the normal faults in the LANL region, we set the F parameter equal to the strike-slip value of zero. Campbell (1993) recommends "for normal faults and faults whose style of faulting is unknown, F can be assumed to be 0.5, intermediate between strike-slip and reverse faulting." However, we believe that the motions from normal faults are more likely to be similar or even lower than strike-slip faults than reverse faults due to the smaller stress drops, and thus are using F equal to zero for our analyses.

The depth to the bottom of the Guaje Pumice layer is used as the depth of sediments. As discussed in Section 6, the shear wave velocities are substantially higher for the materials below this depth. A seismogenic depth of 2 km is used for evaluating the distance to the seismogenic rupture.

APPENDIX M

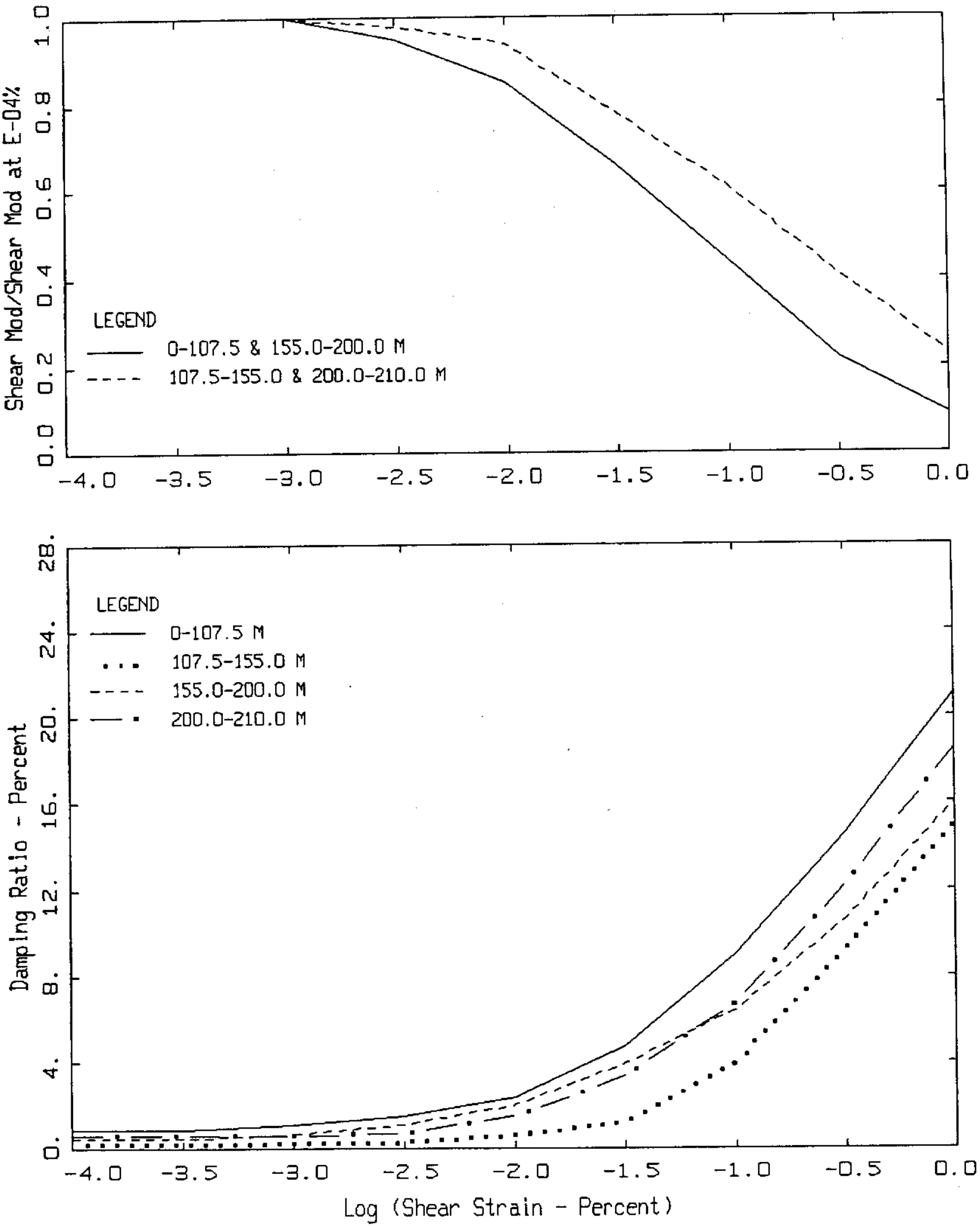
SHEAR MODULUS REDUCTION AND DAMPING CURVES



Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-2 AND TA-41	Figure M-1
Woodward-Clyde Federal Services			

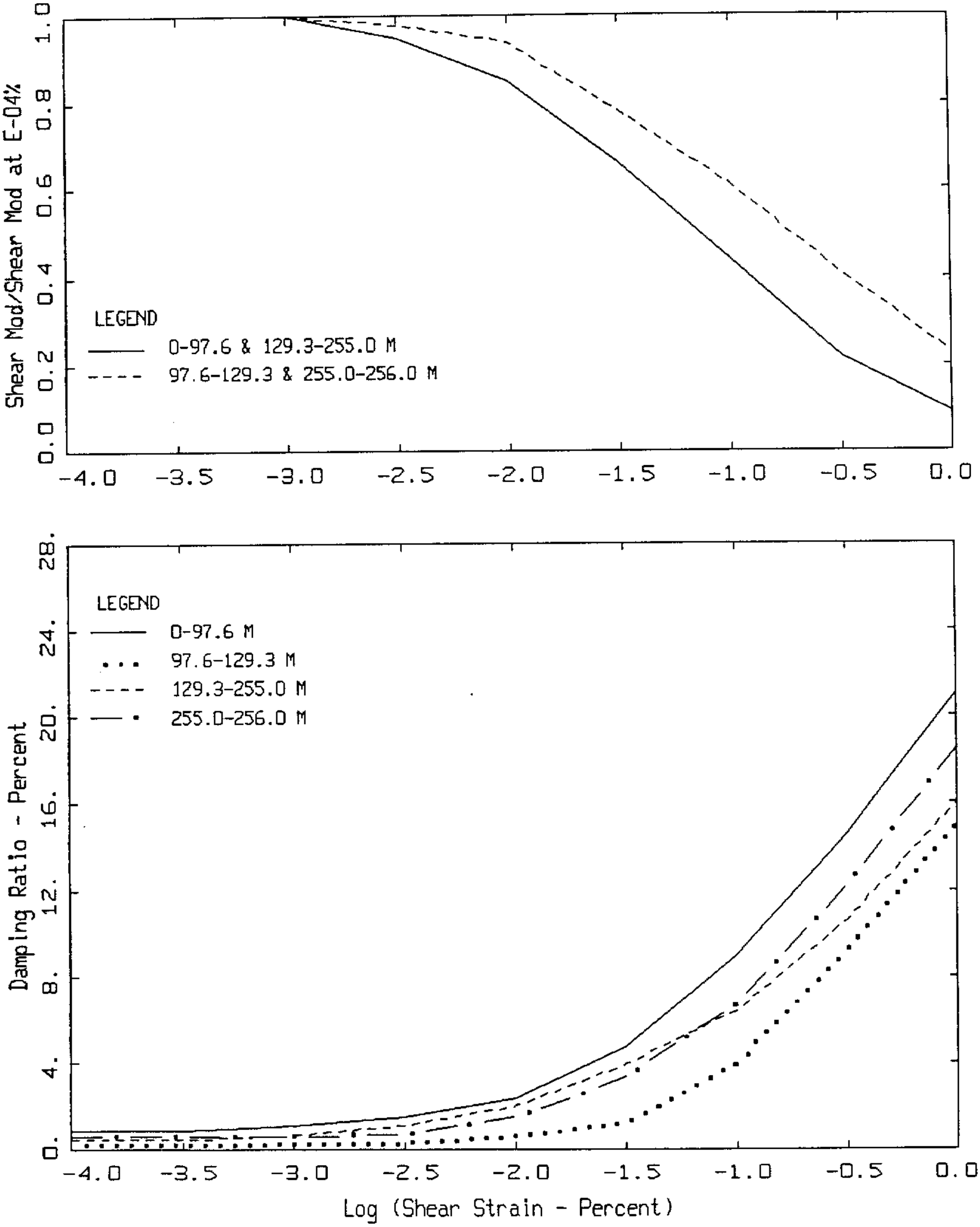
91C0509A-1300/052993



Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-3	Figure M-2
Woodward-Clyde Federal Services			

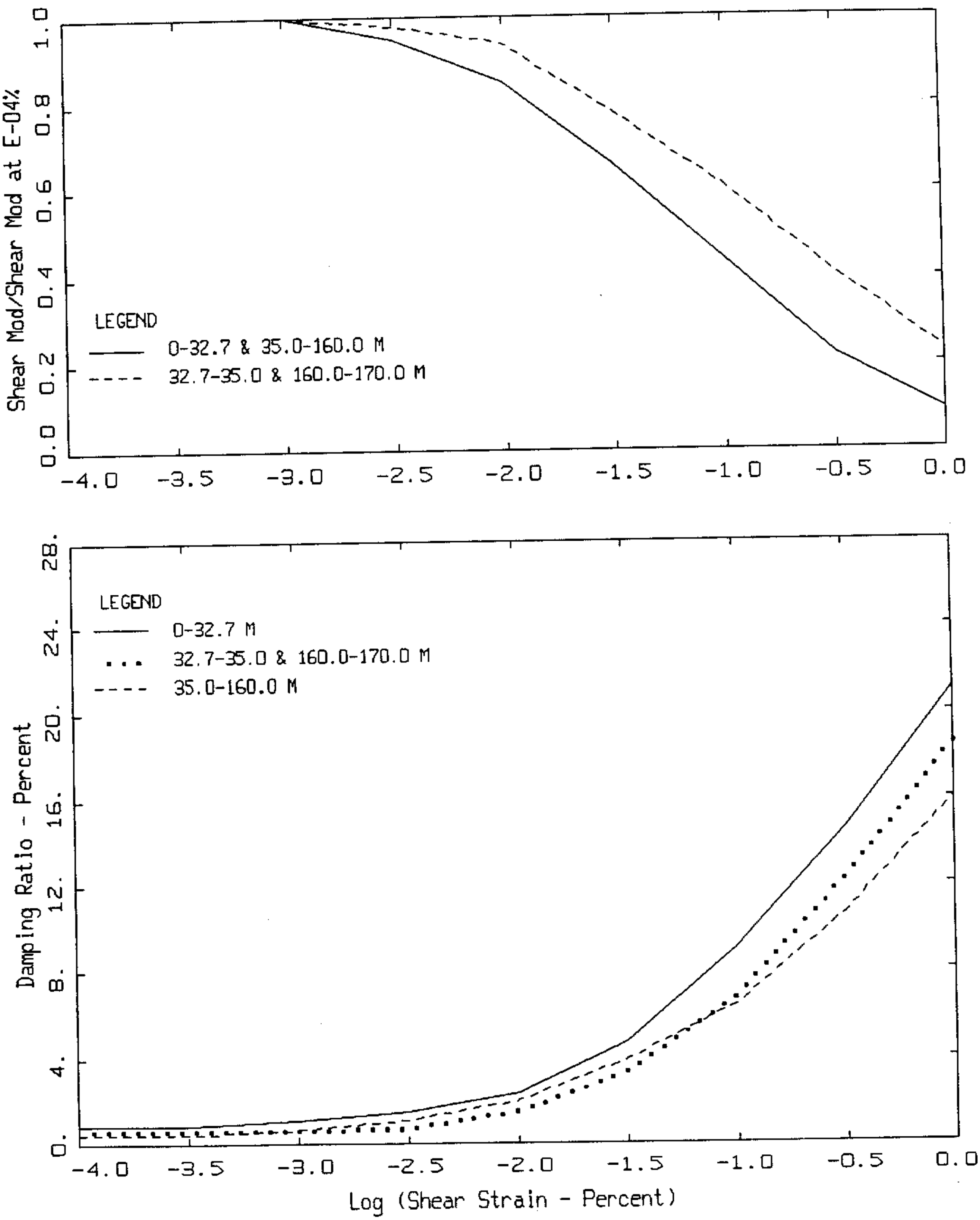
91C0509A-1300/052993



Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-16	Figure M-3
Woodward-Clyde Federal Services			

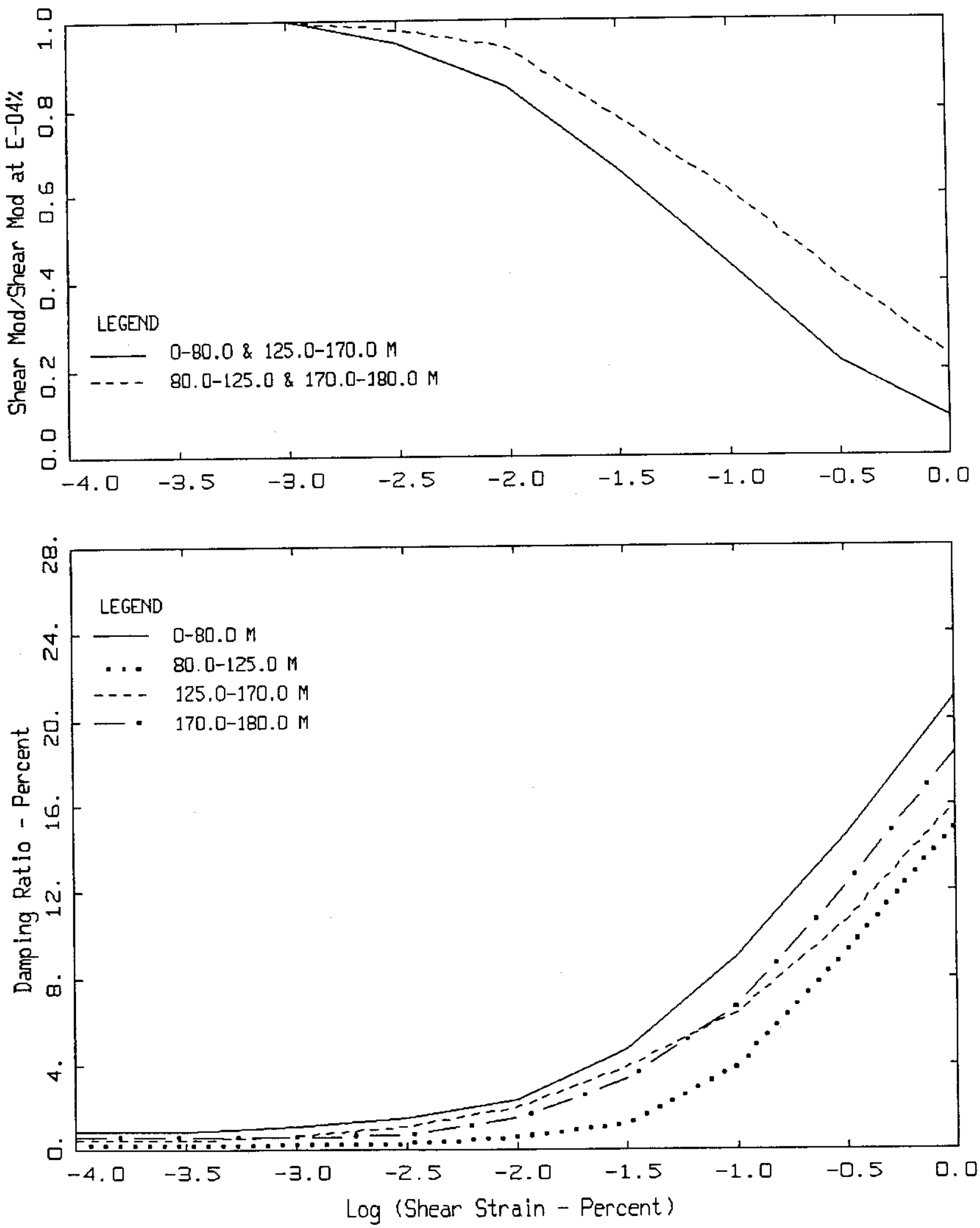
91C0509A-1300/052993



Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-18	Figure M-4
Woodward-Clyde Federal Services			

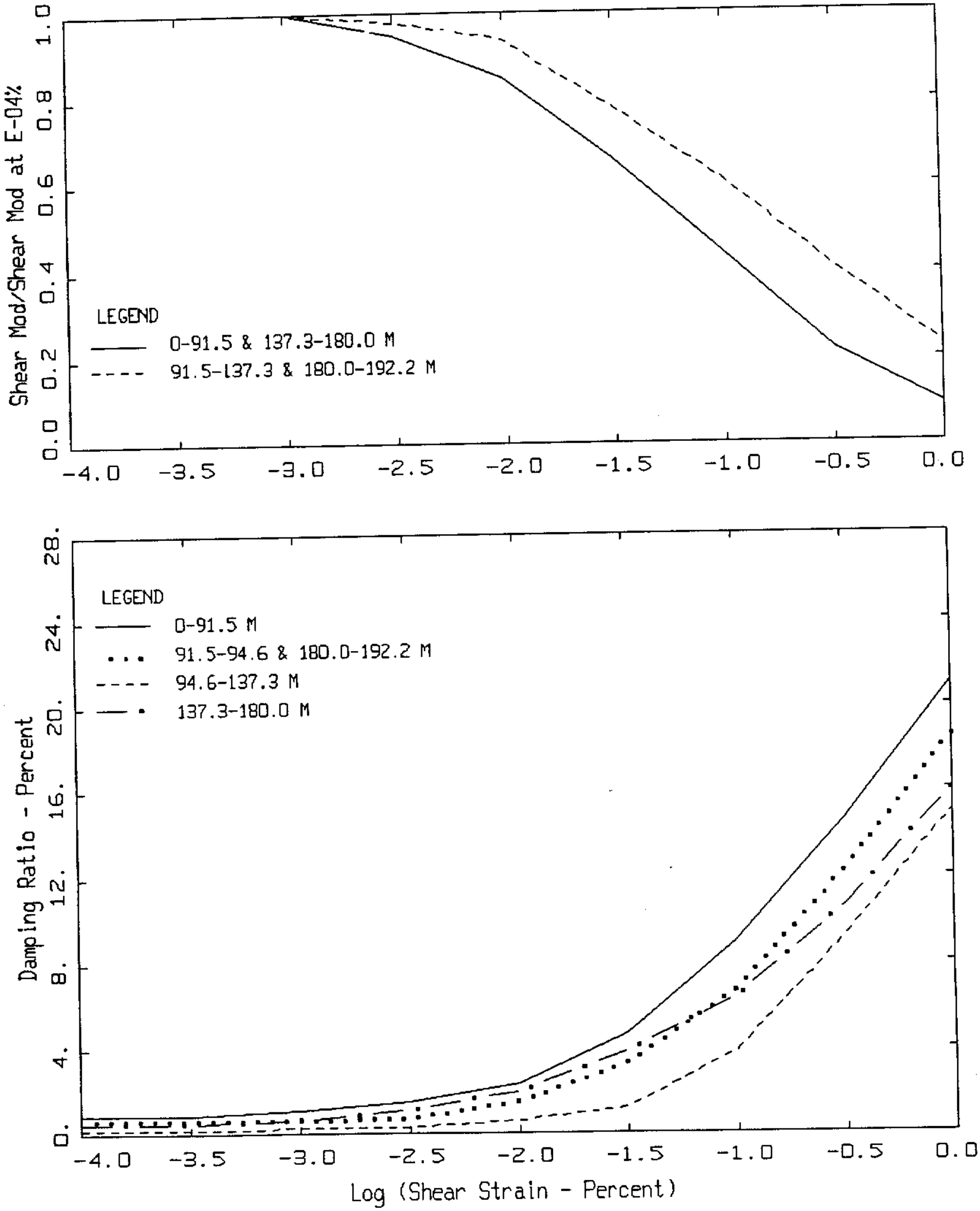
91C0509A-1300/052993



Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-21 AND TA-46	Figure M-5
Woodward-Clyde Federal Services			

91C0509A-1300/052993



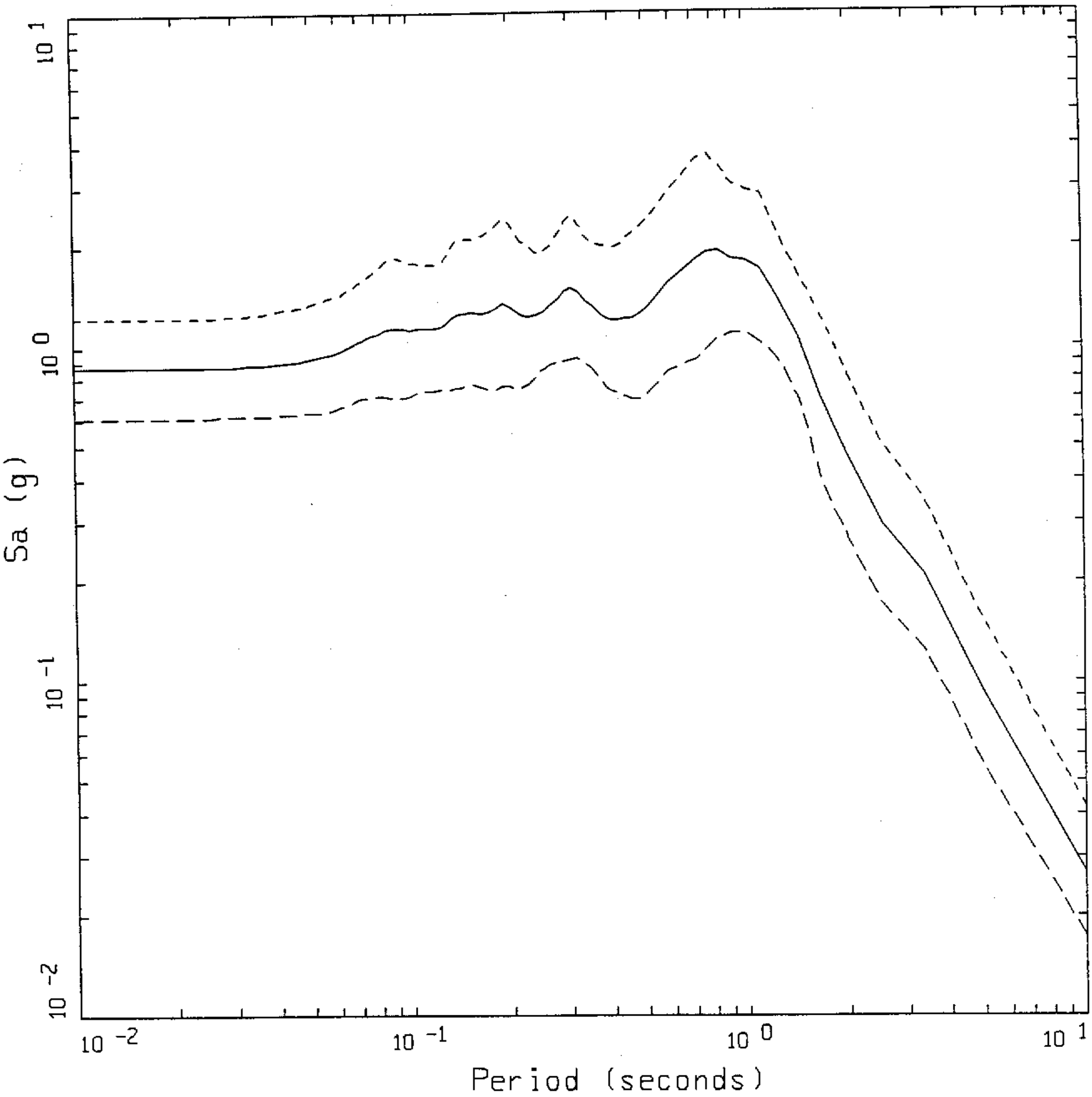
Source: Modified from Stokoe et al. (1993)

Project No. 91C0509	Los Alamos Seismic Hazards	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR TA-55	Figure M-6
Woodward-Clyde Federal Services			

91C0509A-1300/052993

APPENDIX N

STOCHASTIC ATTENUATION RESPONSE SPECTRA - VARIATION OF PARAMETERS



LEGEND

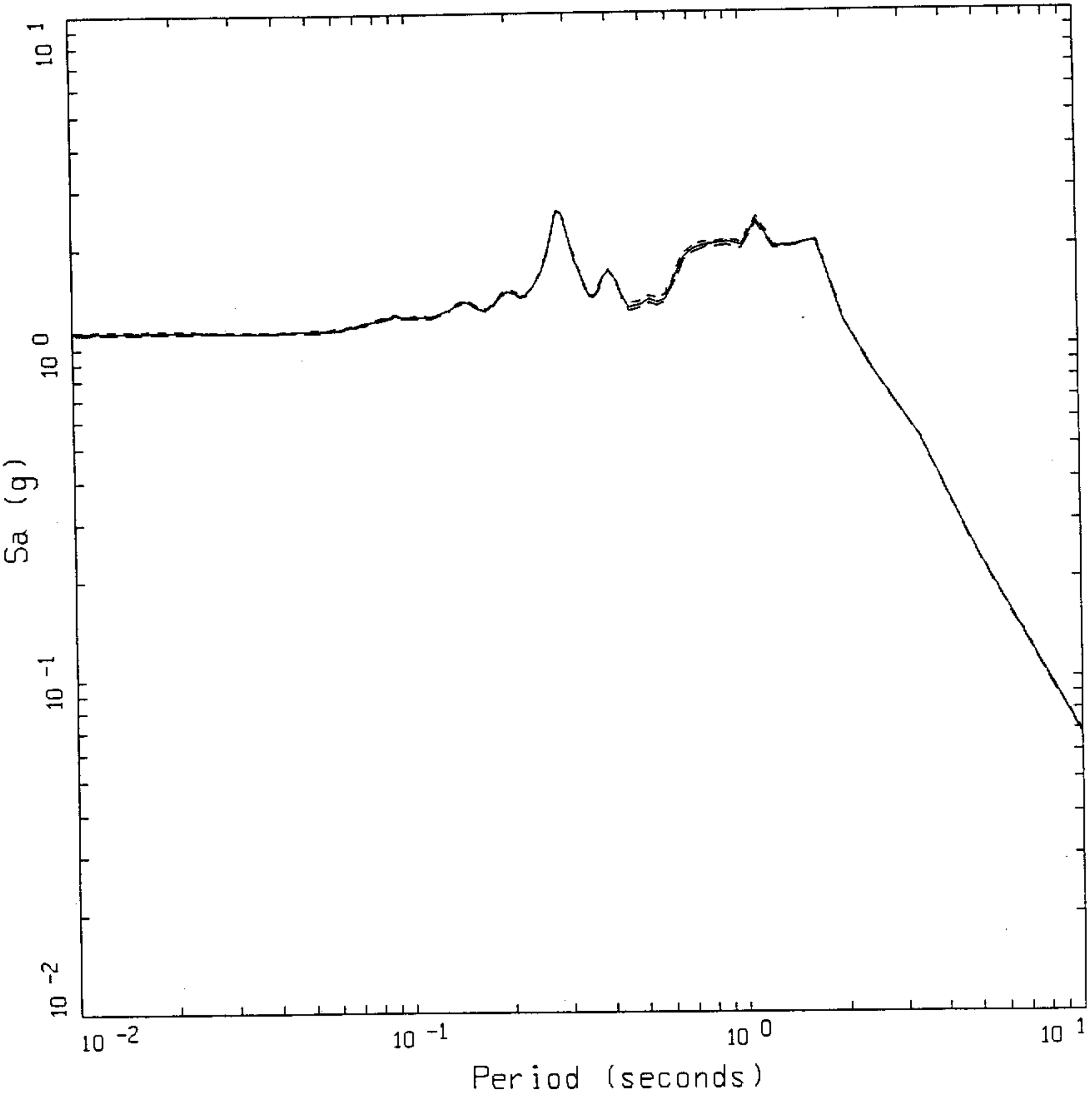
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.23 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.87 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.61 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2- VARIATION OF PARAMETERS	Figure N-1
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

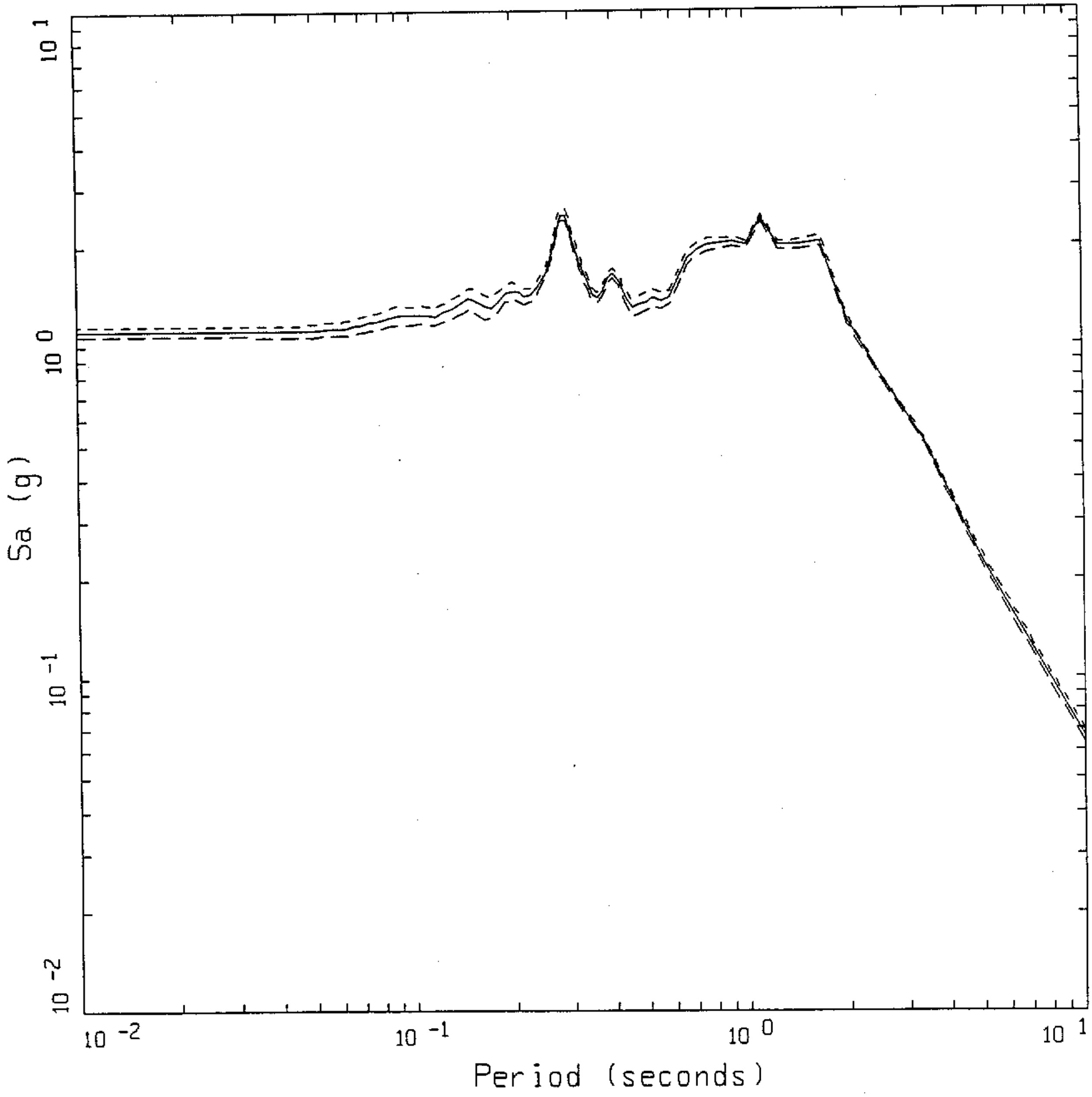
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.13 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.13 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.11 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2- VARIATION OF Q(f)	Figure N-2
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

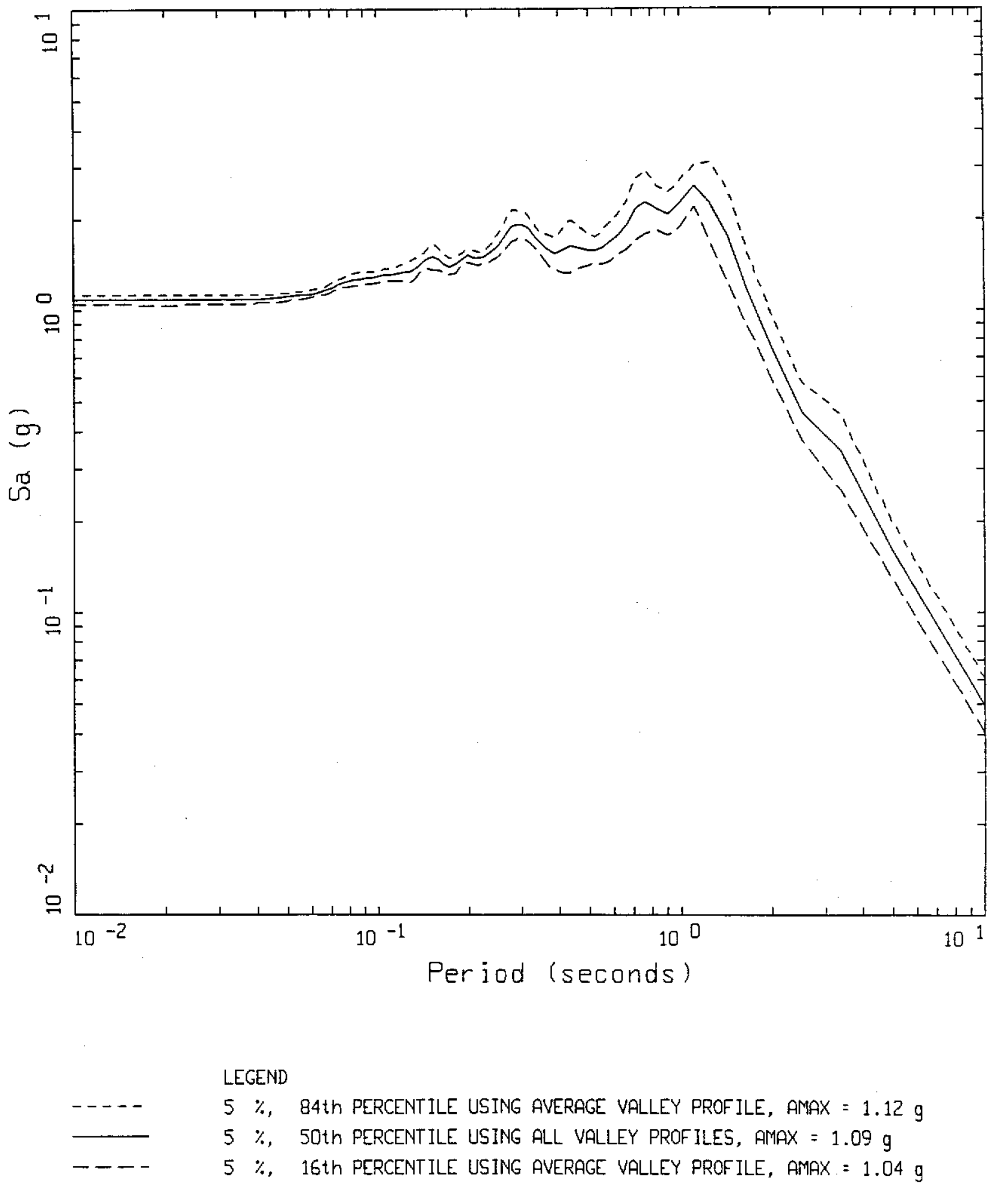
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.15 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.12 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.08 g

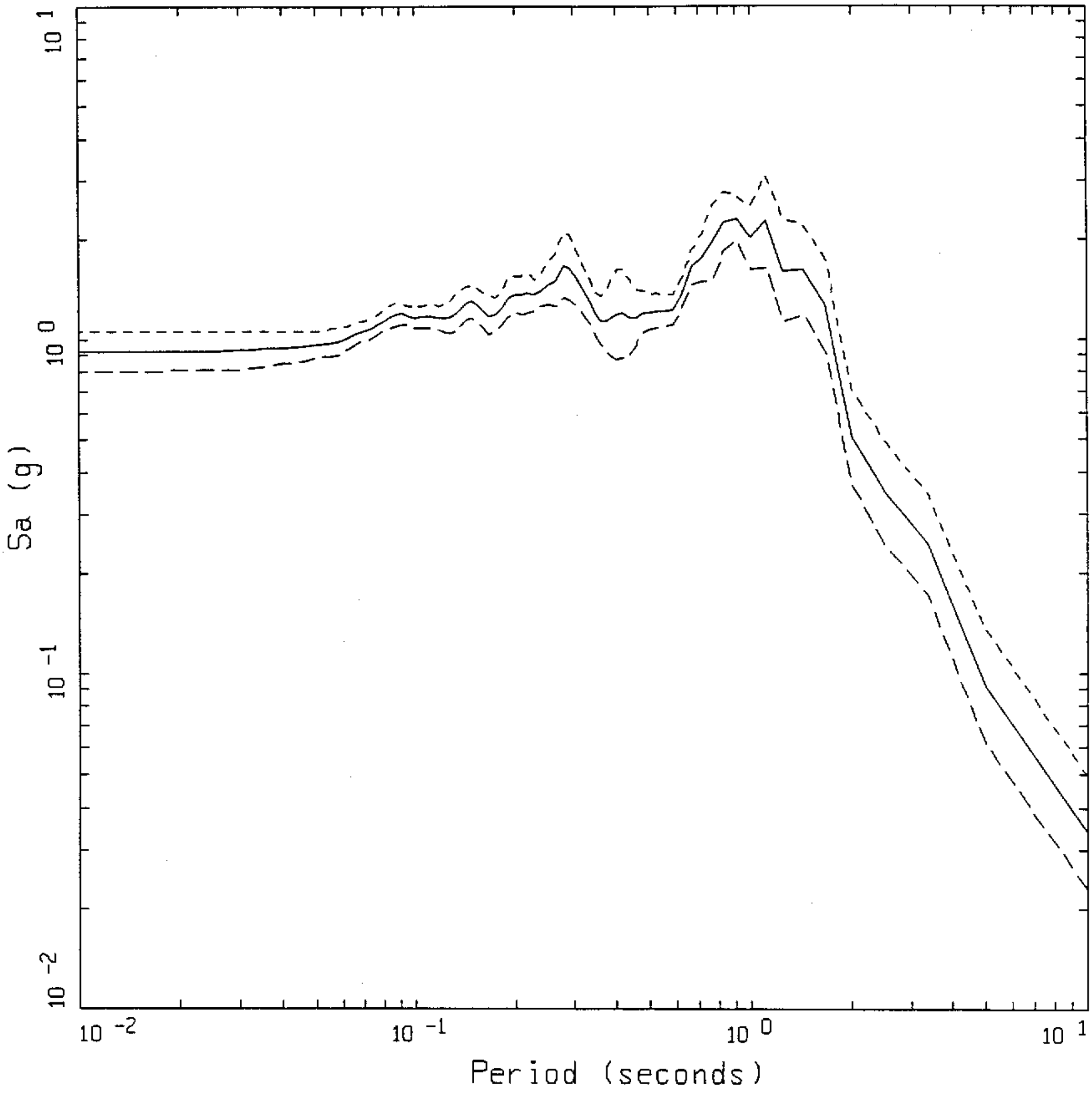
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2- VARIATION OF κ	Figure N-3
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2- VARIATION OF RUPTURE INITIATION	Figure N-4
Woodward-Clyde Federal Services			

91C0509A-1300/060293

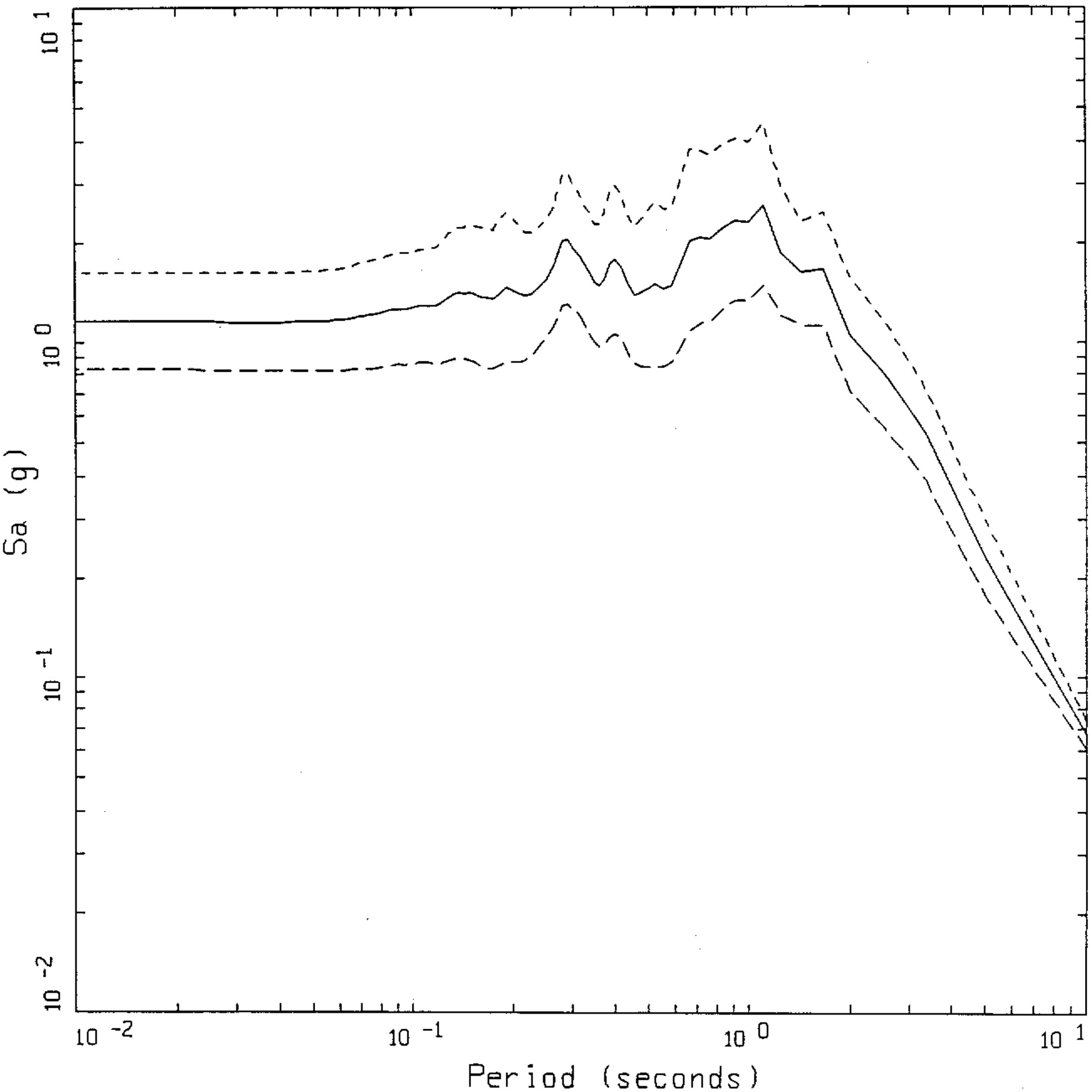


LEGEND

-----	5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.06 g
———	5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.93 g
— — —	5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.81 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2-VARIATION OF SLIP	Figure N-5
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

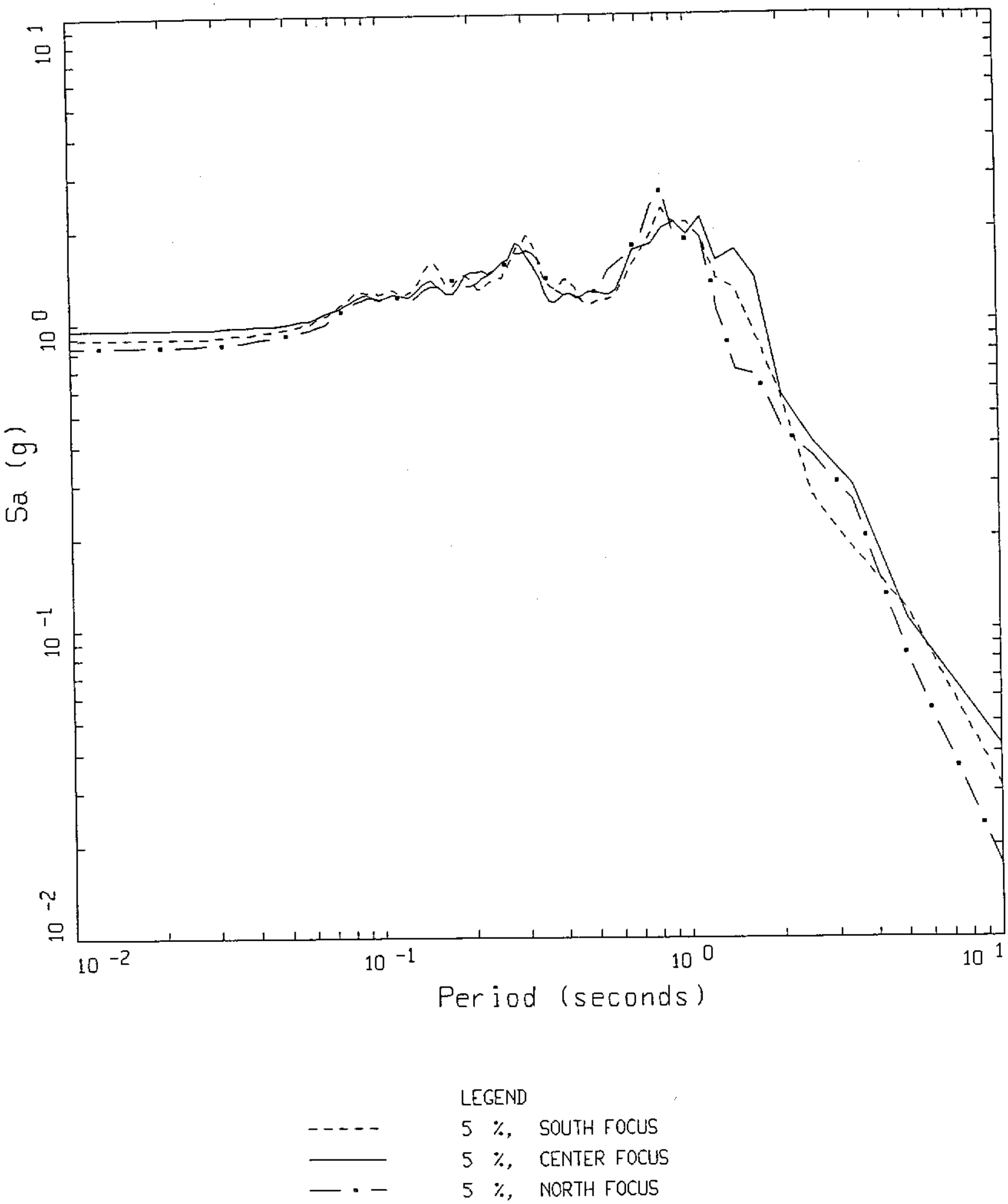
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.62 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.17 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.83 g

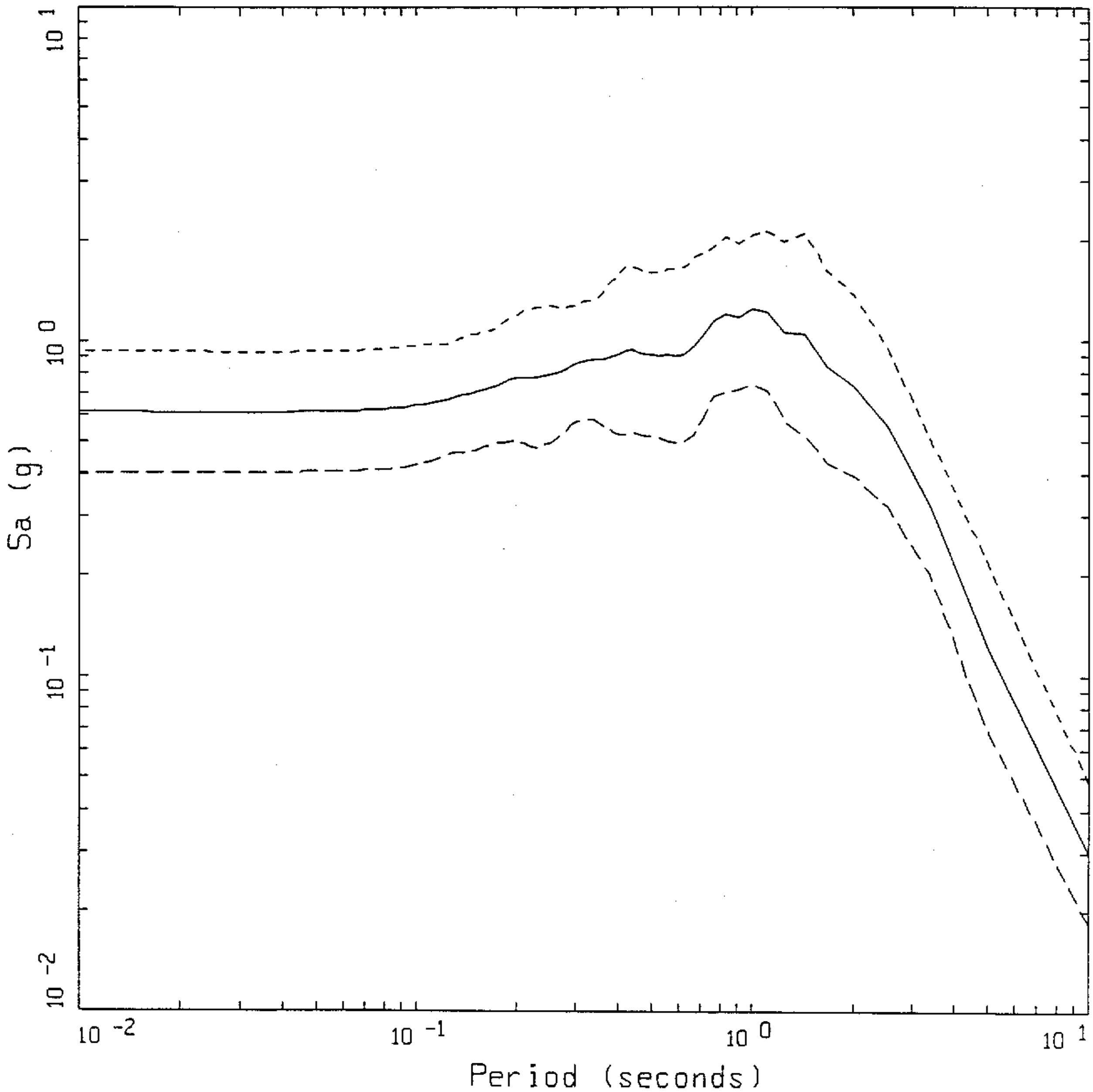
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2-VARIATION OF PROFILE	Figure N-6
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-2- EFFECTS OF DIRECTIVITY	Figure N-7
Woodward-Clyde Federal Services			

91C0509A-1300/060293

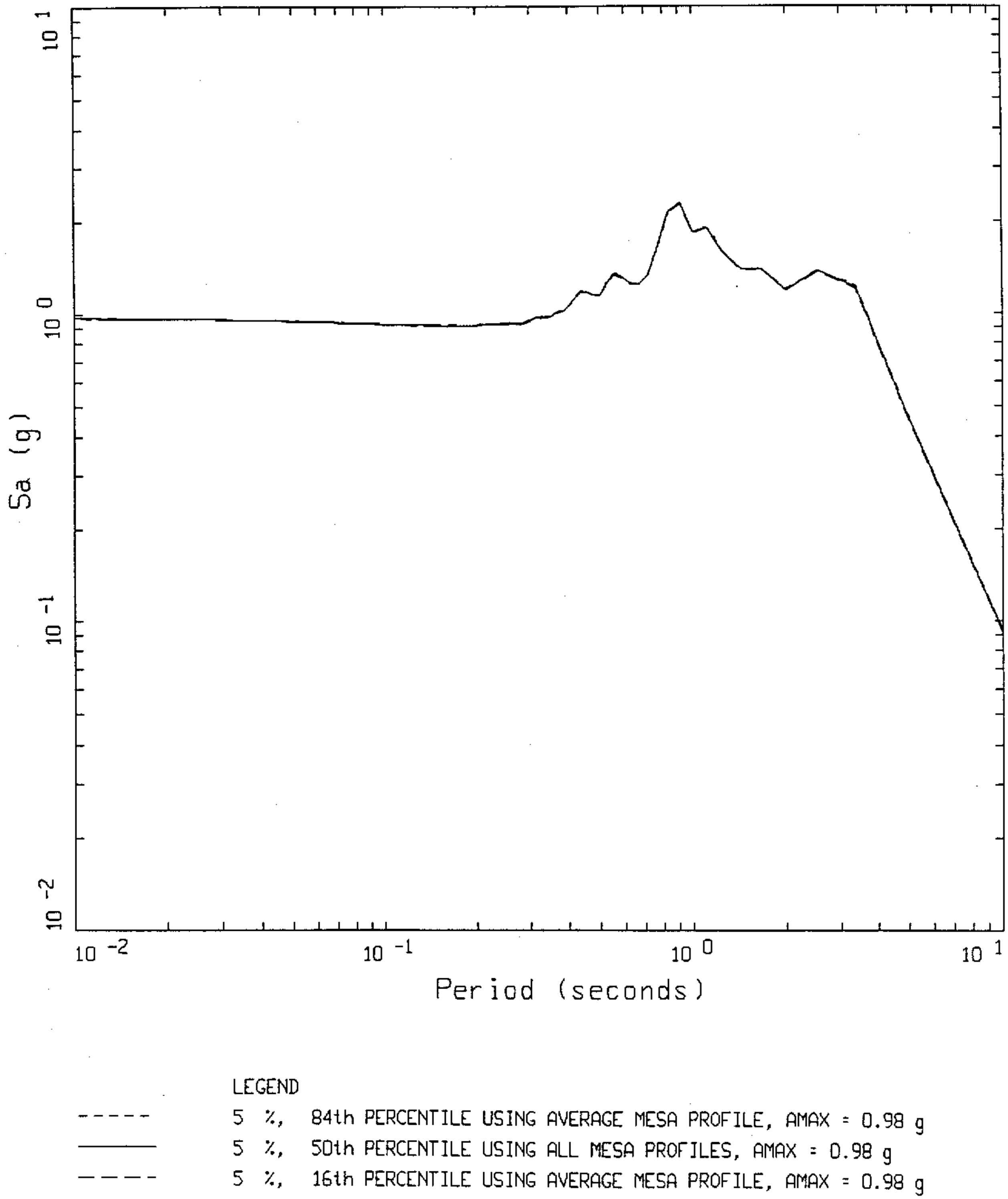


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.93 g
———	5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.62 g
— — —	5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.40 g

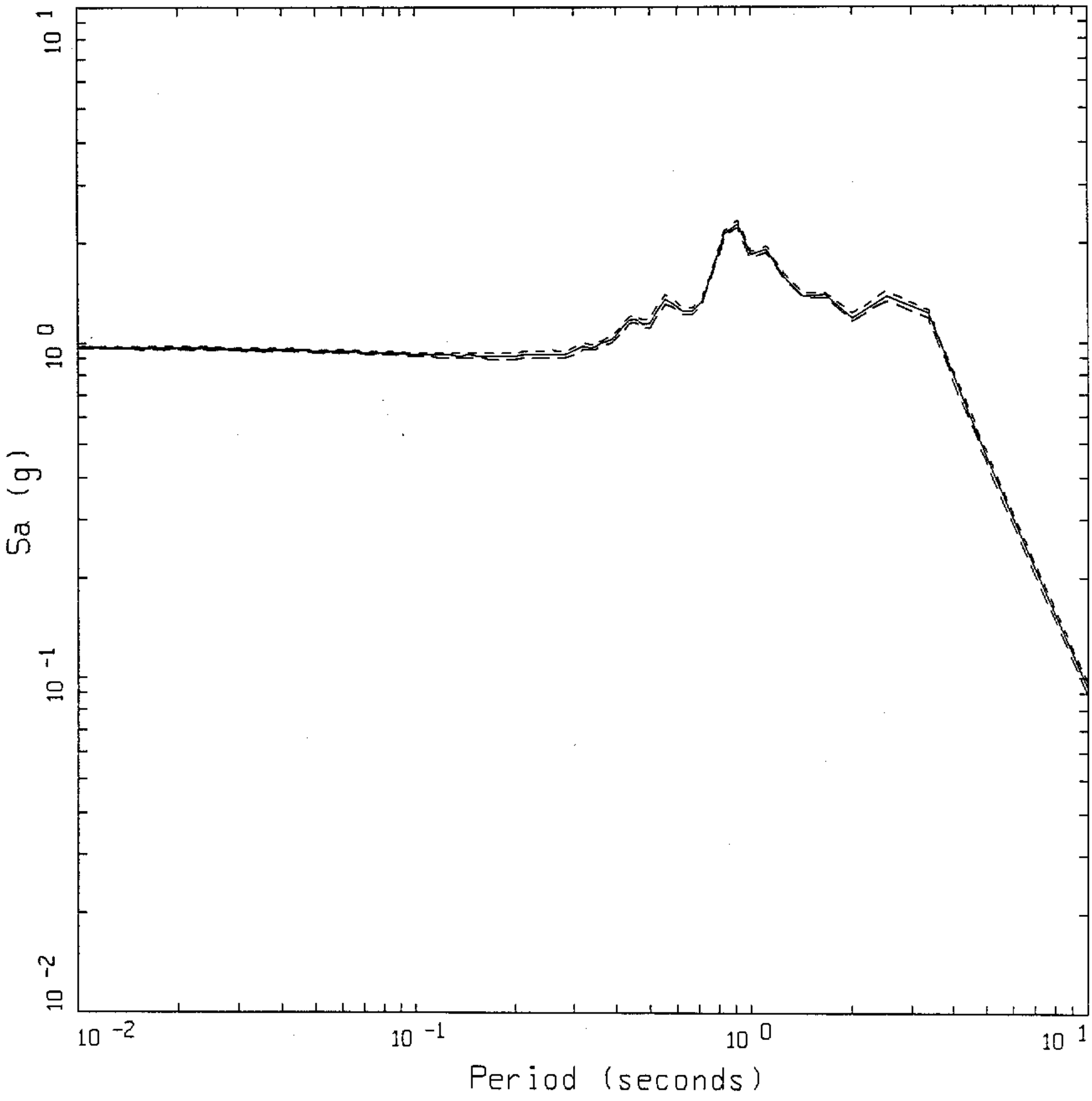
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3-VARIATION OF PARAMETERS	Figure N-8
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3-VARIATION OF Q(f)	Figure N-9
Woodward-Clyde Federal Services			

91C0509A-1300/060293

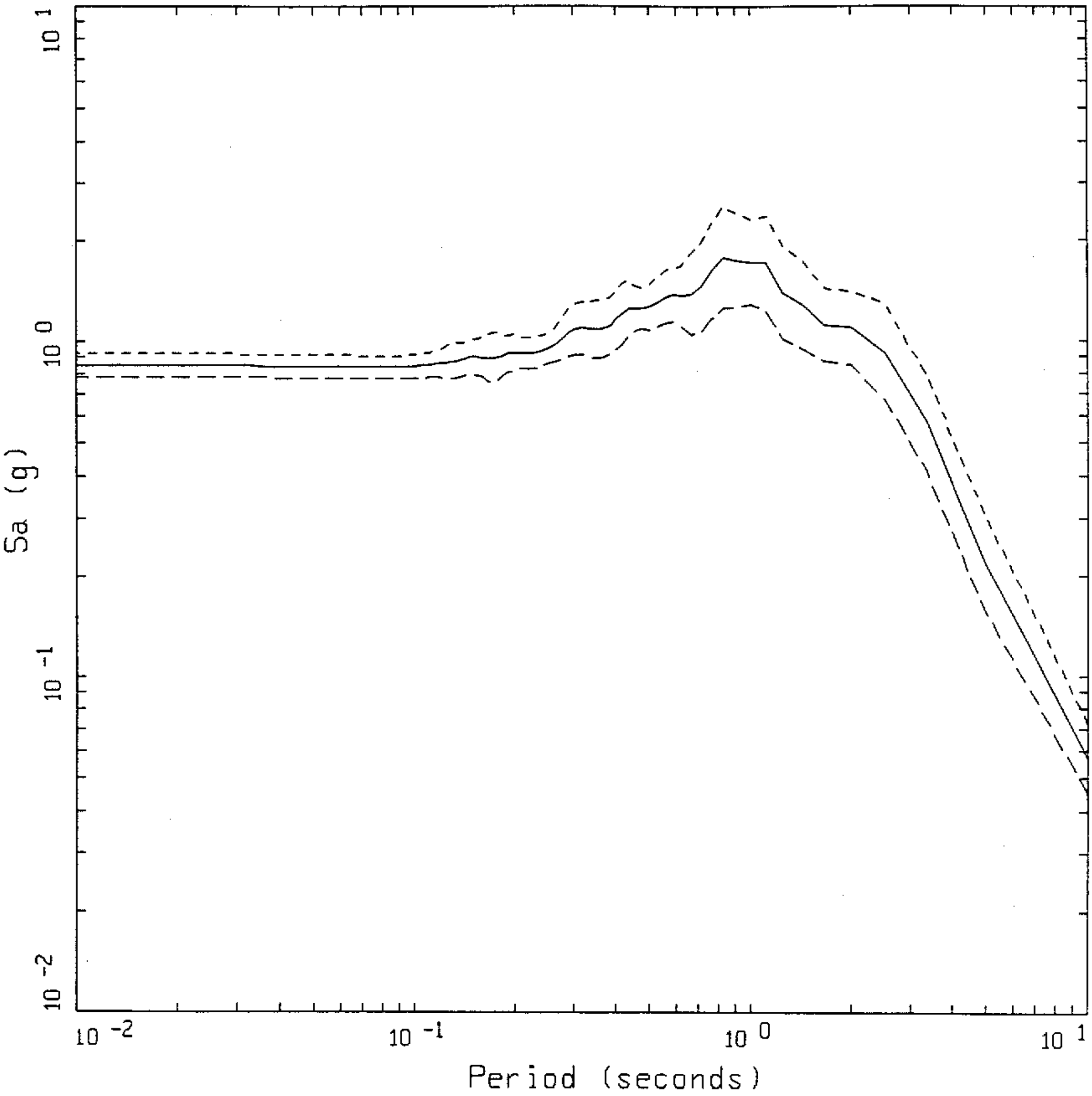


LEGEND

-----	5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.98 g
———	5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.98 g
— — —	5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.96 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3- VARIATION OF κ	Figure N-10
Woodward-Clyde Federal Services			

91C0509A-1300/060293



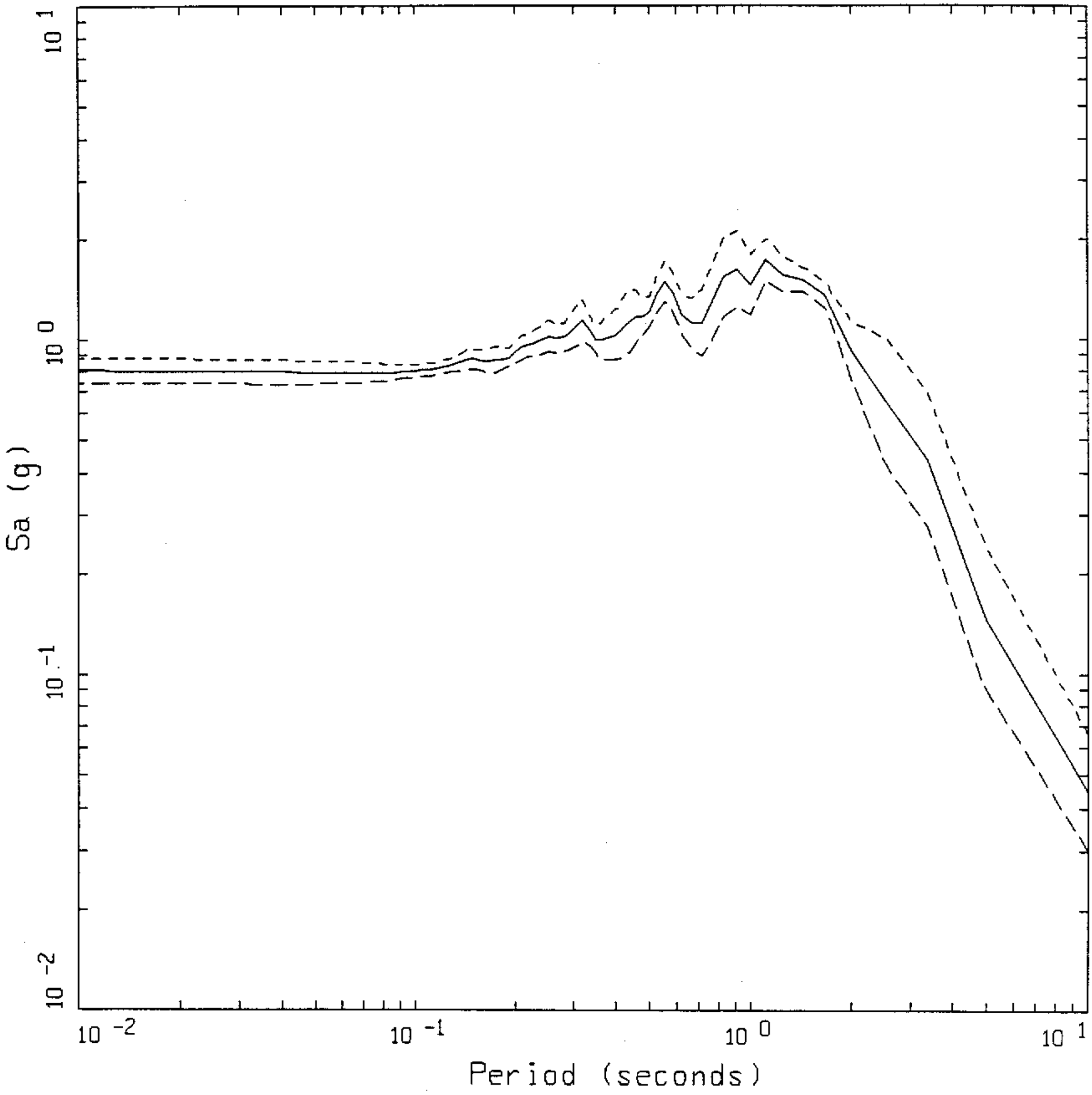
LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.93 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.86 g

— — — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.79 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3-VARIATION OF RUPTURE INITIATION	Figure N-11
Woodward-Clyde Federal Services			

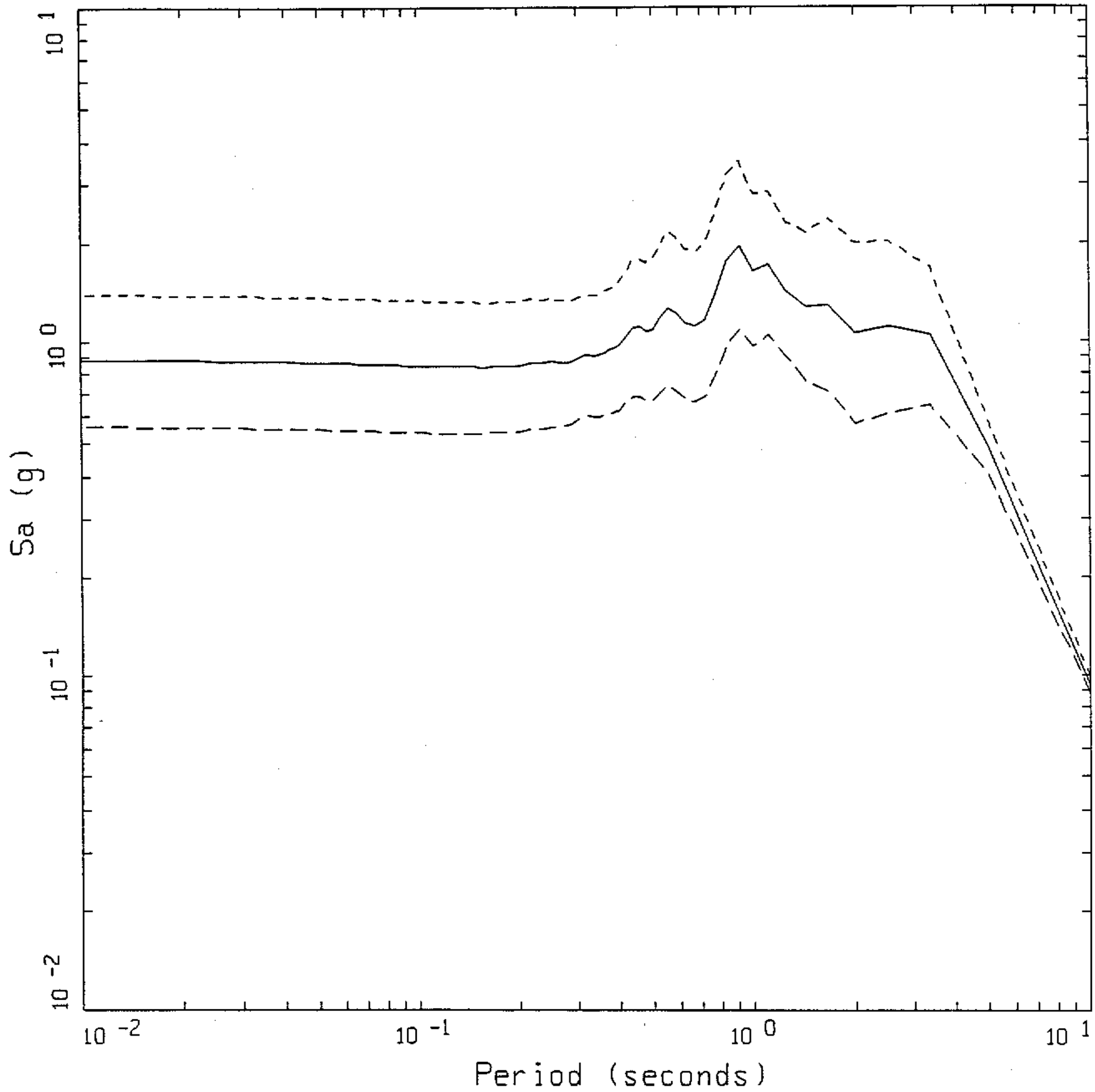


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.88 g
———	5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.81 g
— — —	5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.74 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3- VARIATION OF SLIP	Figure N-12
Woodward-Clyde Federal Services			

91C0509A-1300/060293

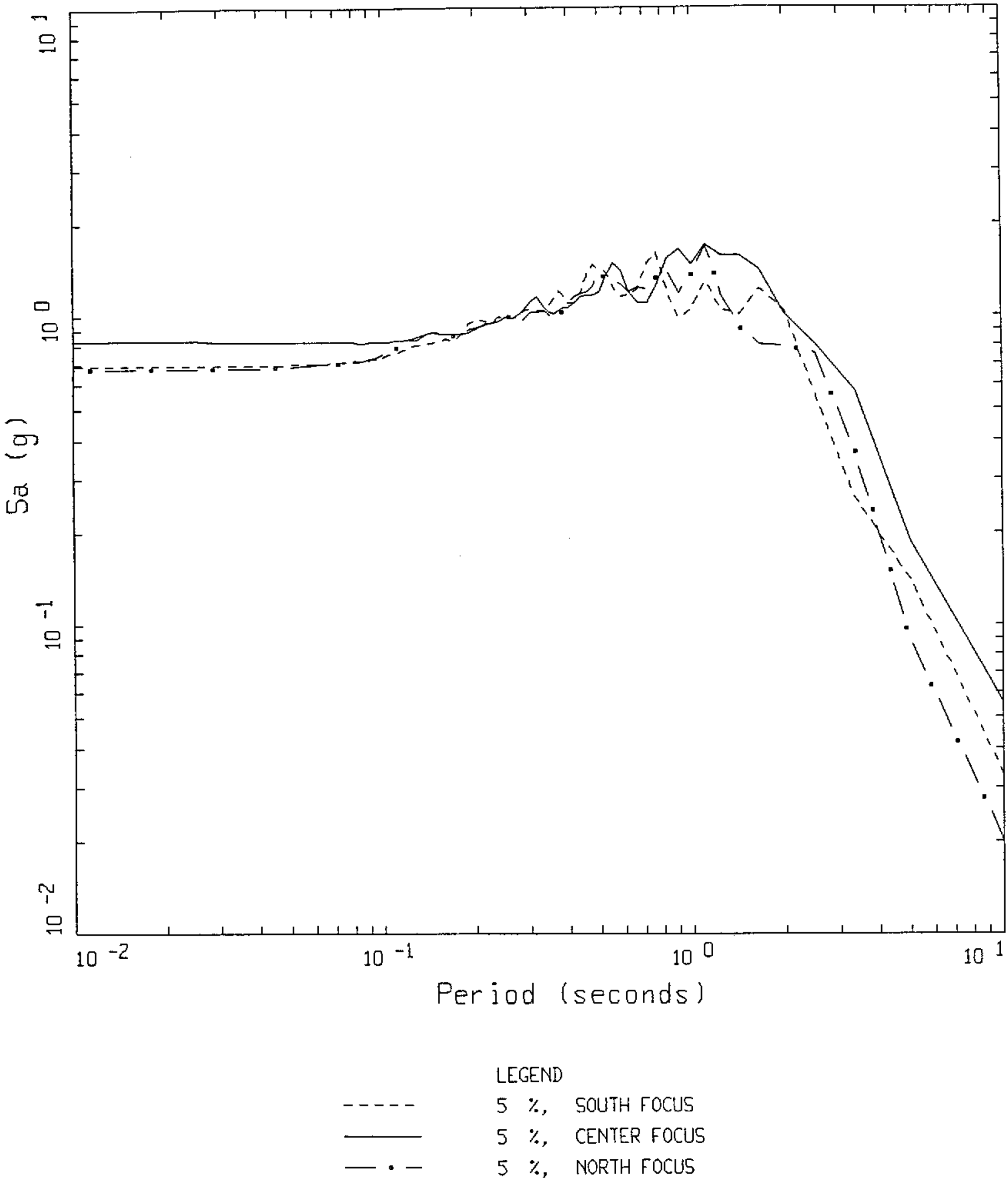


LEGEND

- - - - -	5 %,	84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 1.39 g
———	5 %,	50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.89 g
— — —	5 %,	16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.56 g

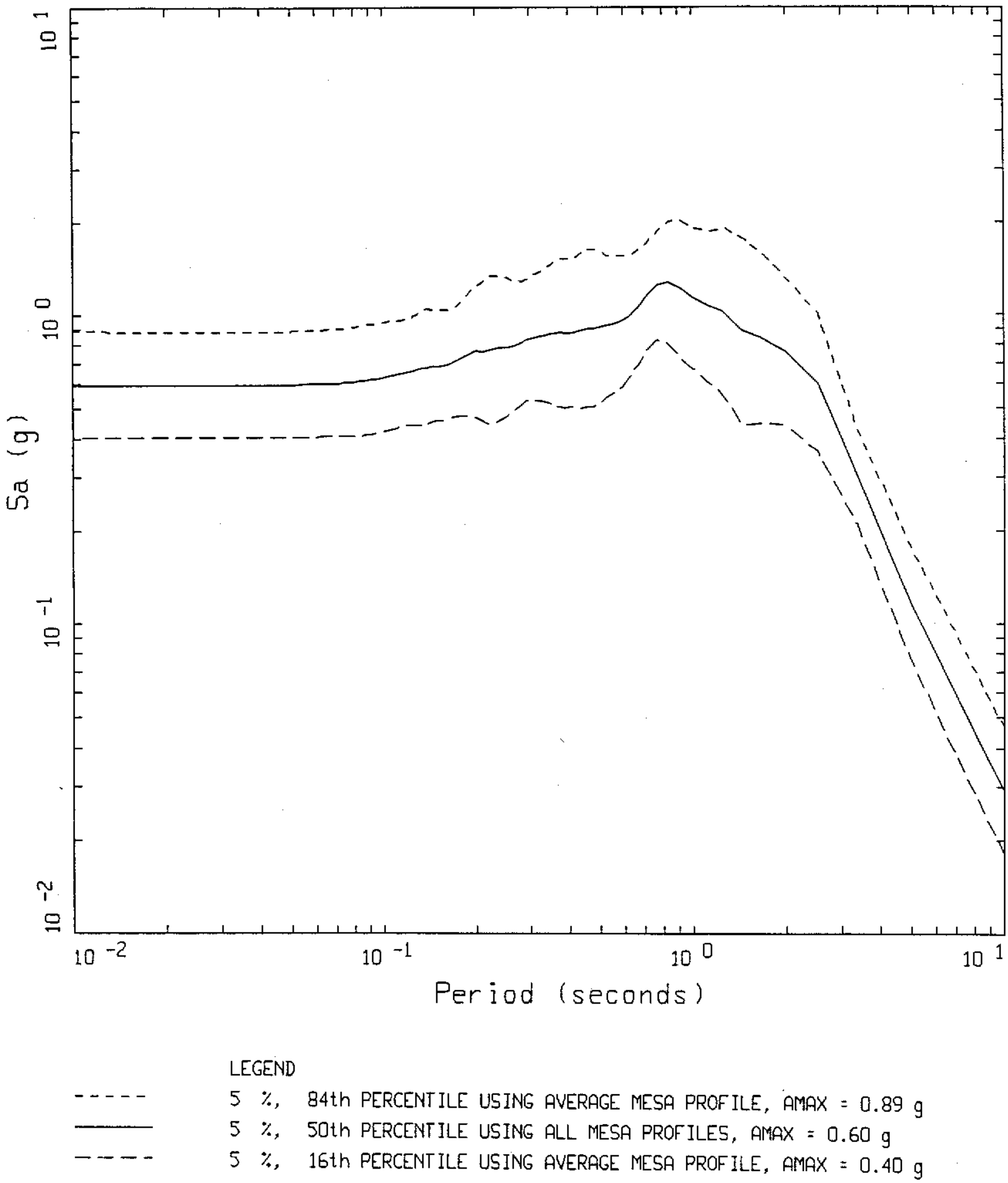
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3-VARIATION OF PROFILE	Figure N-13
Woodward-Clyde Federal Services			

91C0509A-1300/060293



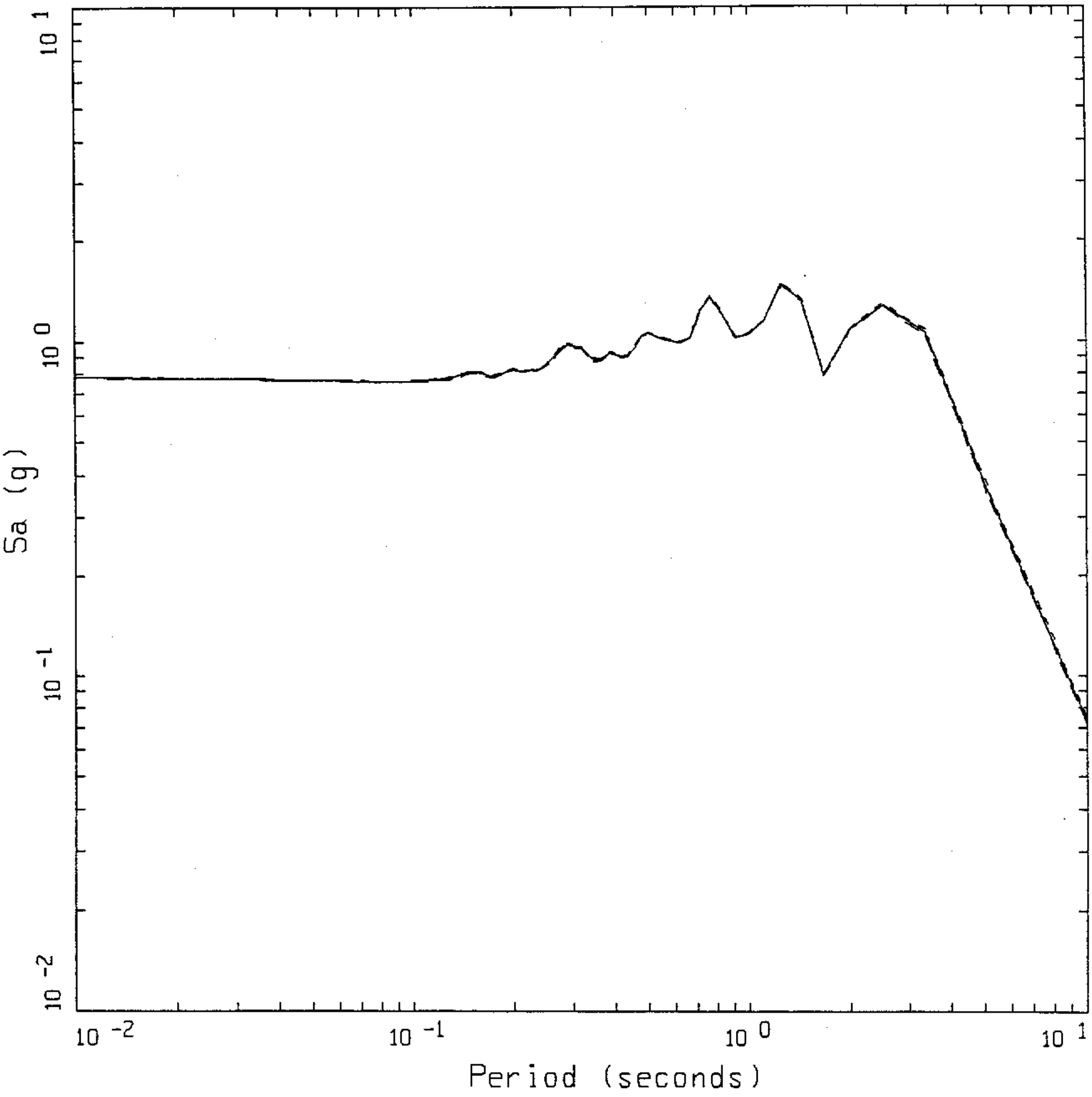
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-3-EFFECTS OF DIRECTIVITY	Figure N-14
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16- VARIATION OF PARAMETERS	Figure N-15
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

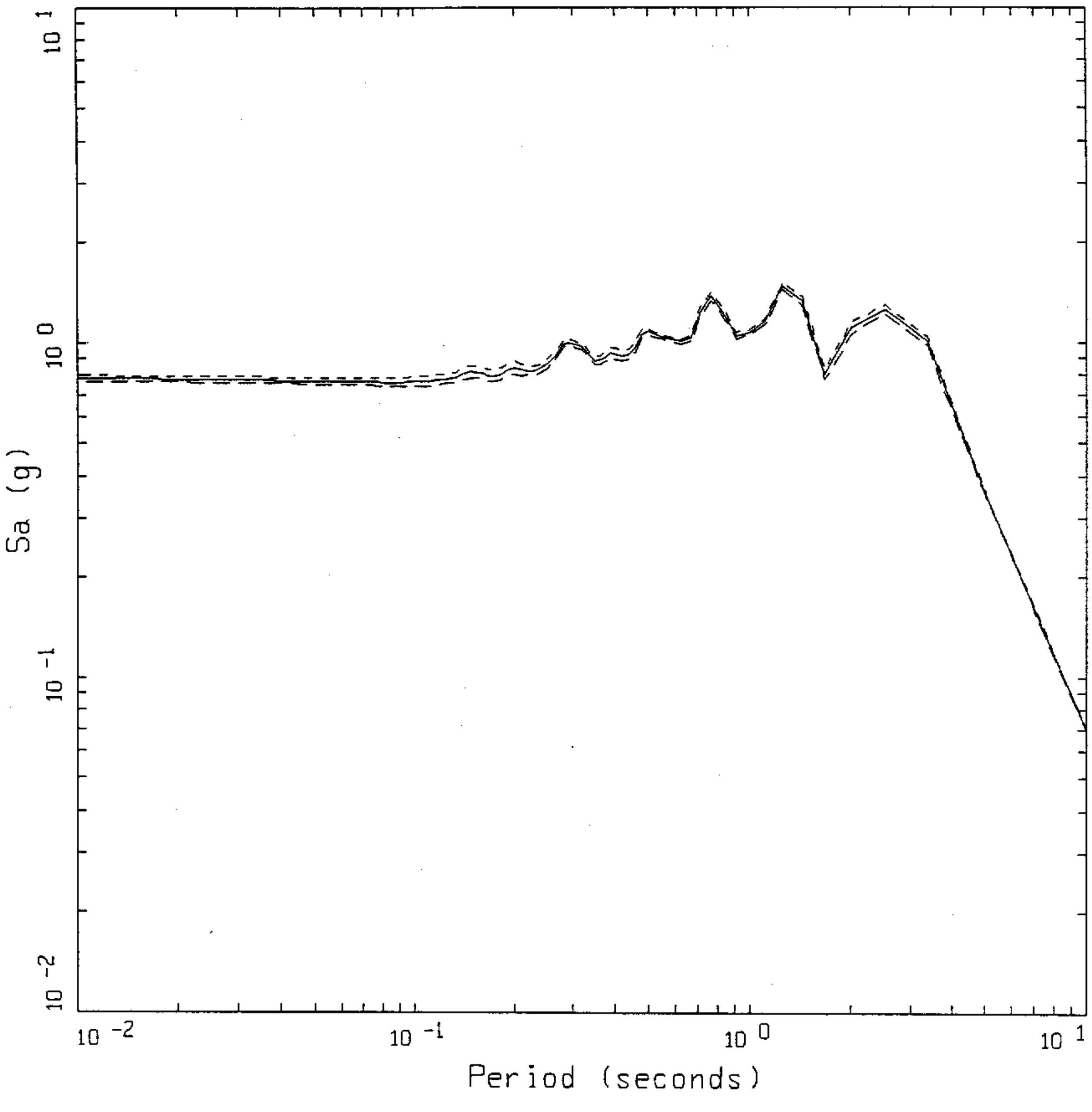
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.79 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.79 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.79 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16-VARIATION OF Q(f)	Figure N-16
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

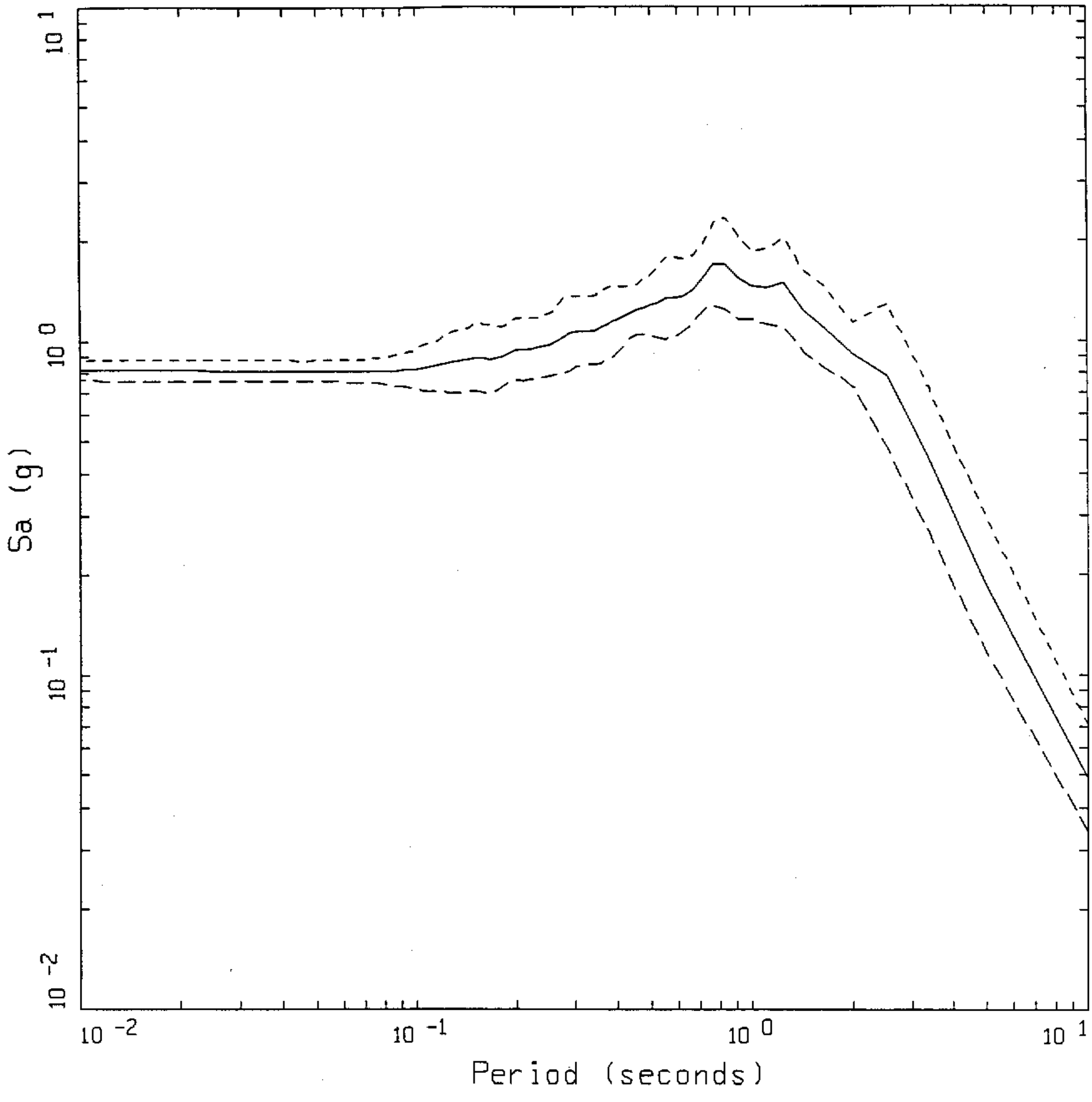
- - - - -   5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.80 g

———   5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.79 g

— — — —   5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.77 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16- VARIATION OF κ	Figure N-17
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

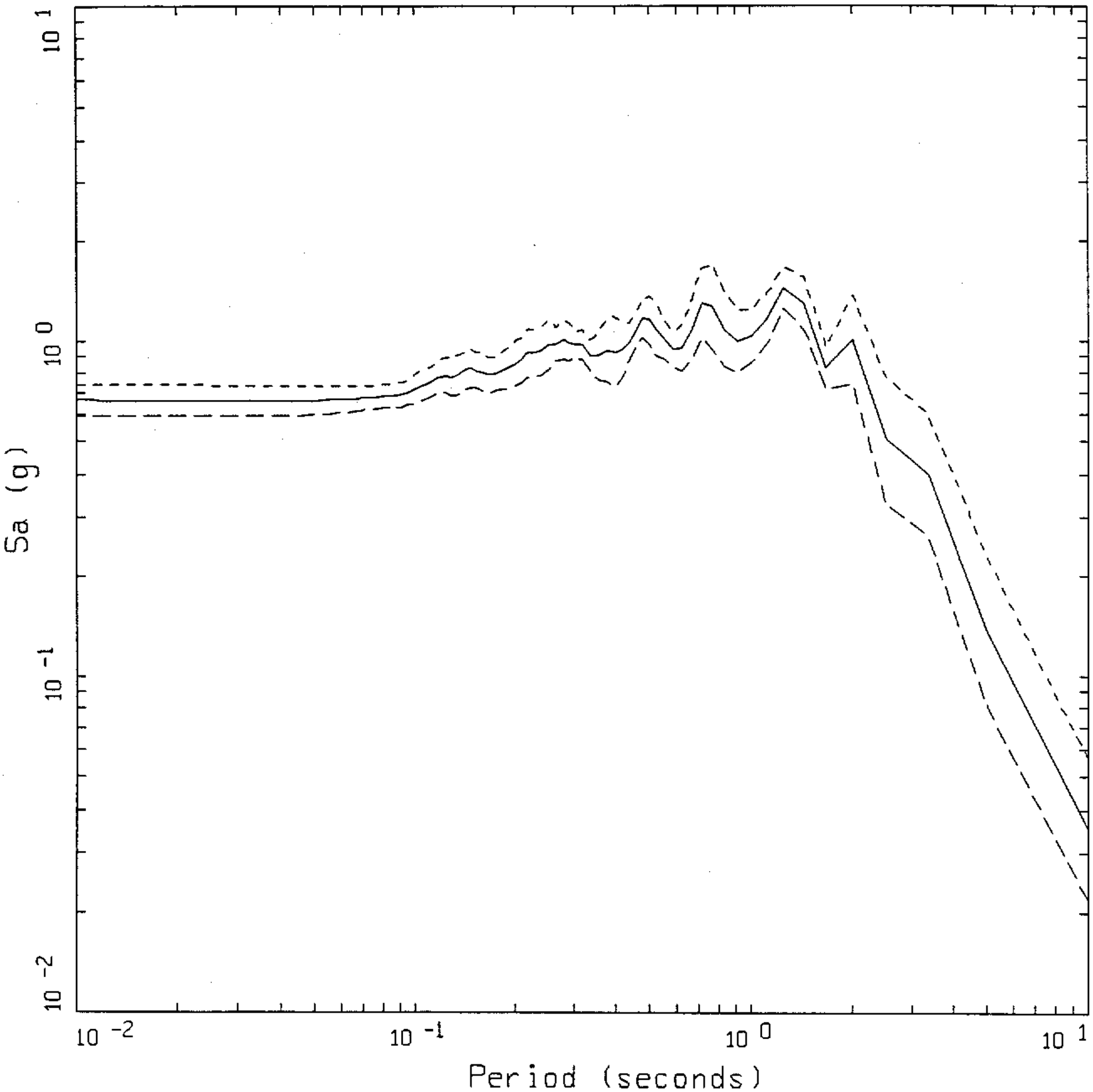
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.89 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.83 g

— — — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.76 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16-VARIATION OF RUPTURE INITIATION	Figure N-18
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

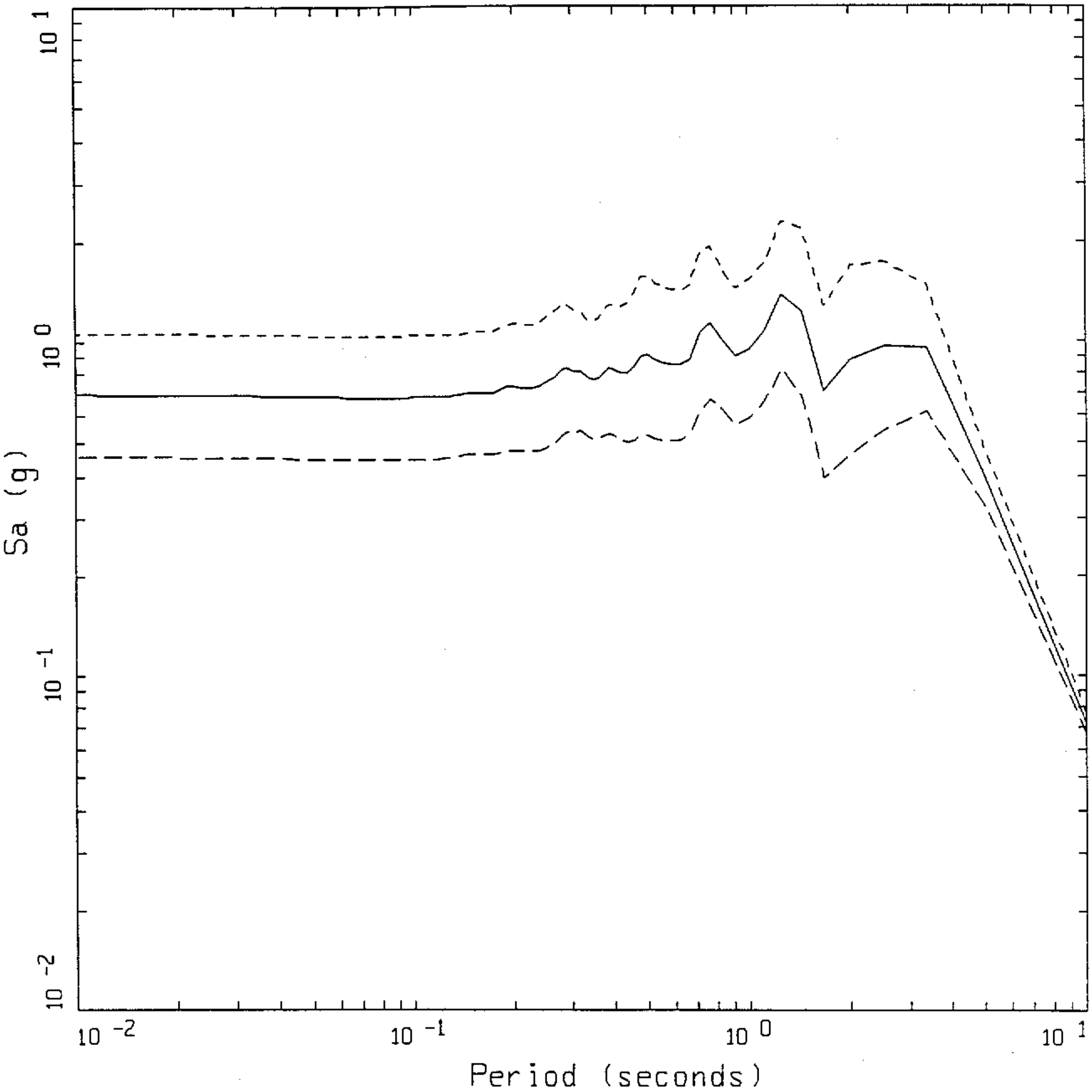
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.74 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.67 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.60 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16-VARIATION OF SLIP	Figure N-19
Woodward-Clyde Federal Services			

91C0509A-1300/060293

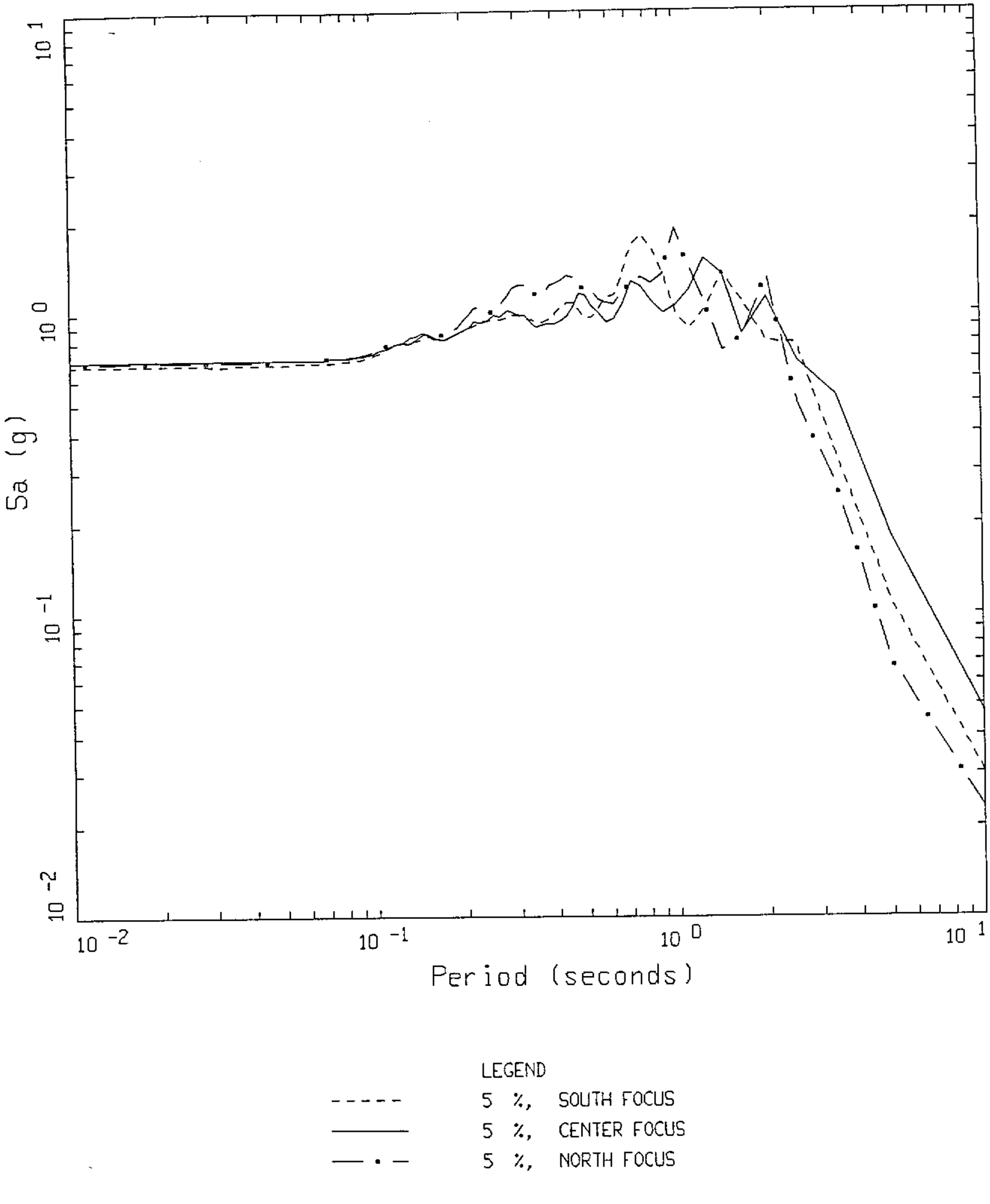


LEGEND

- - - - -	5 %,	84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 1.06 g
———	5 %,	50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.70 g
— — — —	5 %,	16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.46 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16-VARIATION OF PROFILE	Figure N-20
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-16-EFFECTS OF DIRECTIVITY	Figure N-21
Woodward-Clyde Federal Services			

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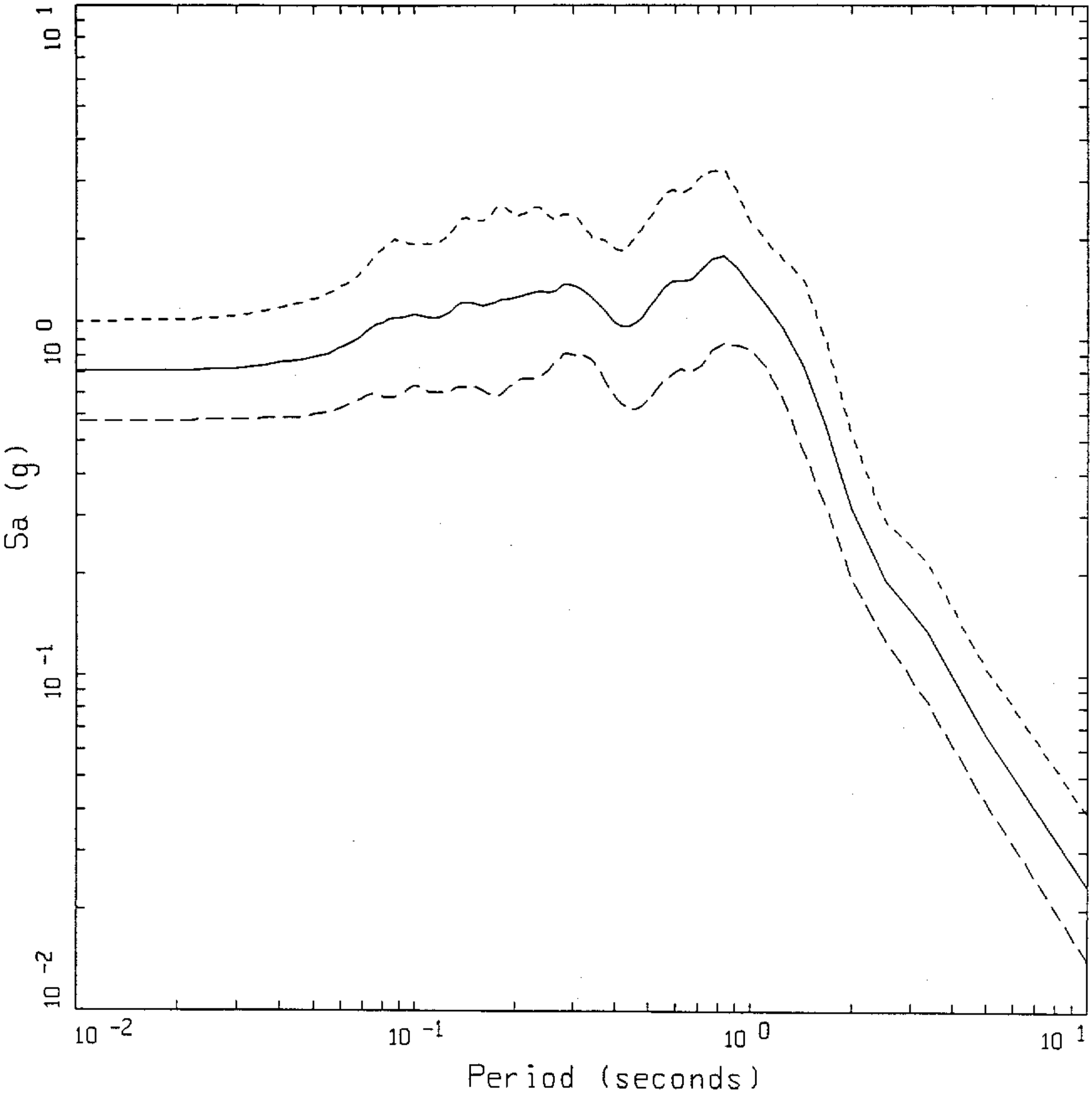


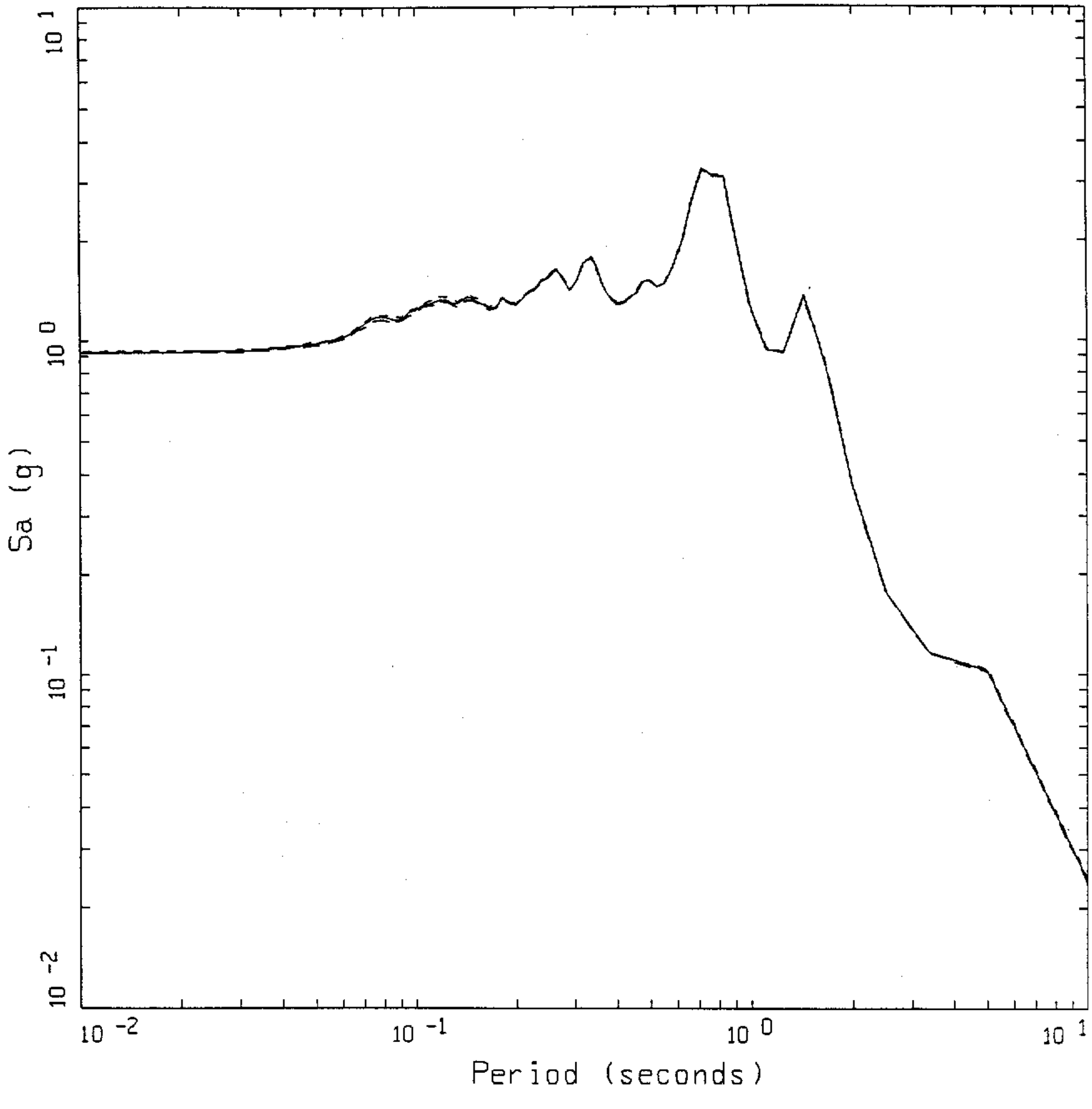
LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.14 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.81 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.58 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18-VARIATION OF PARAMETERS	Figure N-22
Woodward-Clyde Federal Services			



LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.93 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.93 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.93 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18-VARIATION OF Q(f)	Figure N-23
Woodward-Clyde Federal Services			

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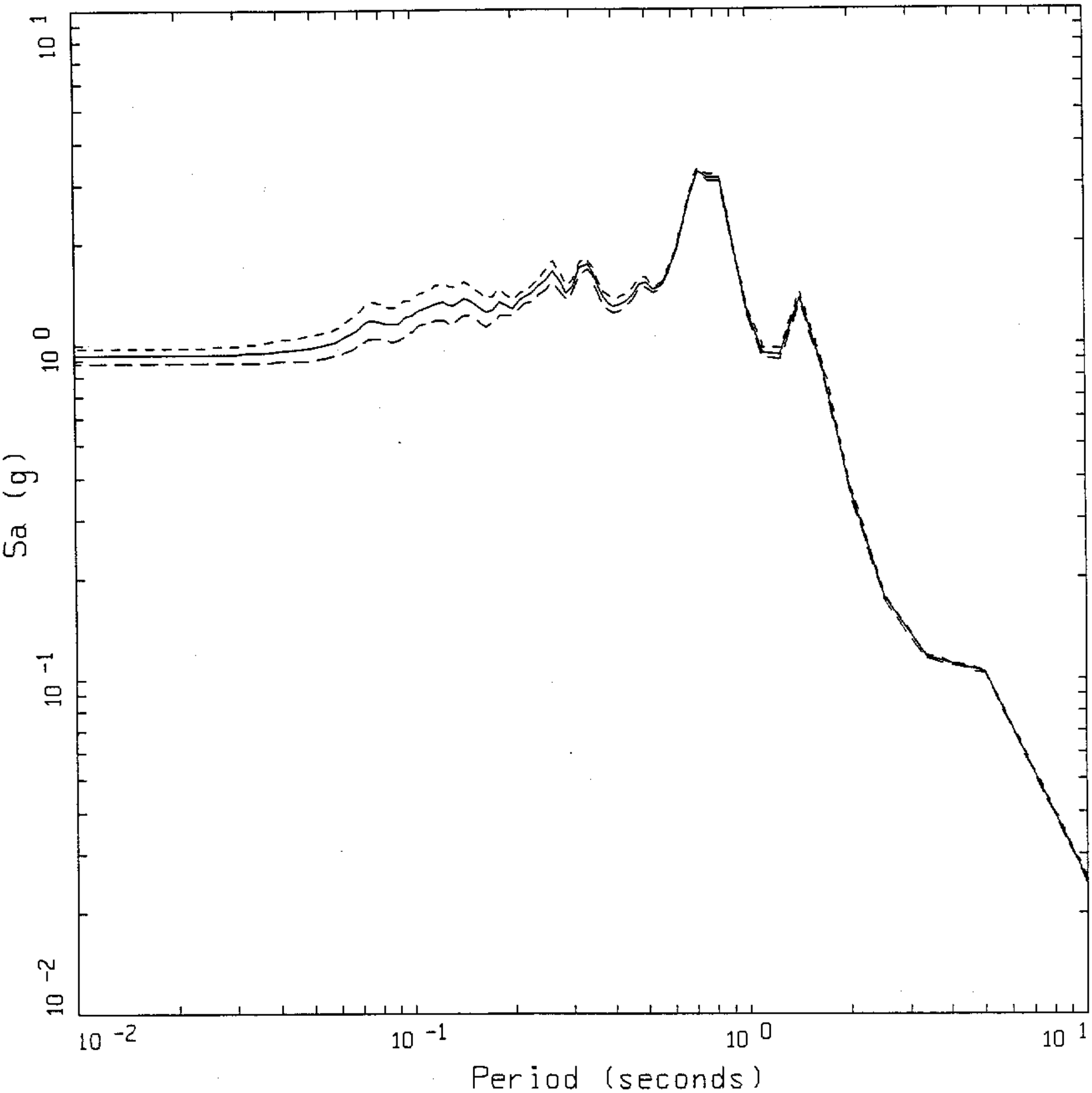

LEGEND

- - - - -	5 %,	84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.88 g
———	5 %,	50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.93 g
— — — —	5 %,	16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.98 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18- VARIATION OF κ	Figure N-24
Woodward-Clyde Federal Services			

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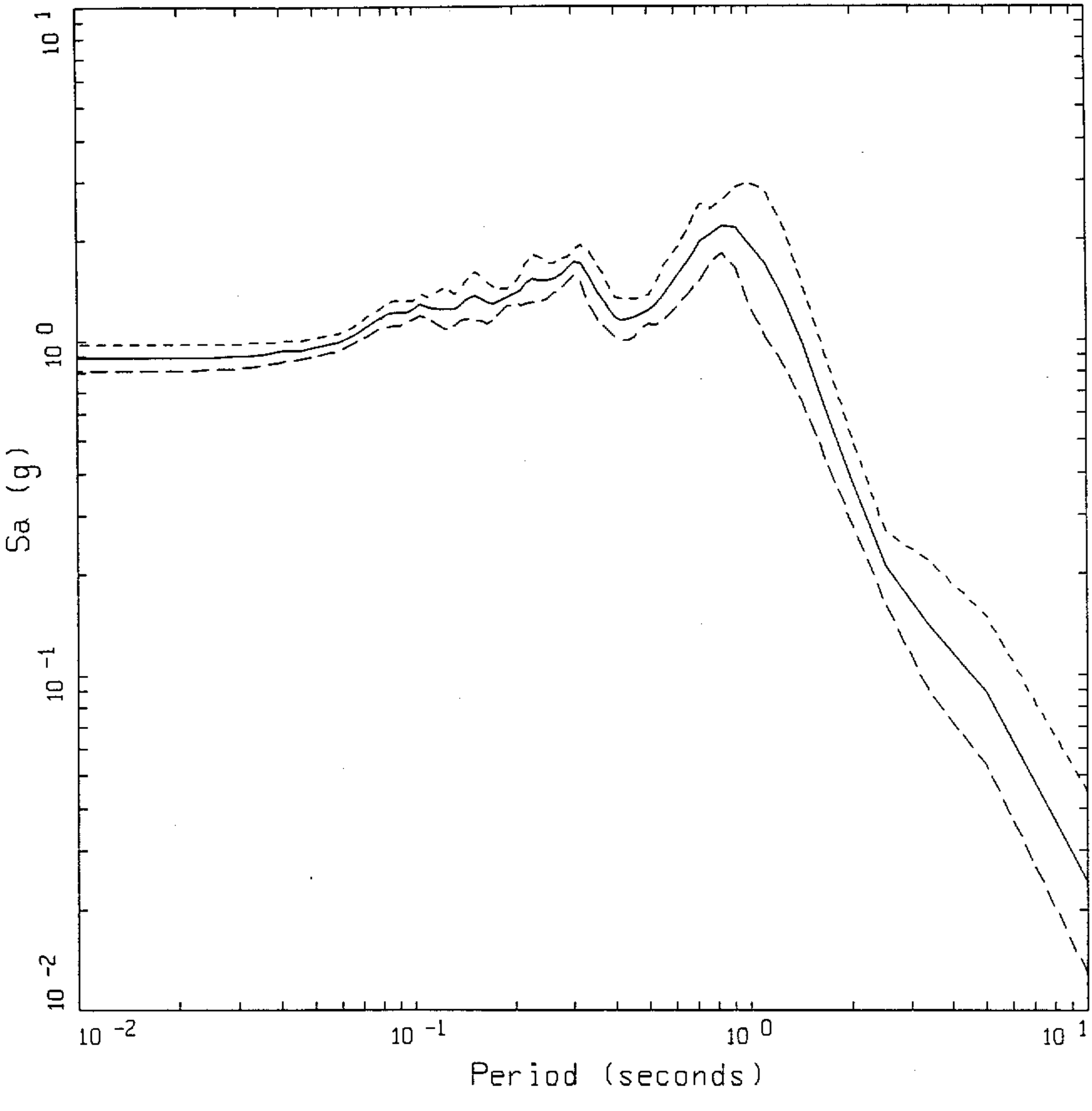


LEGEND

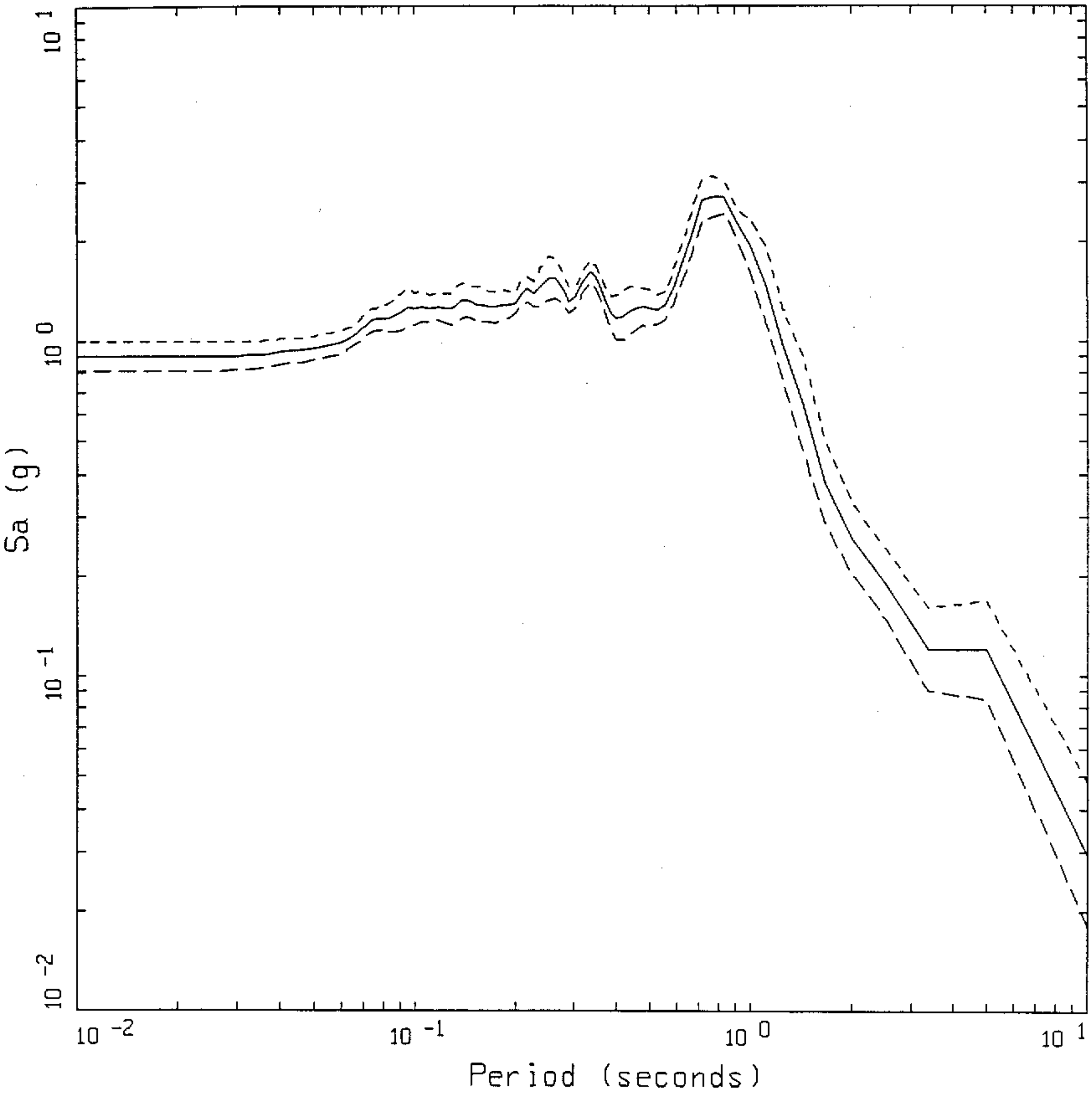
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.98 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.89 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.81 g

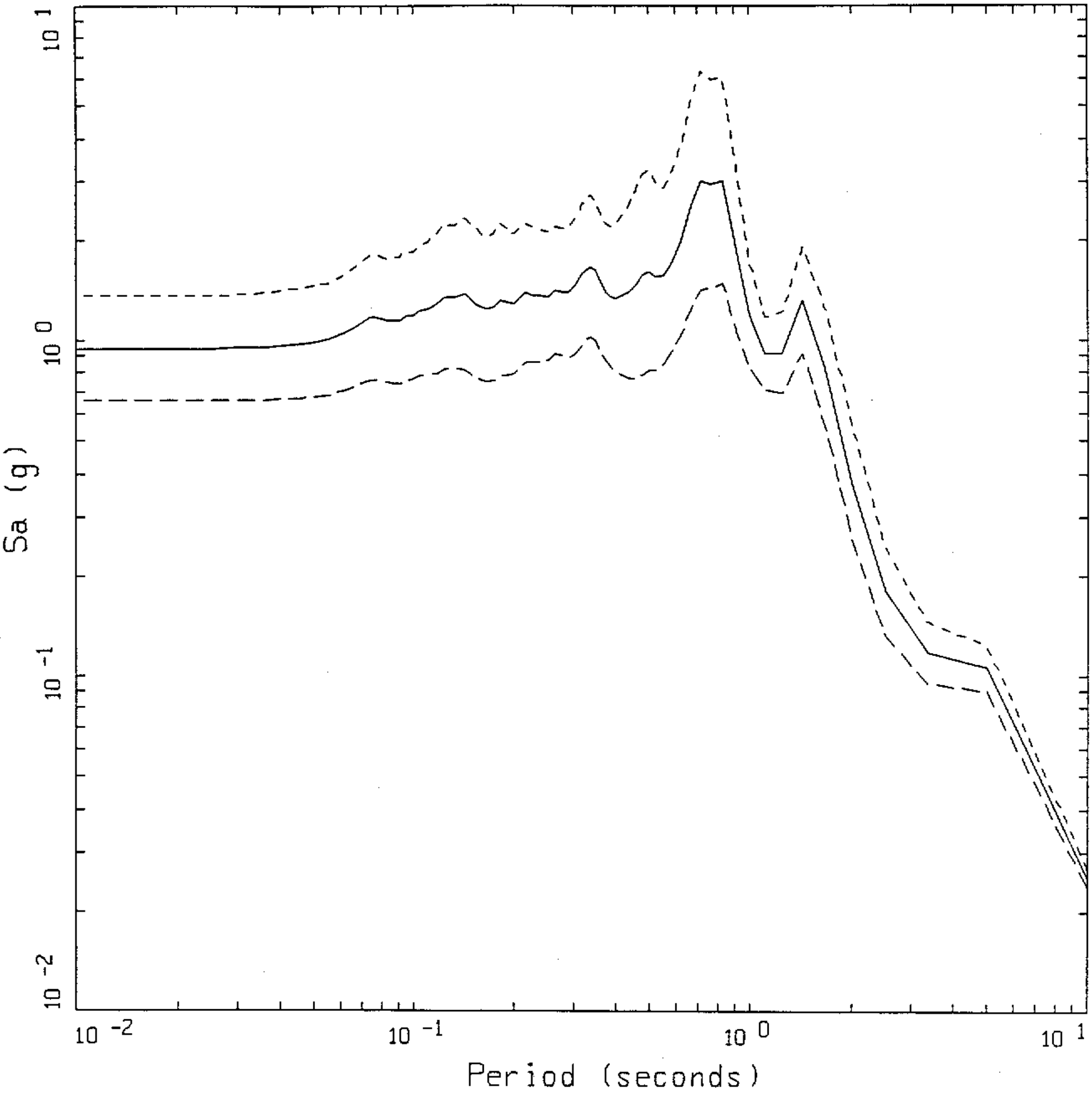
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18- VARIATION OF RUPTURE INITIATION	Figure N-25
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18- VARIATION OF SLIP	Figure N-26
Woodward-Clyde Federal Services			

91C0509A-1300/060293

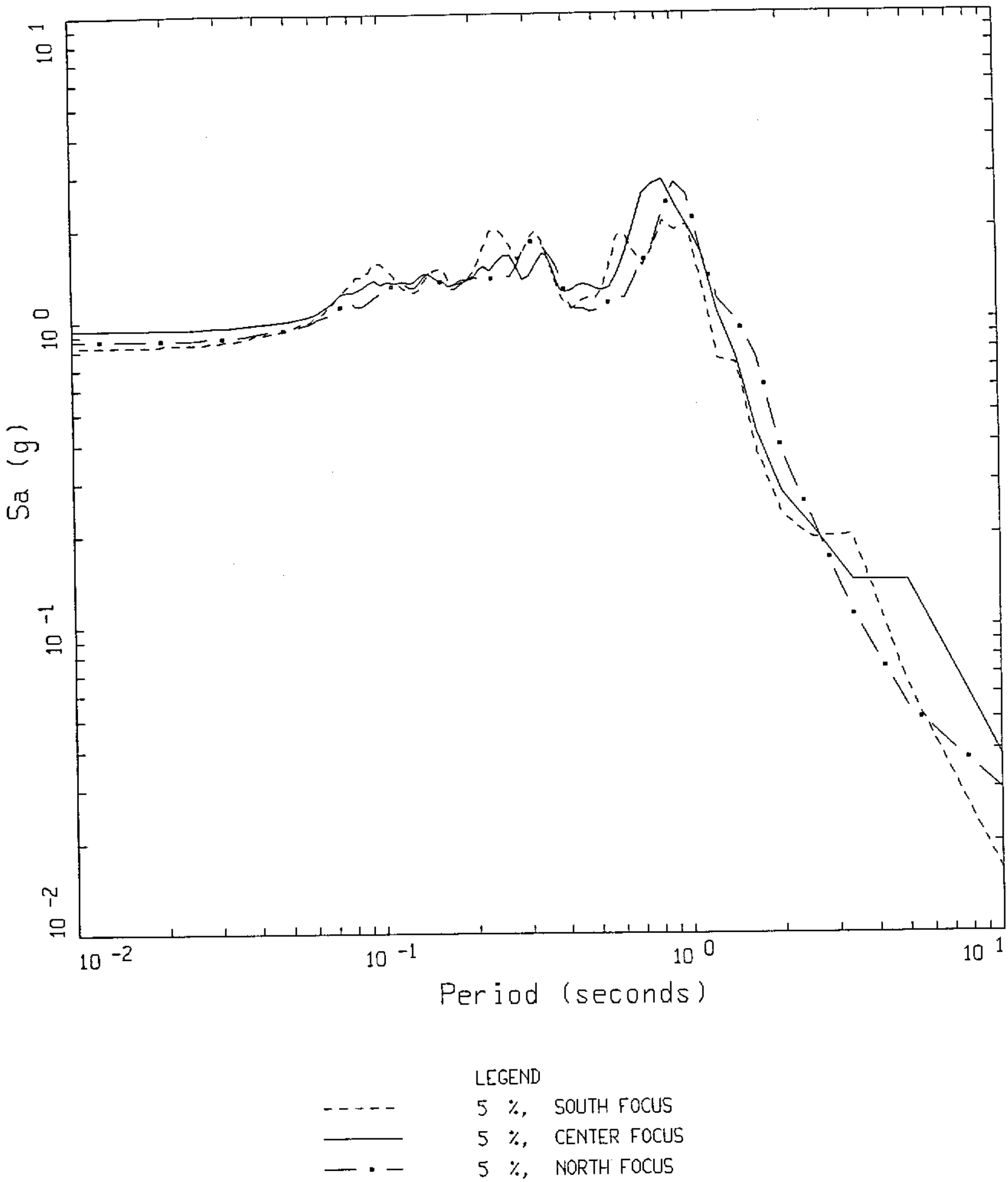


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.36 g
————	5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.95 g
— — — —	5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.66 g

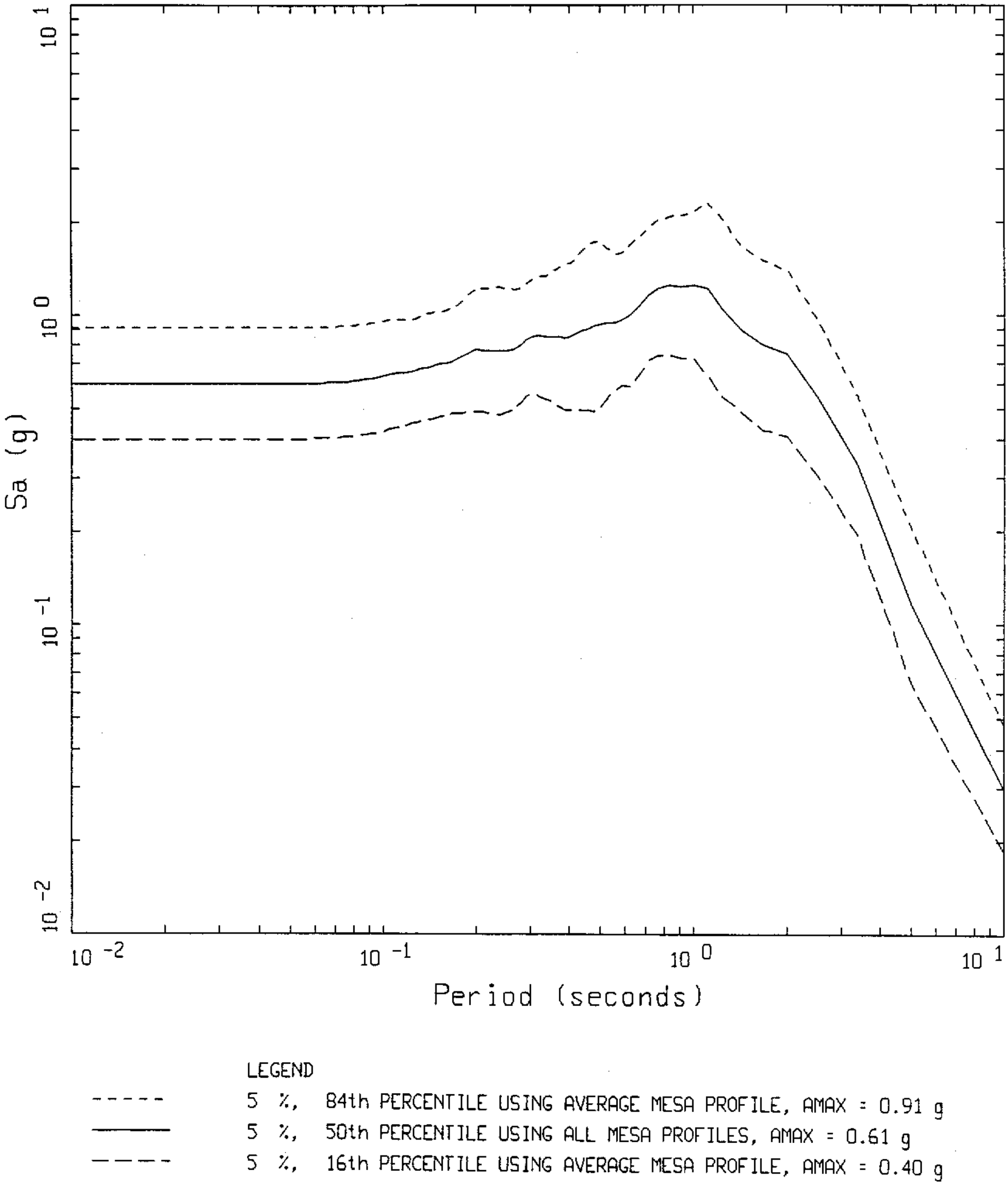
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18- VARIATION OF PROFILE	Figure N-27
Woodward-Clyde Federal Services			

91C0509A-1300/060293



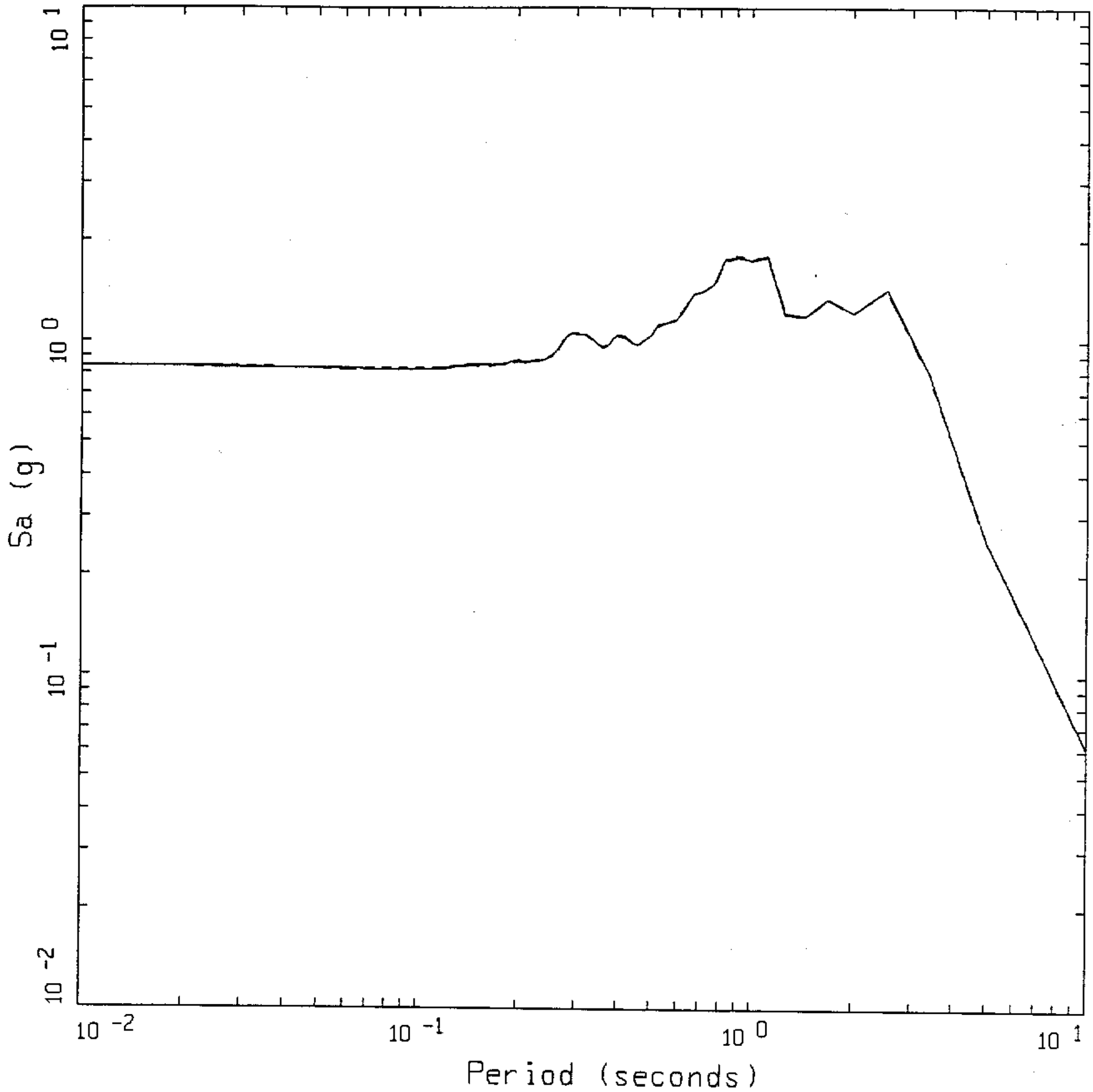
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-18- EFFECTS OF DIRECTIVITY	Figure N-28
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21- VARIATION OF PARAMETERS	Figure N-29
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.85 g

5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.85 g

5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.85 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21- VARIATION OF Q(f)	Figure N-30
Woodward-Clyde Federal Services			

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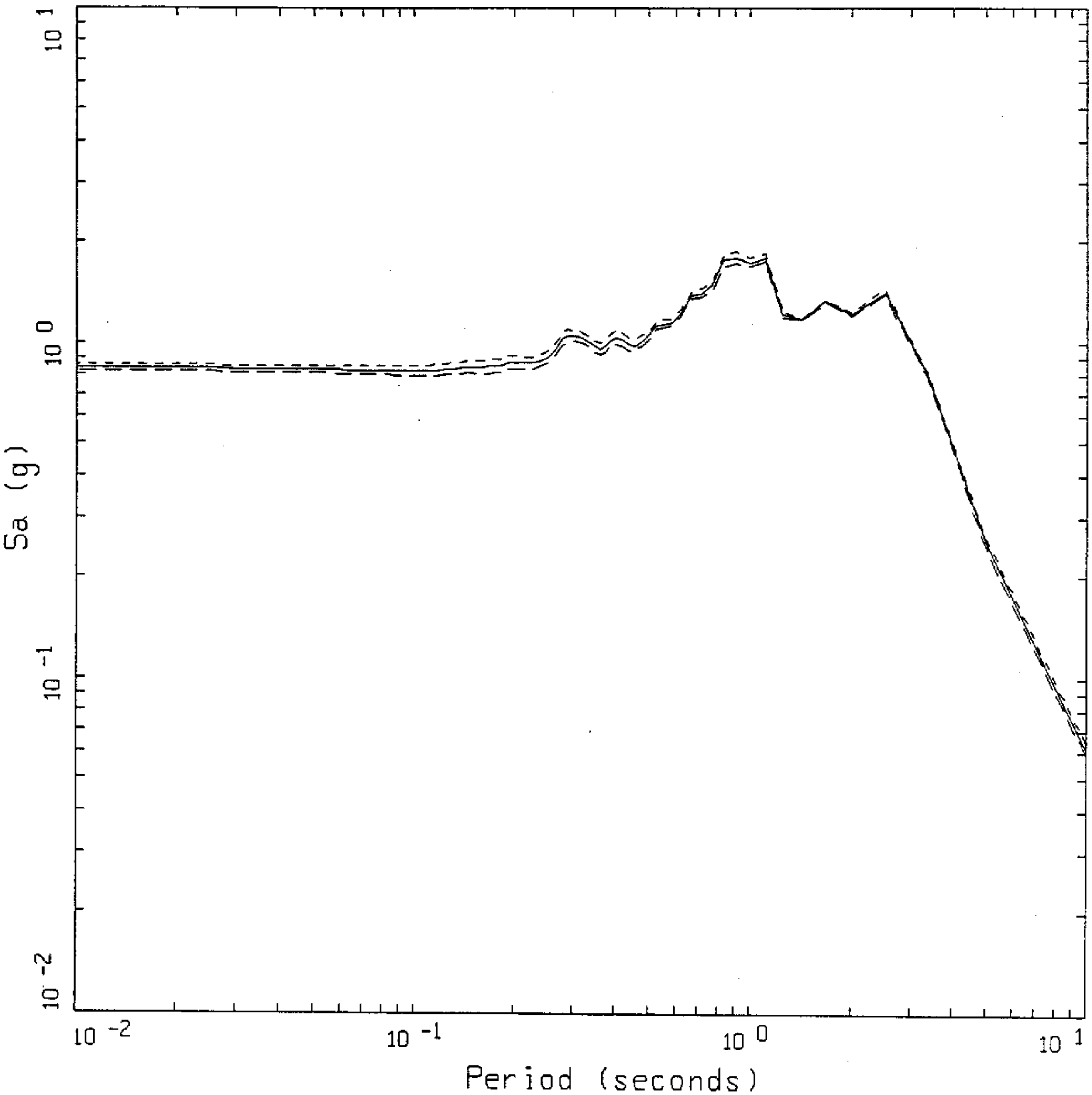


LEGEND

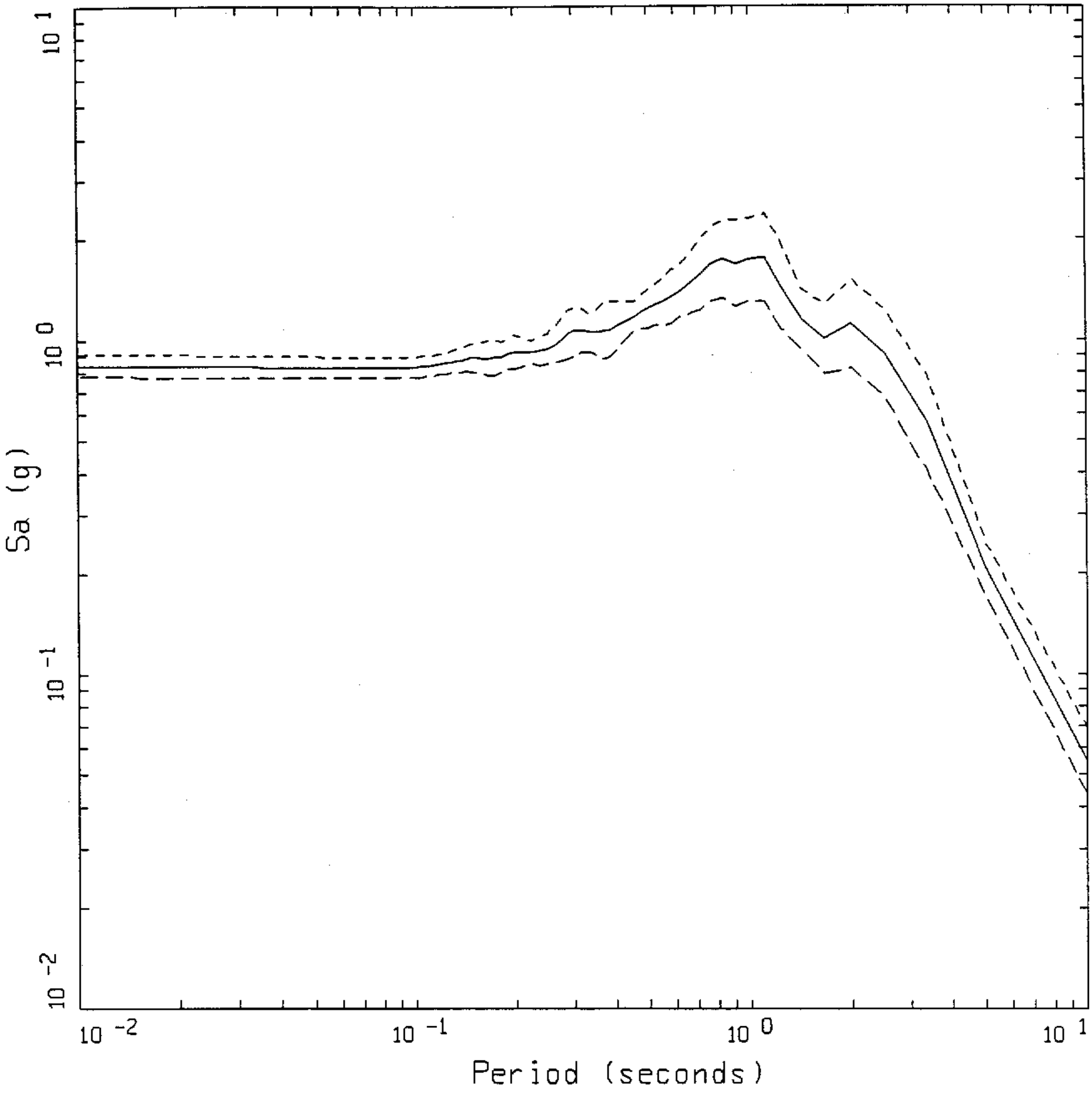
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.86 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.85 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.82 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21-VARIATION OF κ	Figure N-31
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

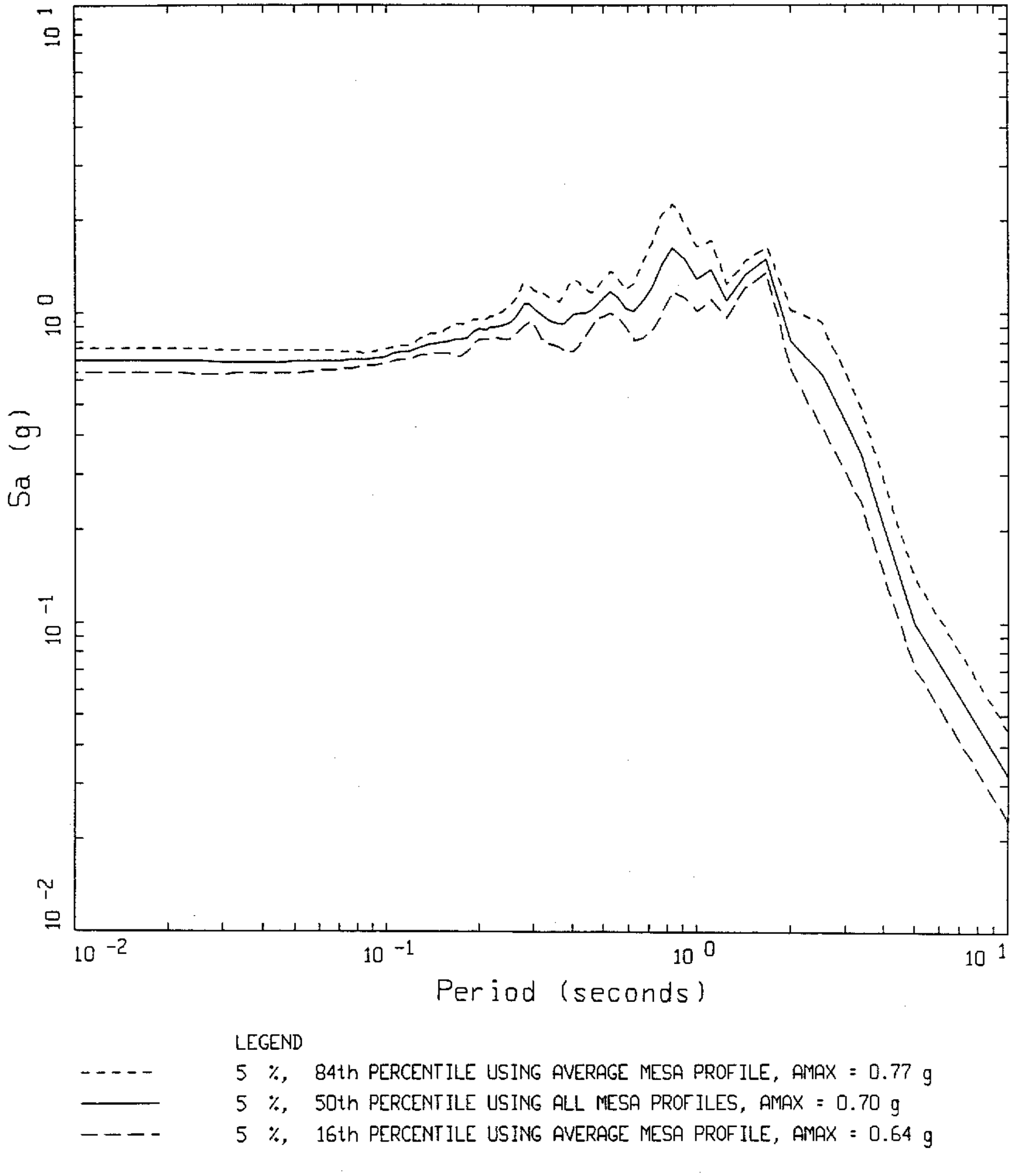
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.91 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.85 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.78 g

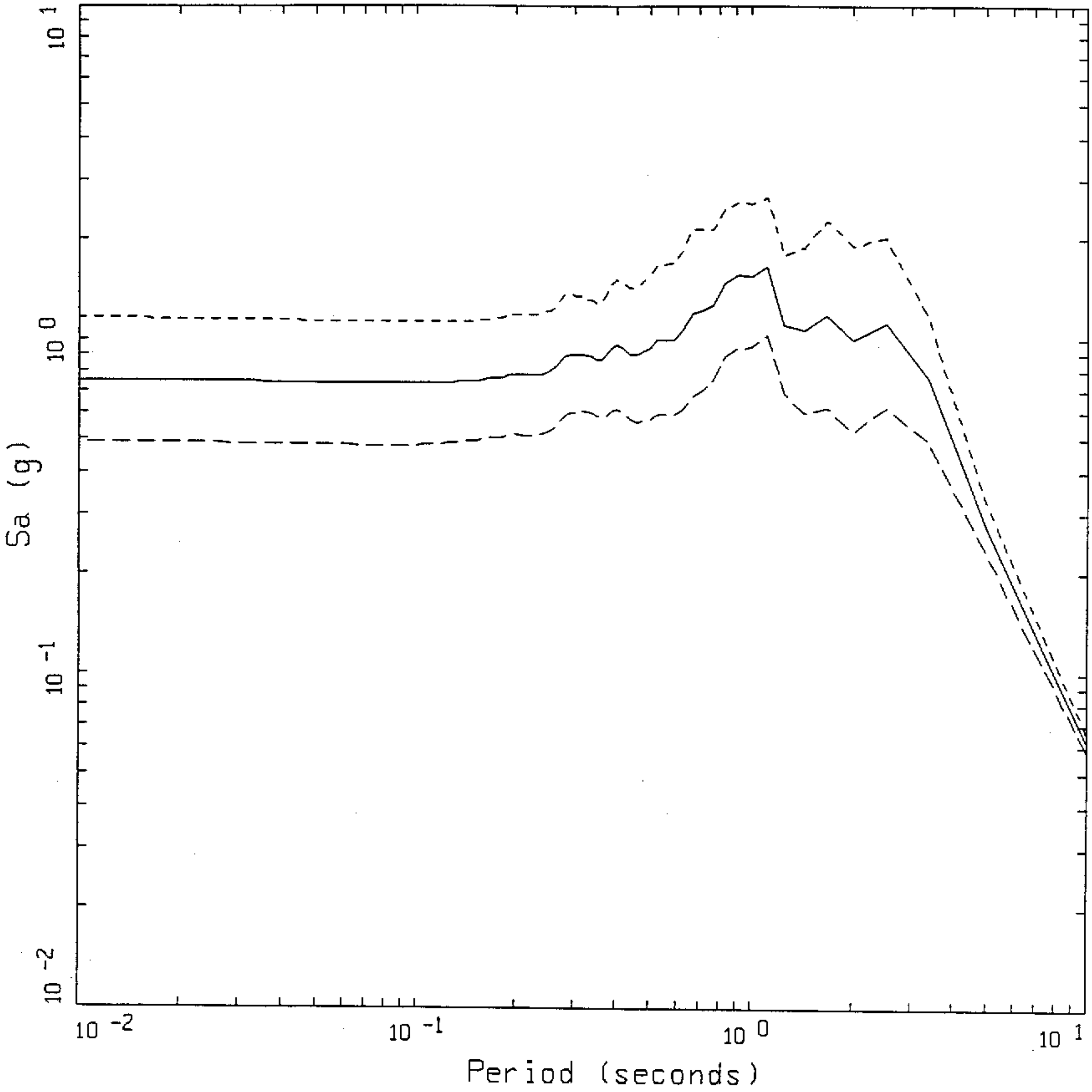
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21- VARIATION OF RUPTURE INITIATION	Figure N-32
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21-VARIATION OF SLIP	Figure N-33
Woodward-Clyde Federal Services			

91C0509A-1300/060293

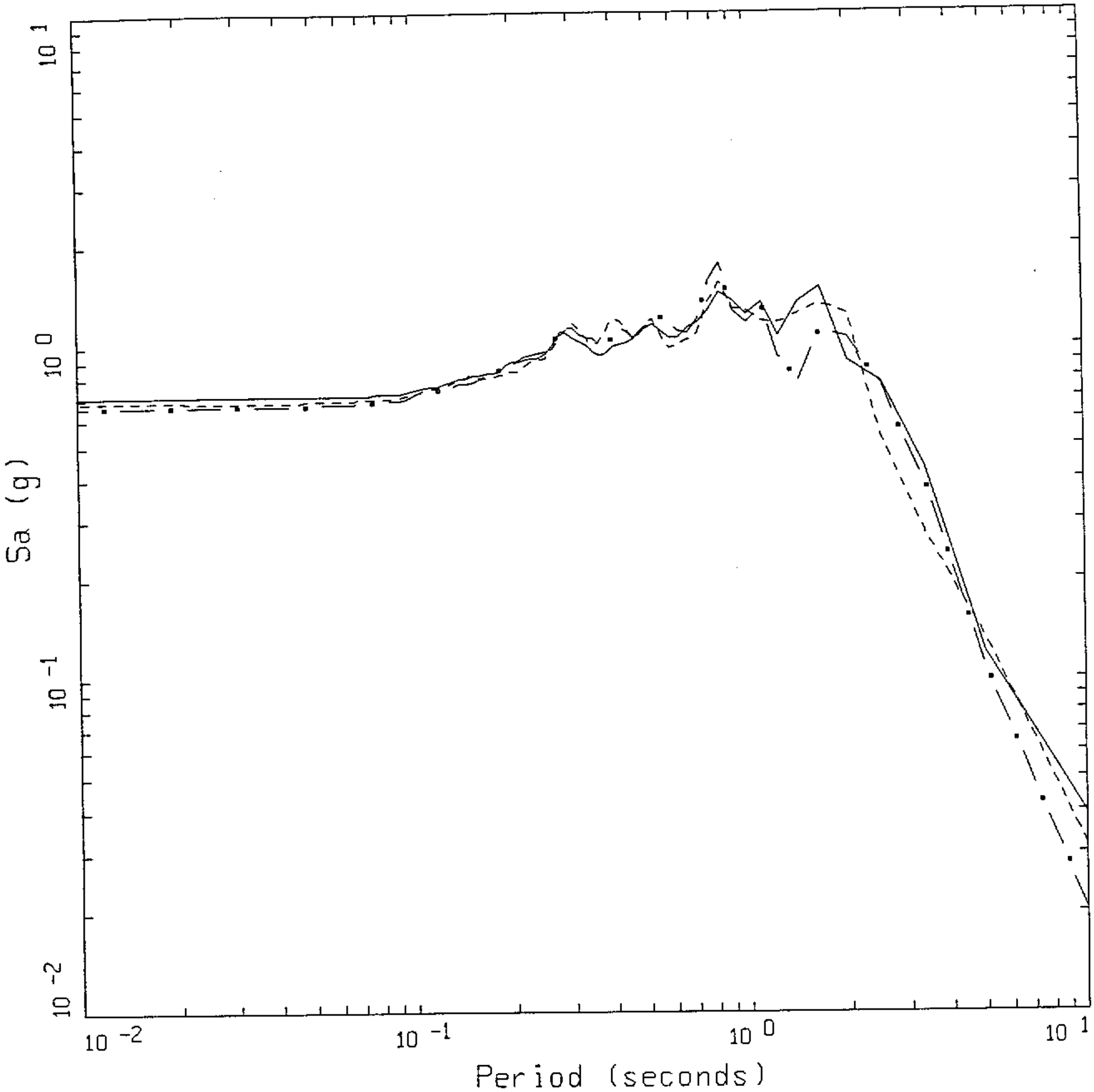


LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 1.16 g
——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.76 g
— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.49 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21- VARIATION OF PROFILE	Figure N-34
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-21-EFFECTS OF DIRECTIVITY	Figure N-35
Woodward-Clyde Federal Services			

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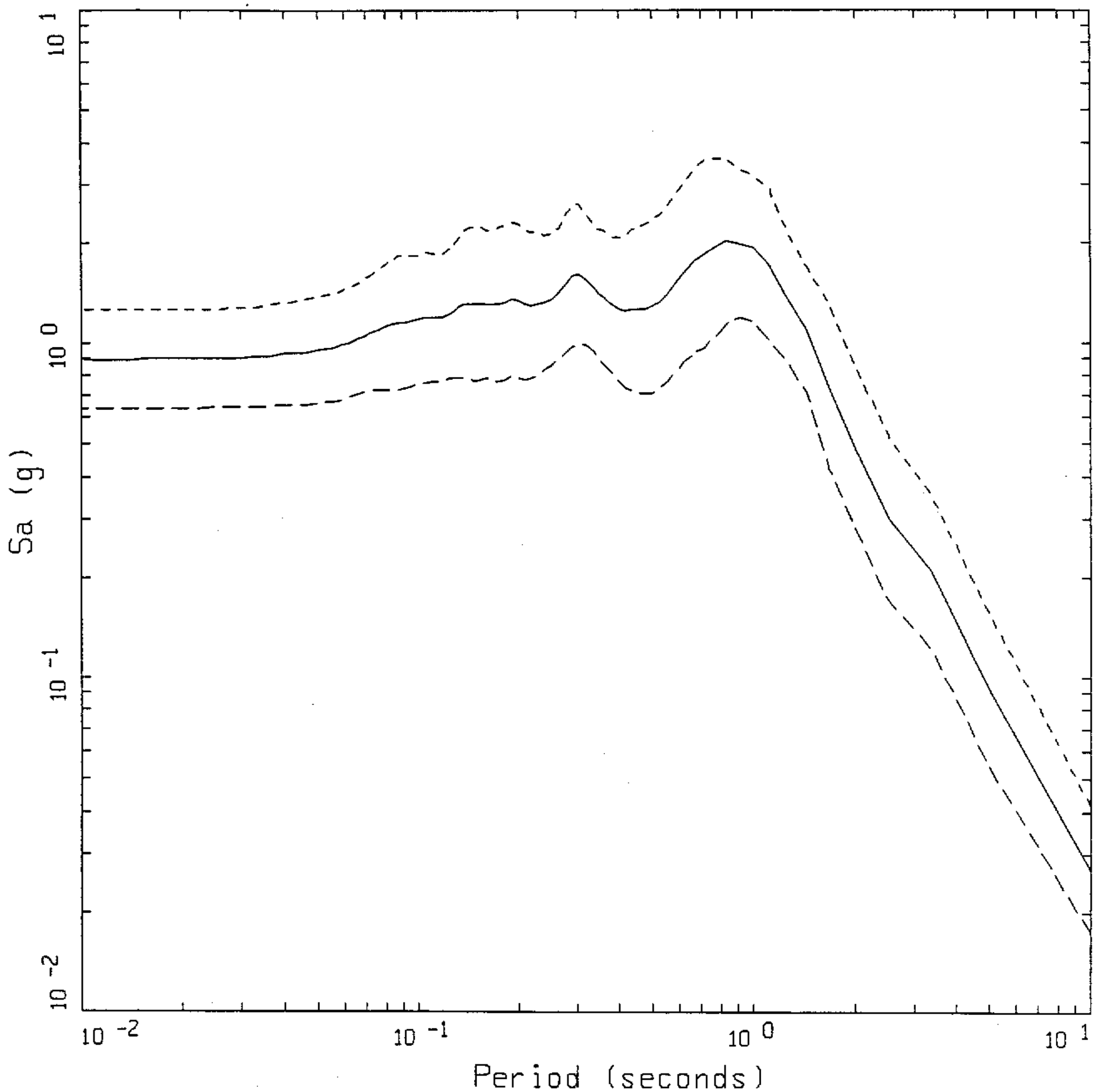
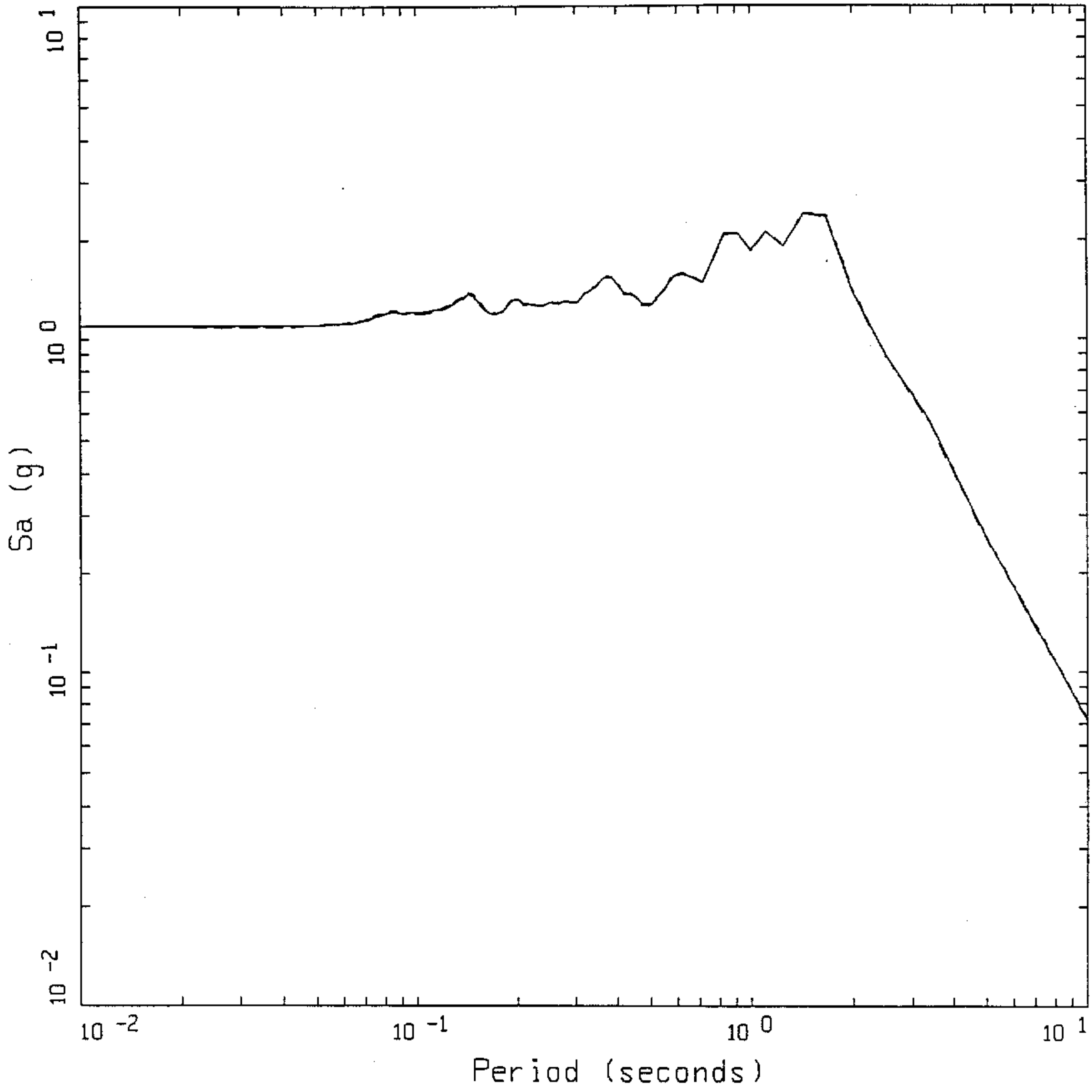


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.25 g
———	5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.90 g
— — — —	5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.64 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41-VARIATION OF PARAMETERS	Figure N-36
Woodward-Clyde Federal Services			

91C0509A-1300/060293

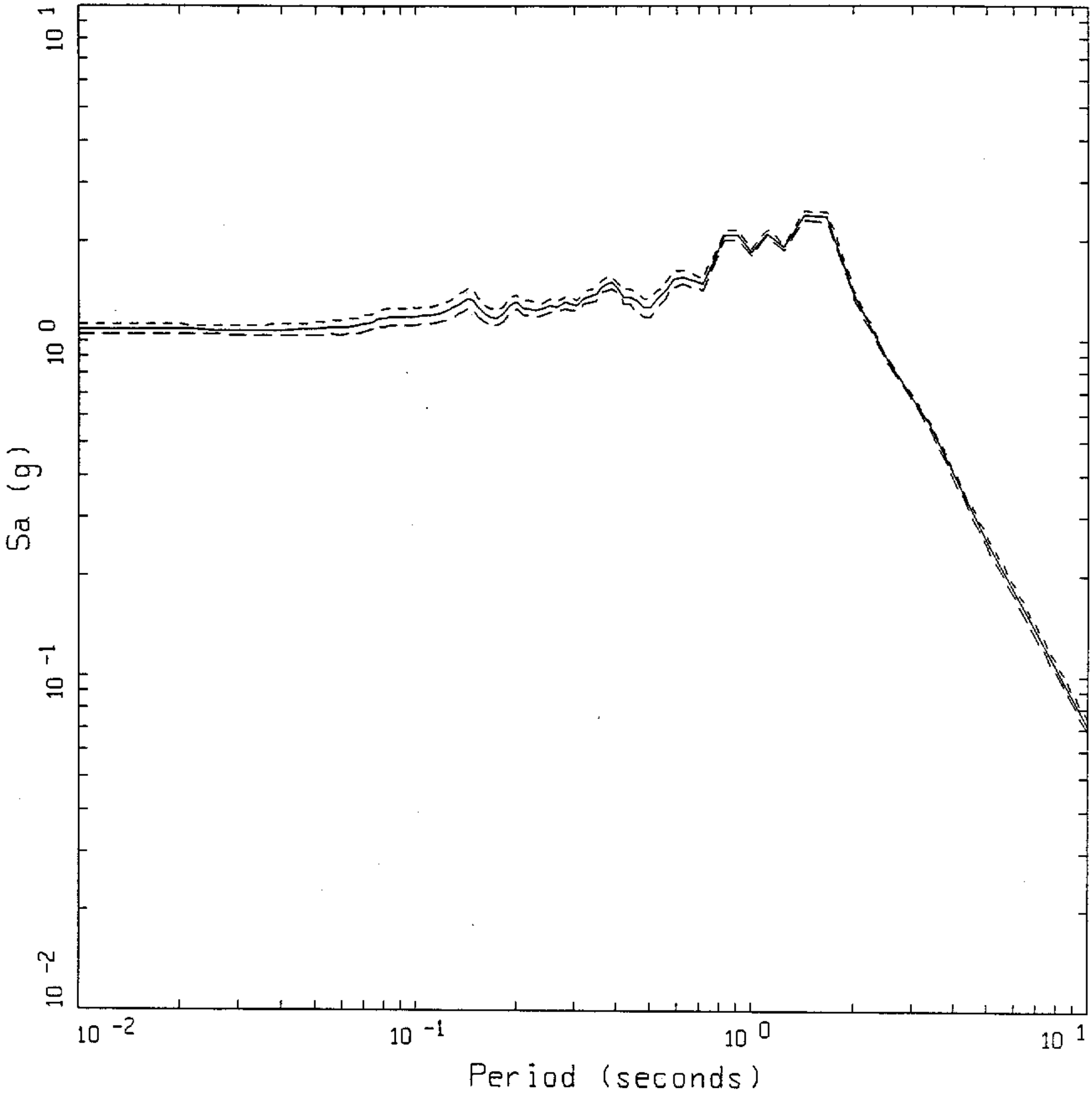


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.10 g
————	5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.10 g
— — — -	5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.10 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41- VARIATION OF Q(f)	Figure N-37
Woodward-Clyde Federal Services			

91C0509A-1300/060293

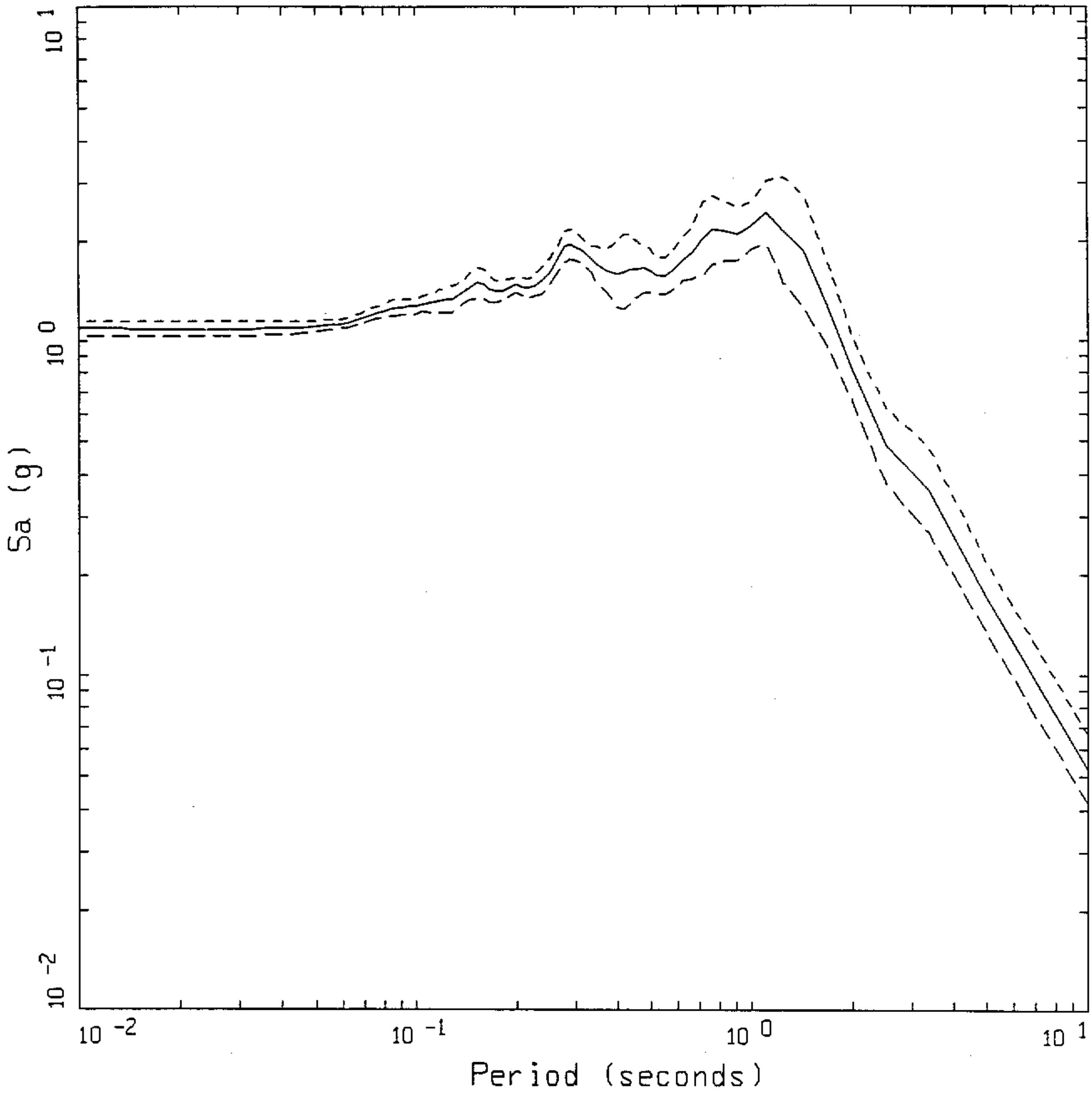


LEGEND

- - - - -	5 %,	84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.12 g
———	5 %,	50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.09 g
— — — —	5 %,	16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.05 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41-VARIATION OF κ	Figure N-38
Woodward-Clyde Federal Services			

91C0509A-1300/060293

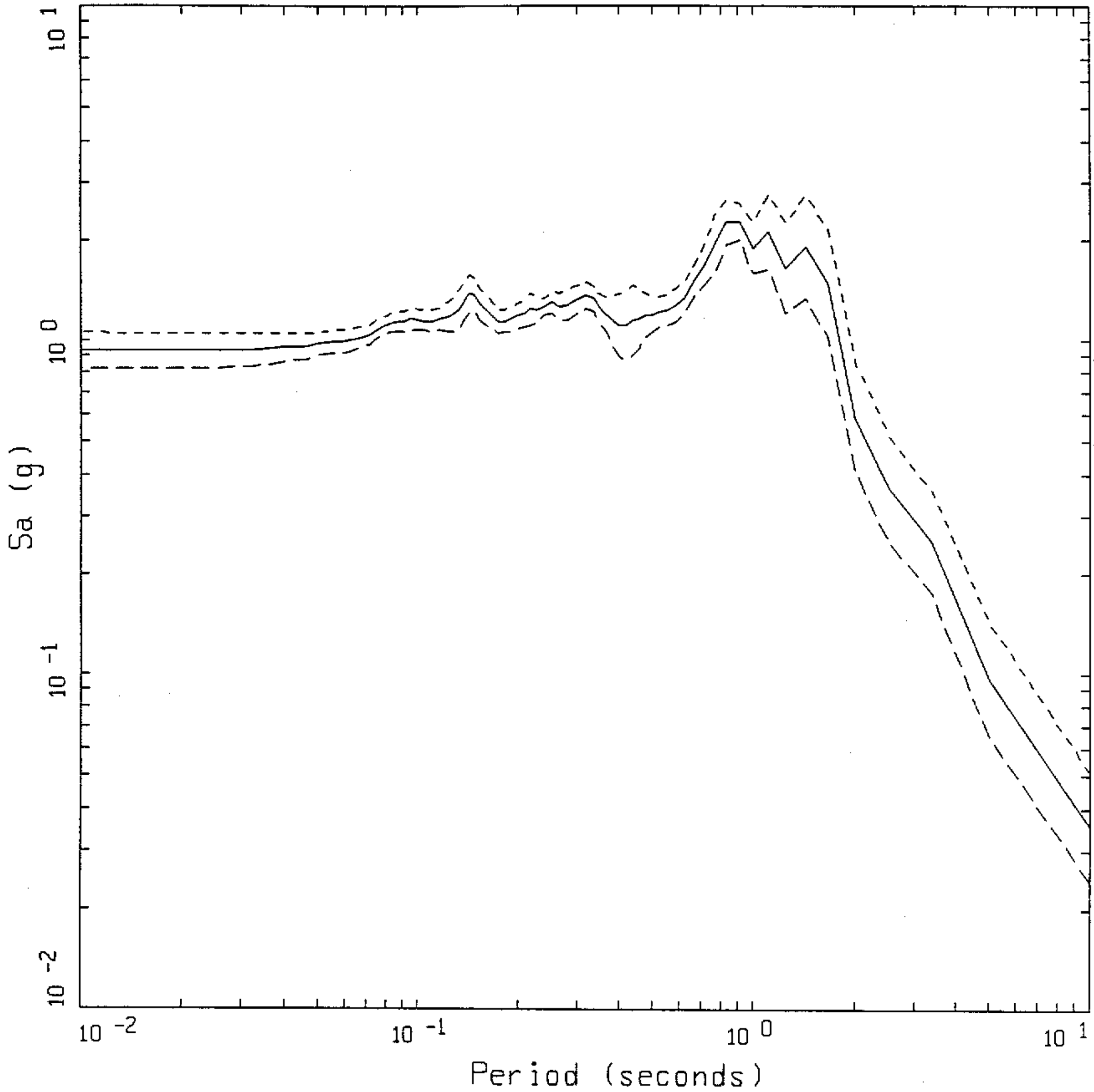


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.15 g
———	5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.10 g
— — —	5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.04 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41- VARIATION OF RUPTURE INITIATION	Figure N-39
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

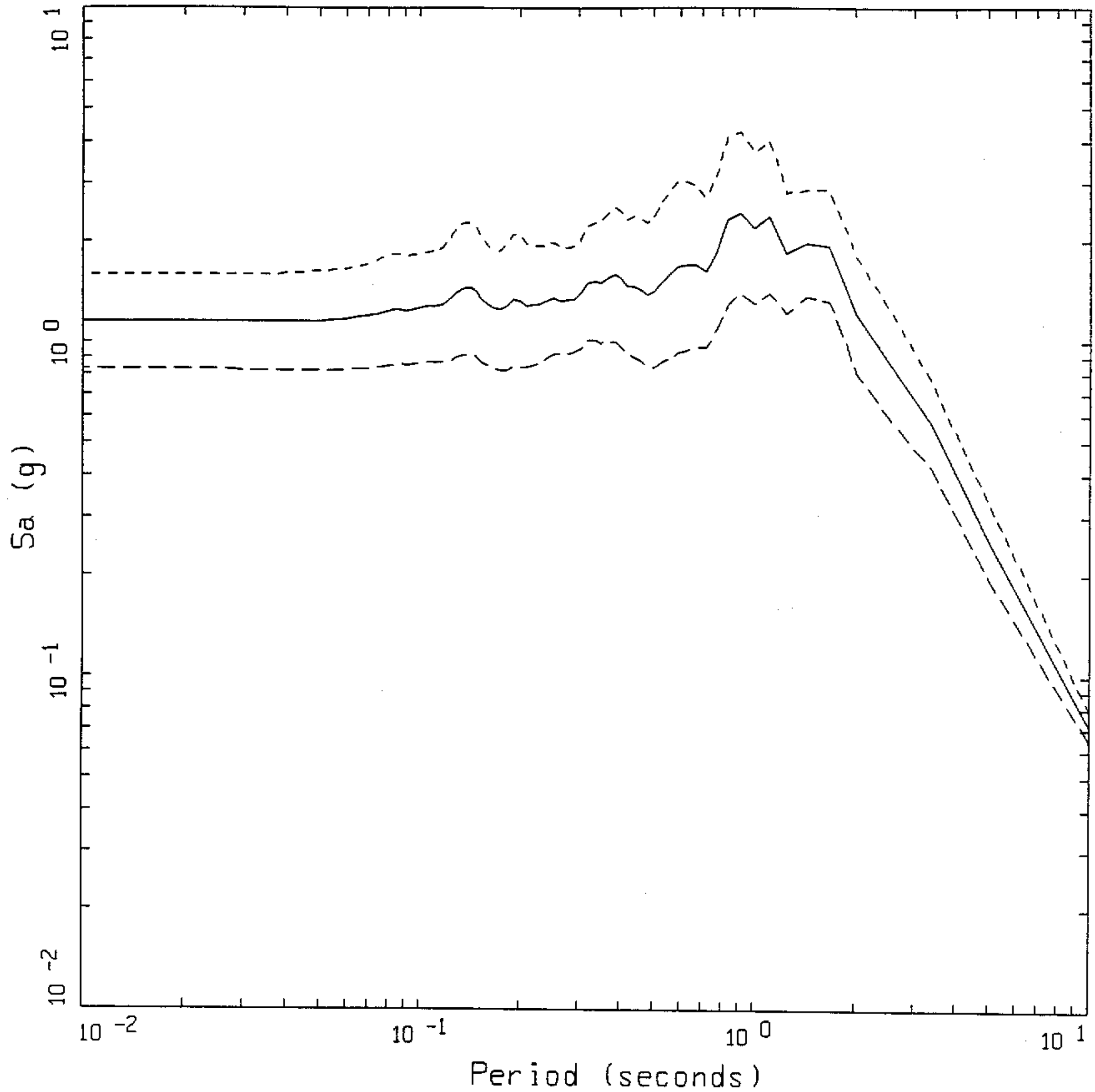
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.05 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 0.93 g

— — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.82 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41-VARIATION OF SLIP	Figure N-40
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

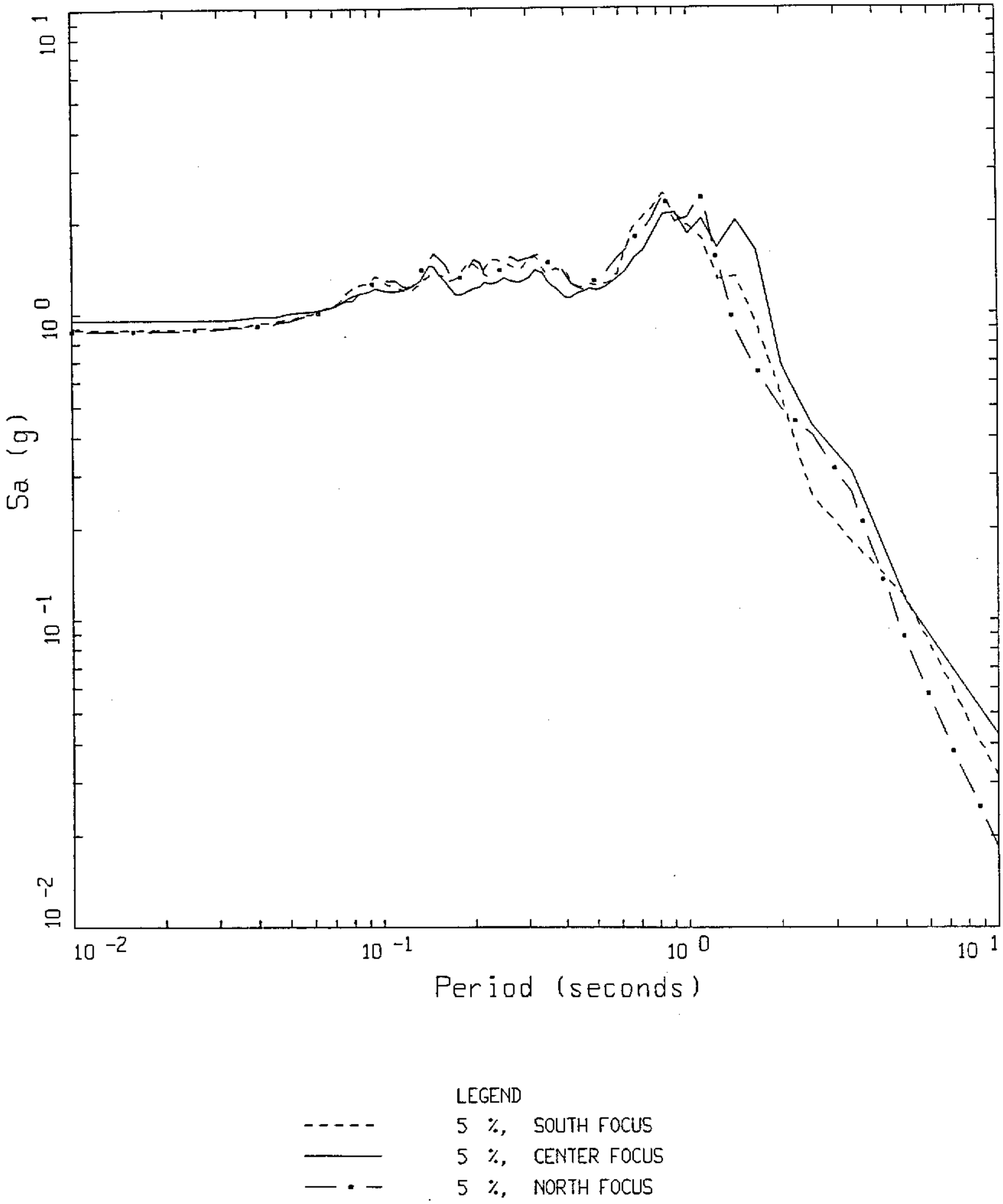
- - - - - 5 %, 84th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 1.59 g

——— 5 %, 50th PERCENTILE USING ALL VALLEY PROFILES, AMAX = 1.16 g

— — — — 5 %, 16th PERCENTILE USING AVERAGE VALLEY PROFILE, AMAX = 0.83 g

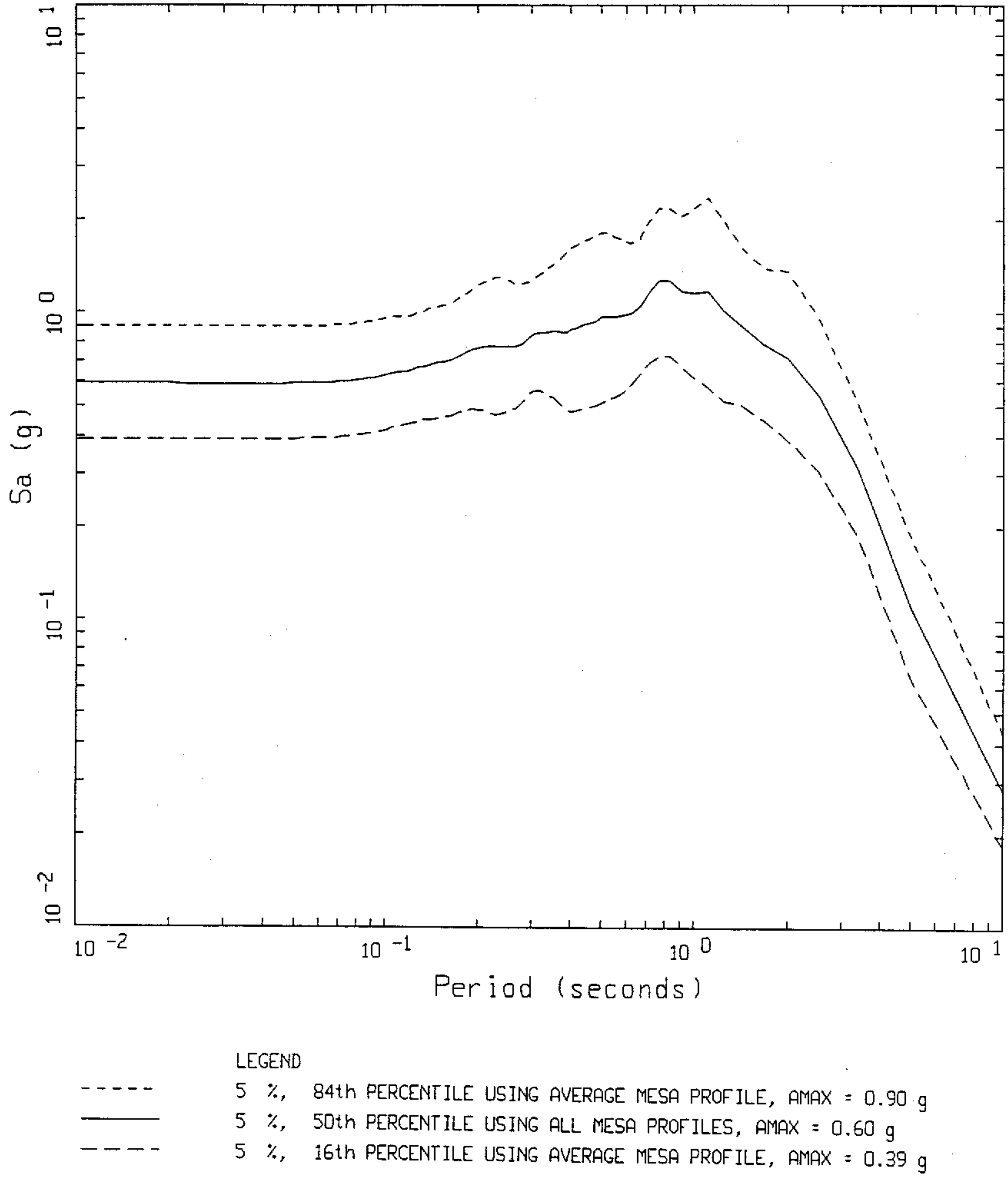
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41-VARIATION OF PROFILE	Figure N-41
Woodward-Clyde Federal Services			

91C0509A-1300/060293



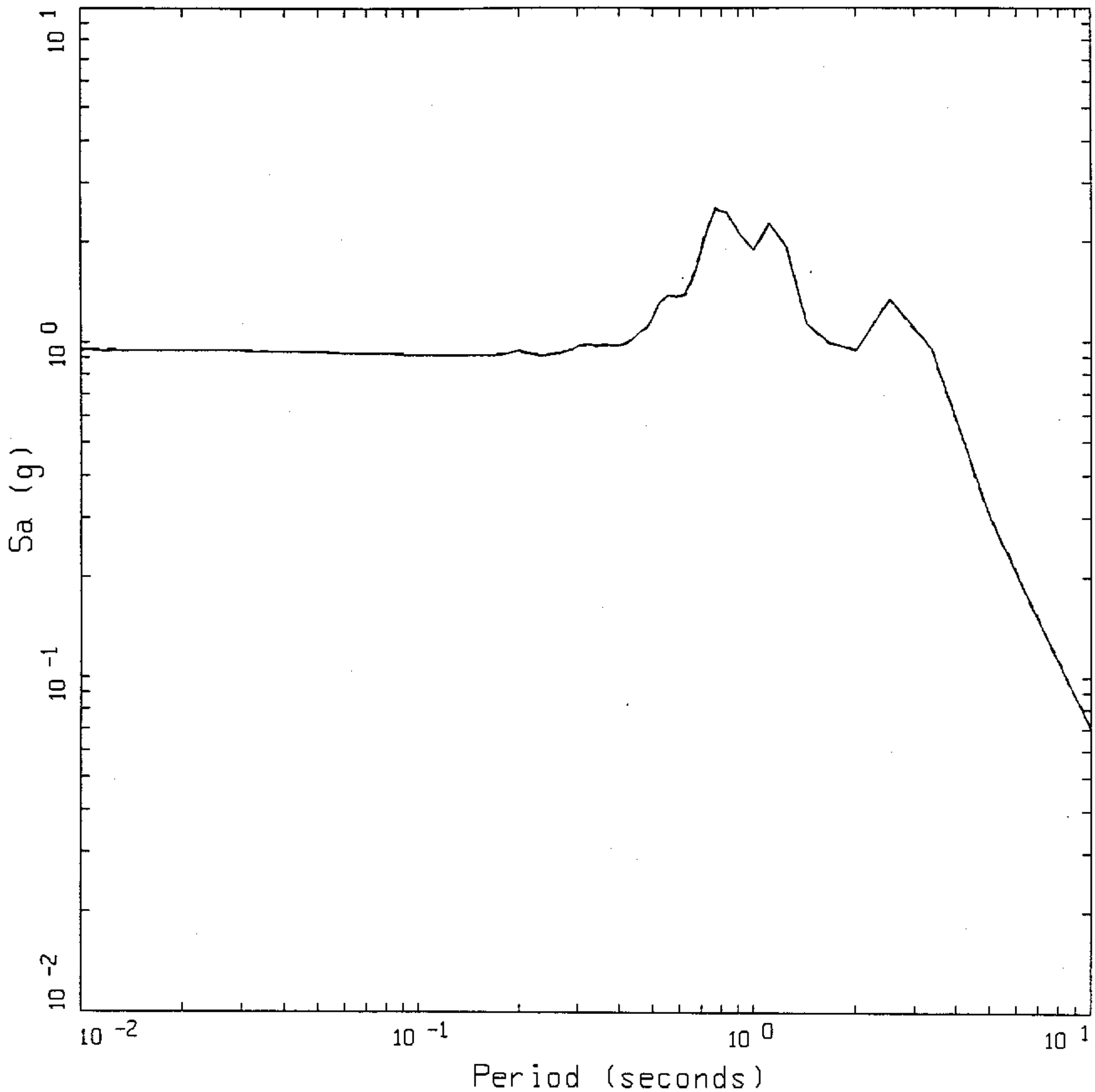
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-41- EFFECTS OF DIRECTIVITY	Figure N-42
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46-VARIATION OF PARAMETERS	Figure N-43
Woodward-Clyde Federal Services			

91C0509A-1300/060293

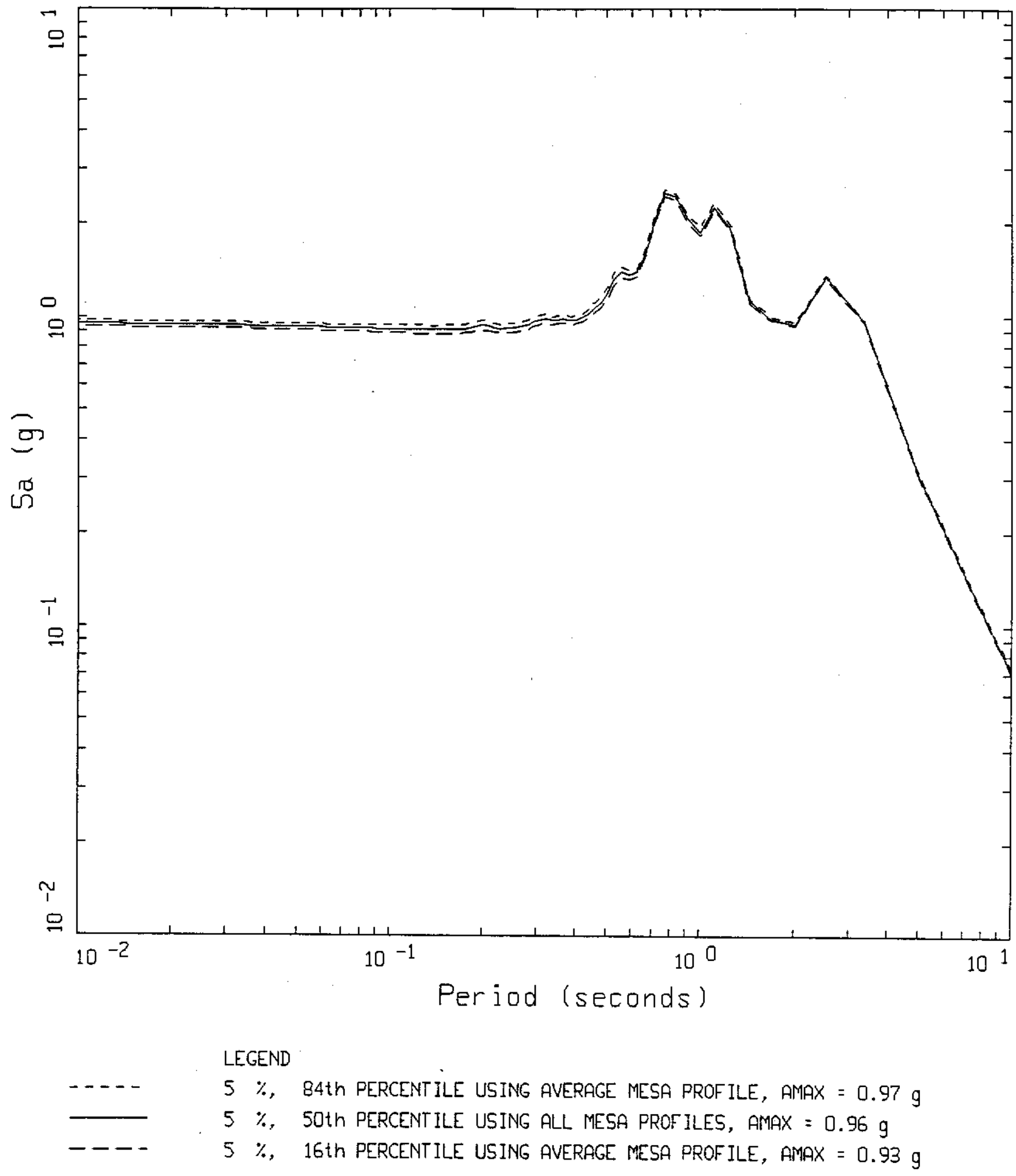


LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.96 g
——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.96 g
— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.96 g

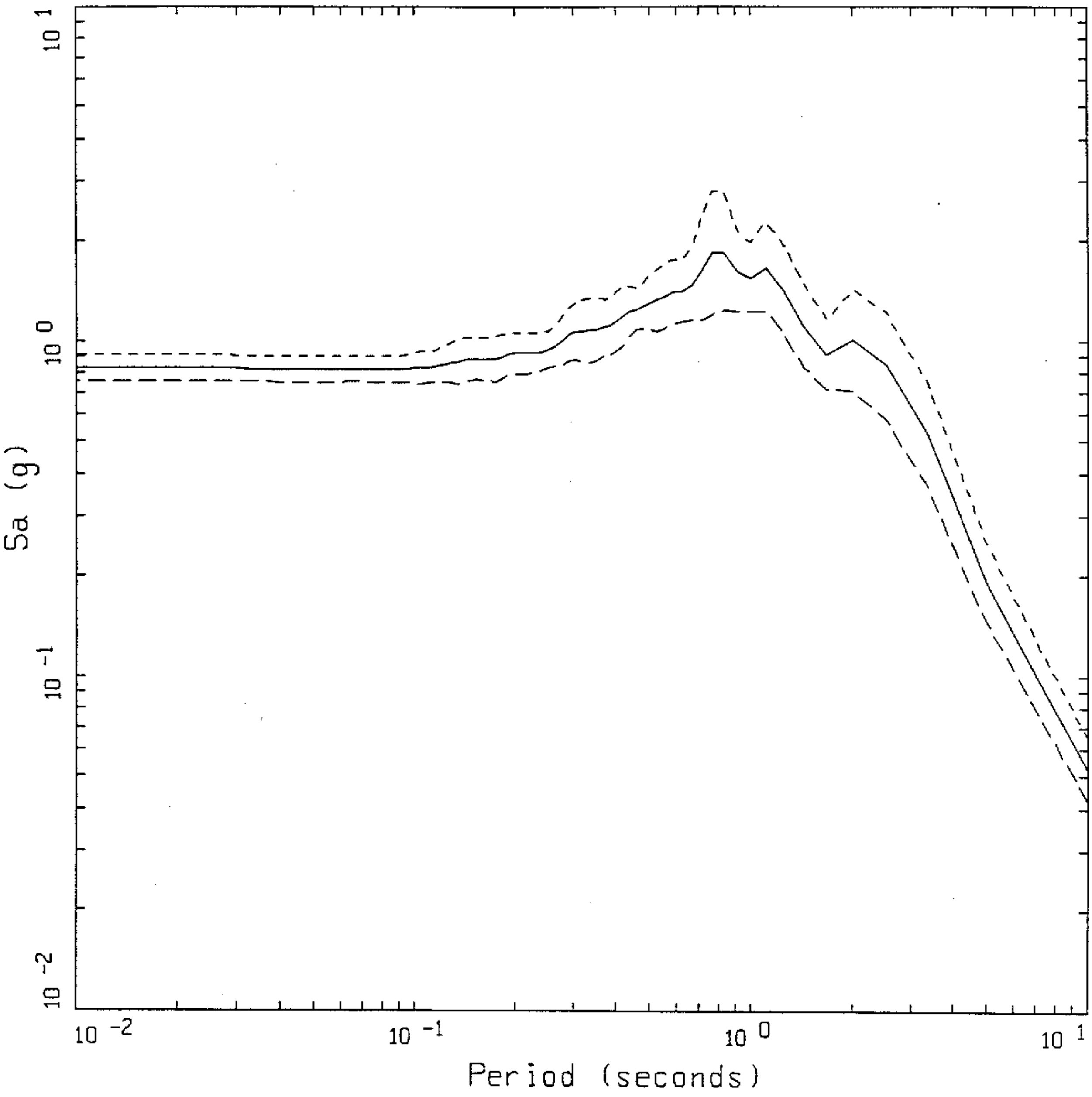
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46- VARIATION OF Q(f)	Figure N-44
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46-VARIATION OF κ	Figure N-45
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

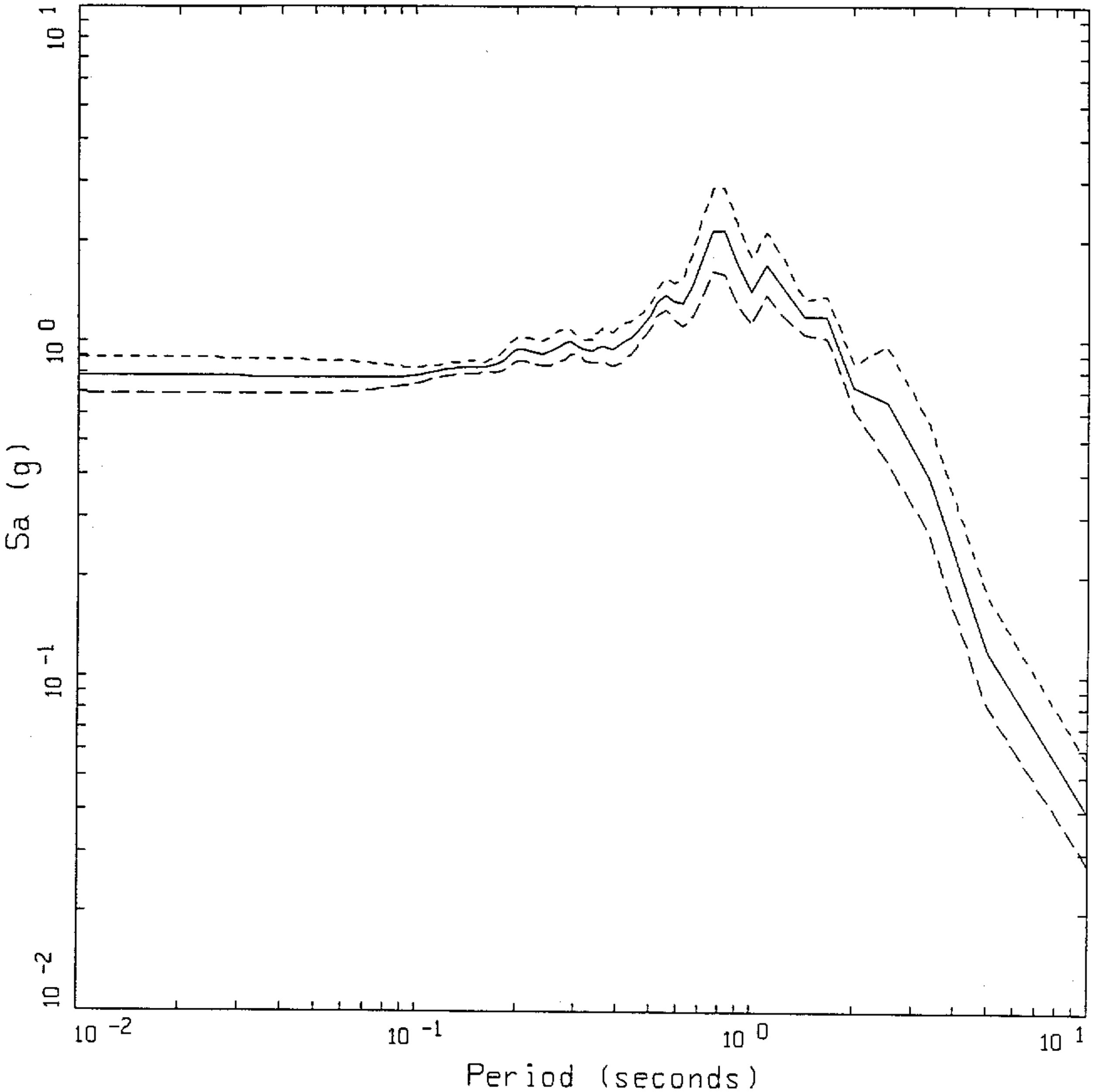
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.91 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.84 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.76 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46- VARIATION OF RUPTURE INITIATION	Figure N-46
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

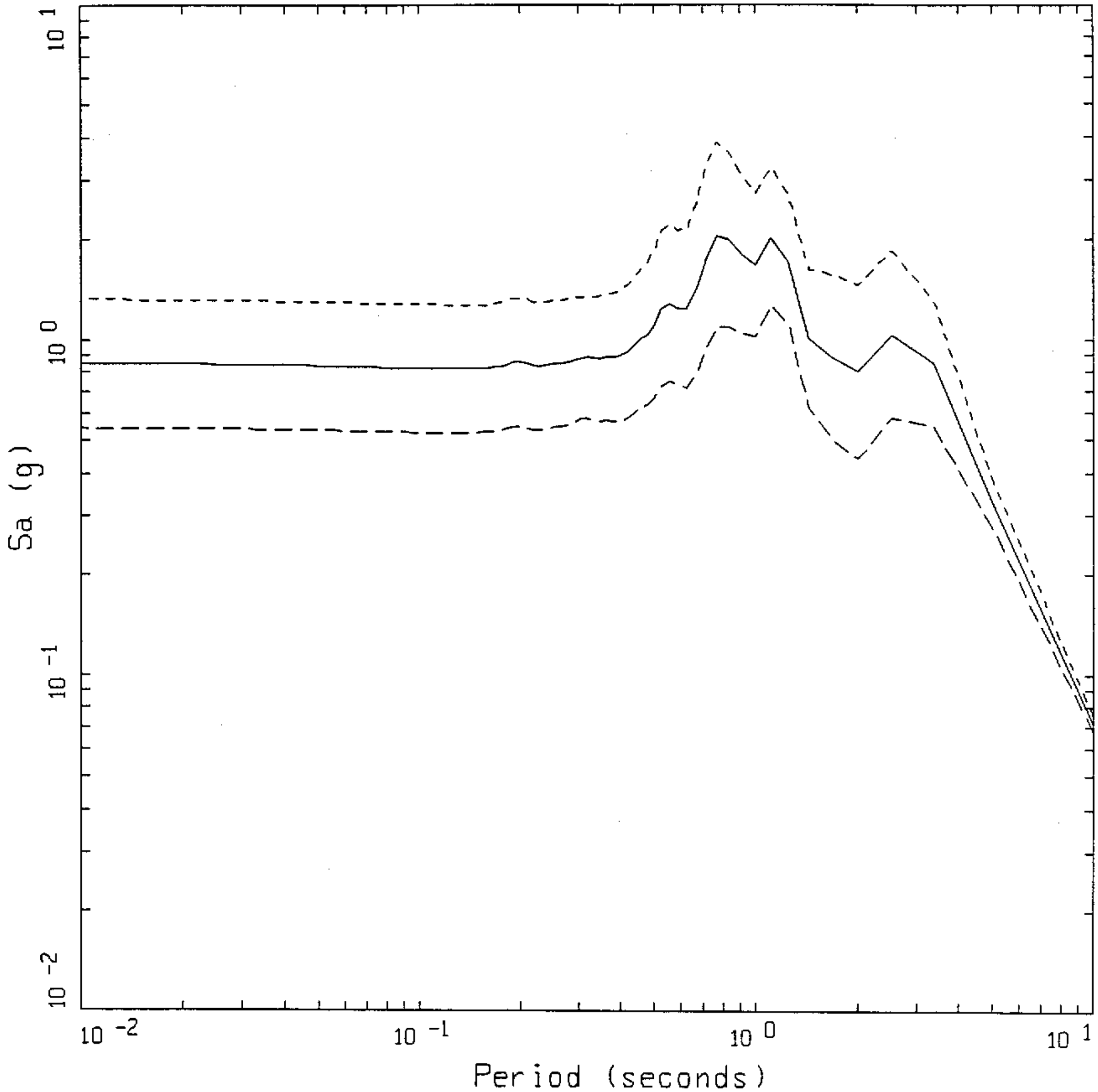
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.89 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.79 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.69 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46- VARIATION OF SLIP	Figure N-47
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

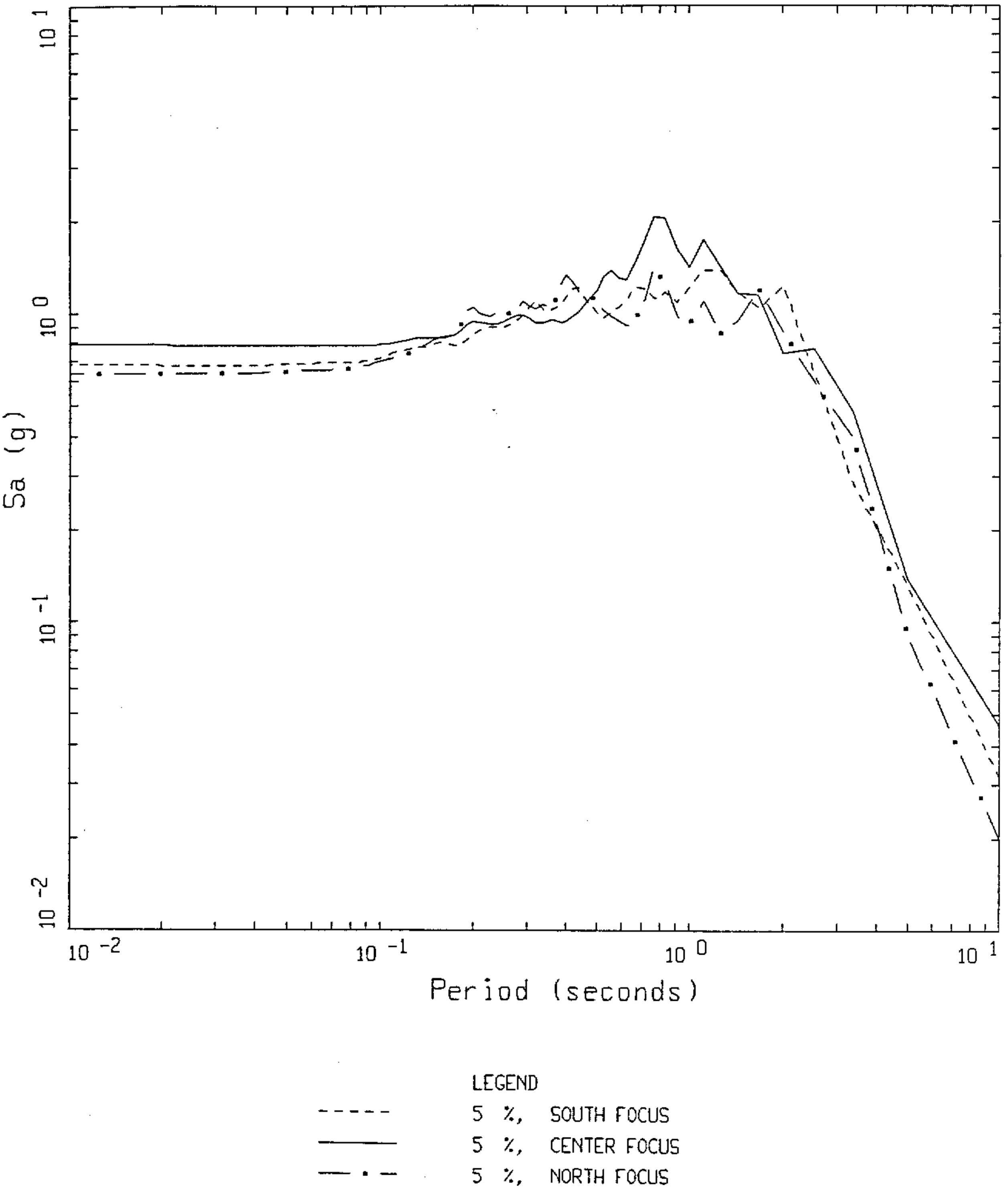
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 1.33 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.86 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.55 g

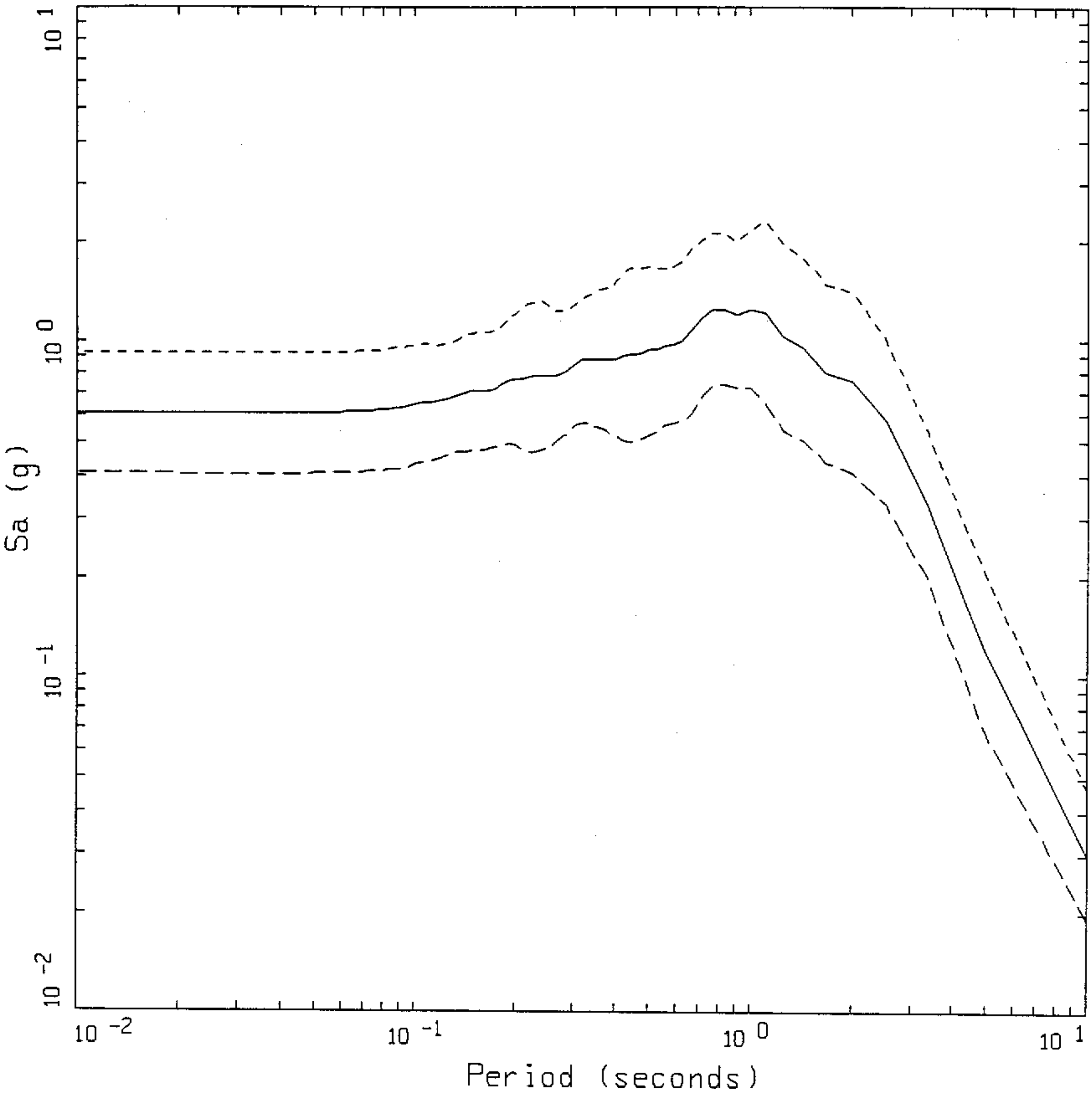
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46-VARIATION OF PROFILE	Figure N-48
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-46- EFFECTS OF DIRECTIVITY	Figure N-49
Woodward-Clyde Federal Services			

91C0509A-1300/060293

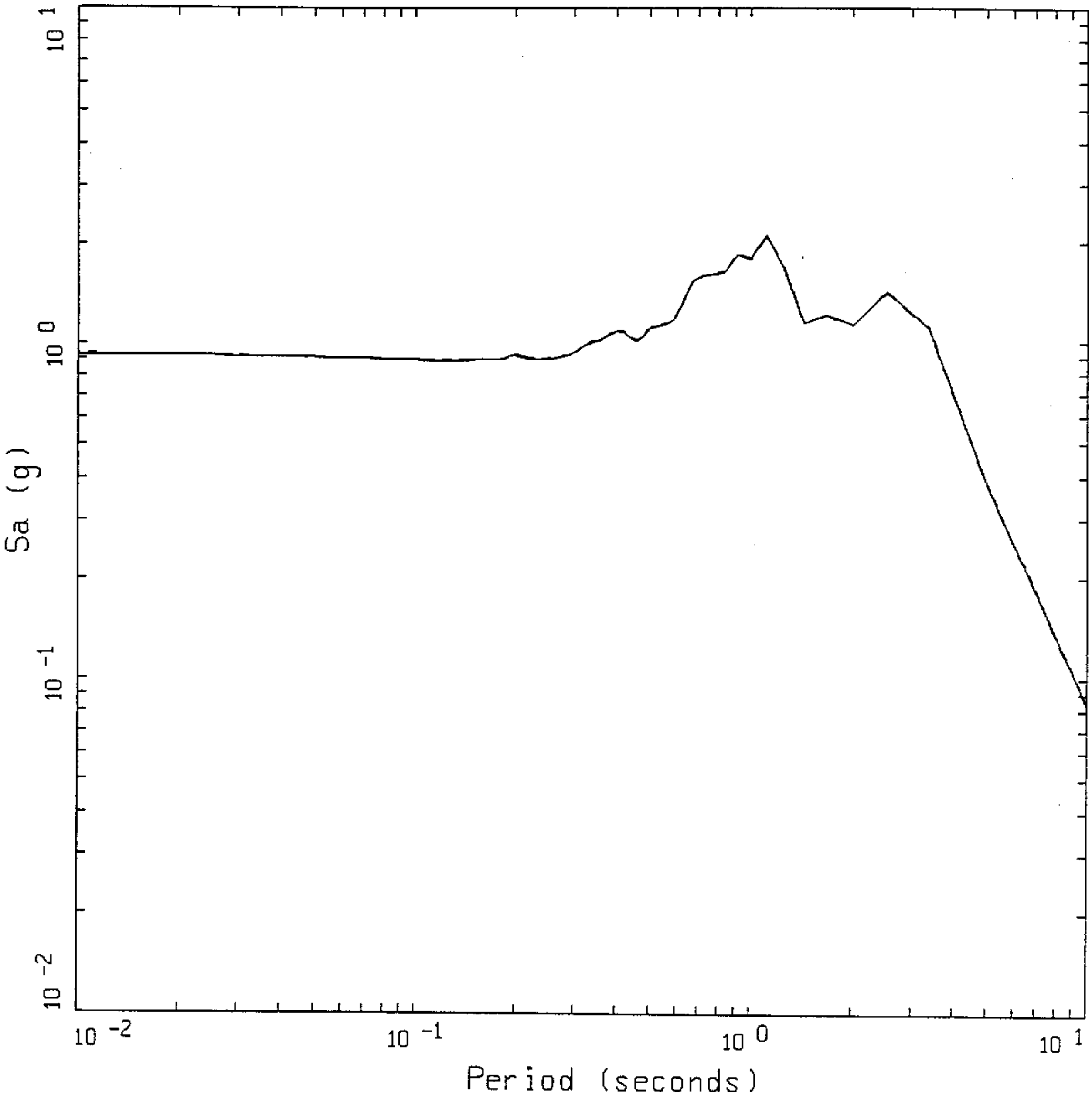


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.93 g
————	5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.62 g
— — — —	5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.41 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55- VARIATION OF PARAMETERS	Figure N-50
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

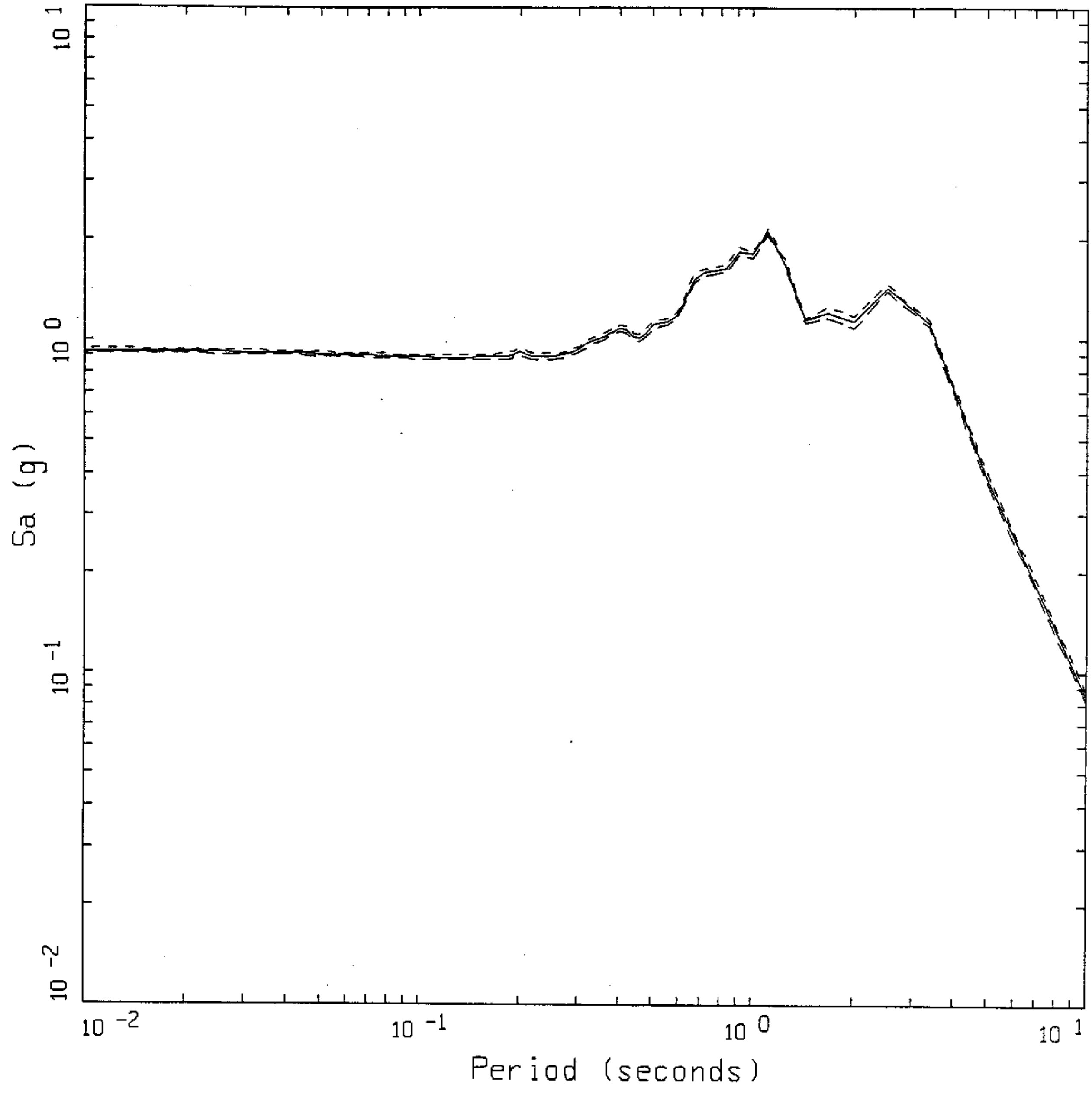
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.93 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.93 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.93 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55- VARIATION OF Q(f)	Figure N-51
Woodward-Clyde Federal Services			

91C0509A-1300/060293

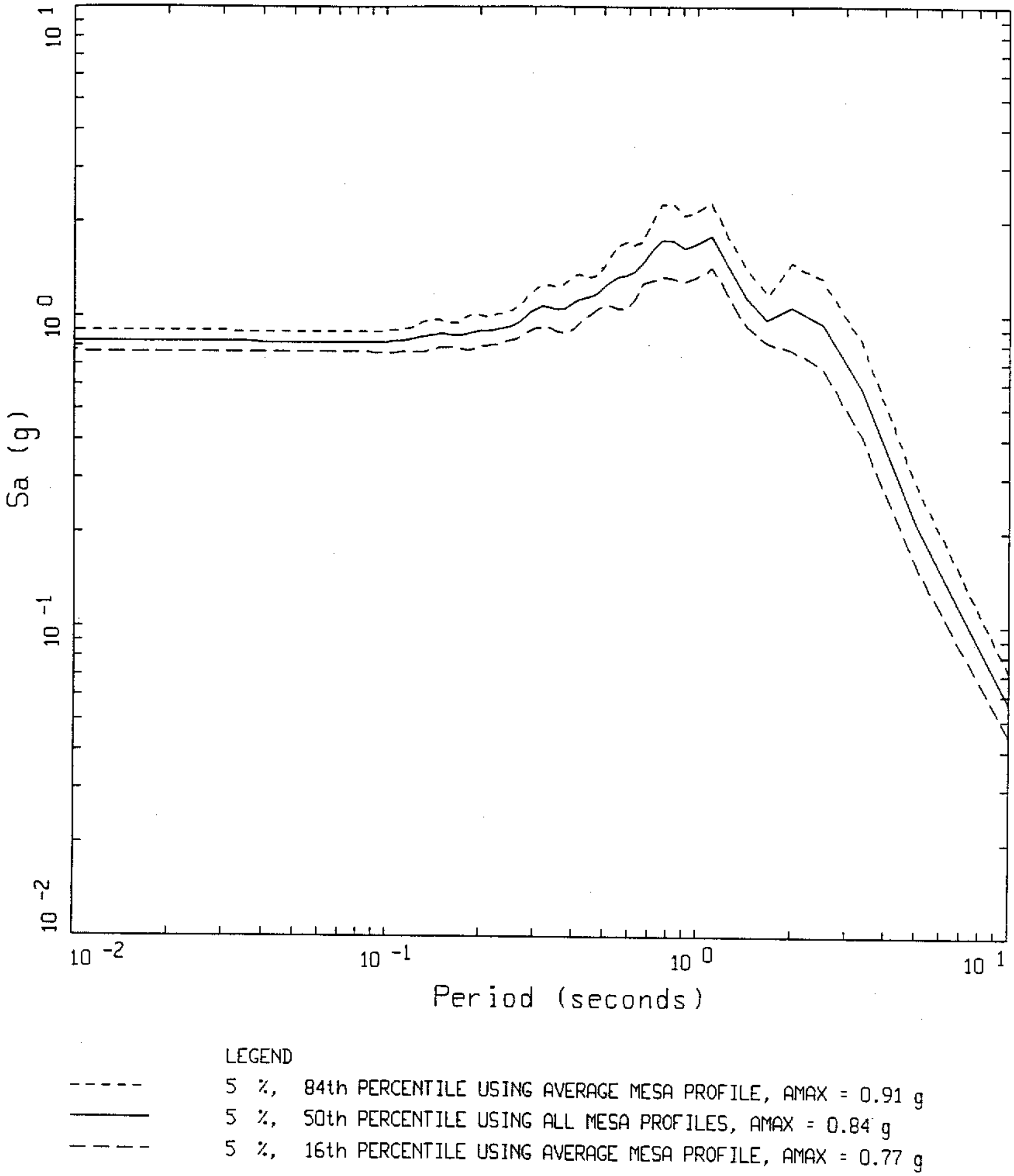


LEGEND

- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.94 g
——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.93 g
— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.91 g

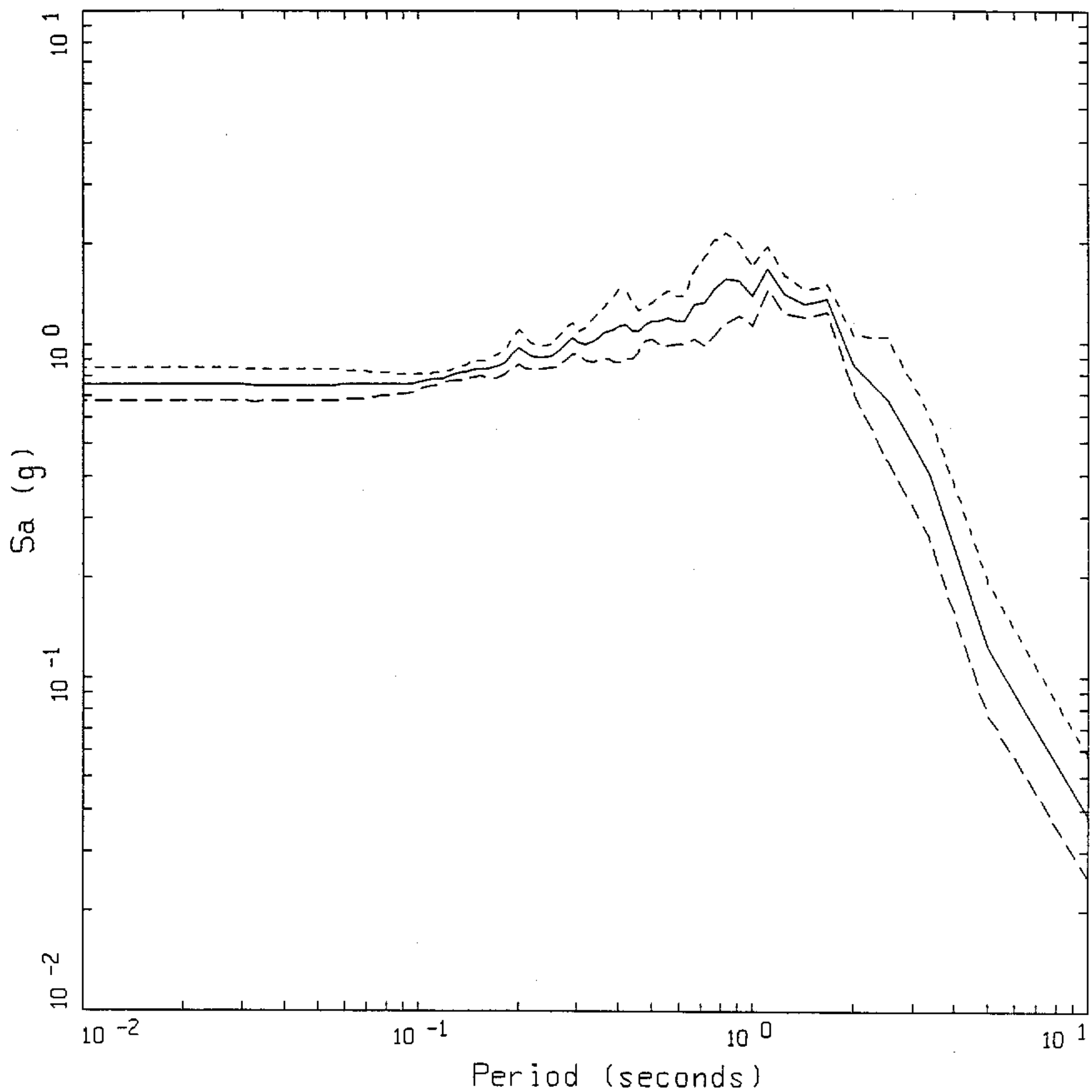
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55- VARIATION OF κ	Figure N-52
Woodward-Clyde Federal Services			

91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55- VARIATION OF RUPTURE INITIATION	Figure N-53
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

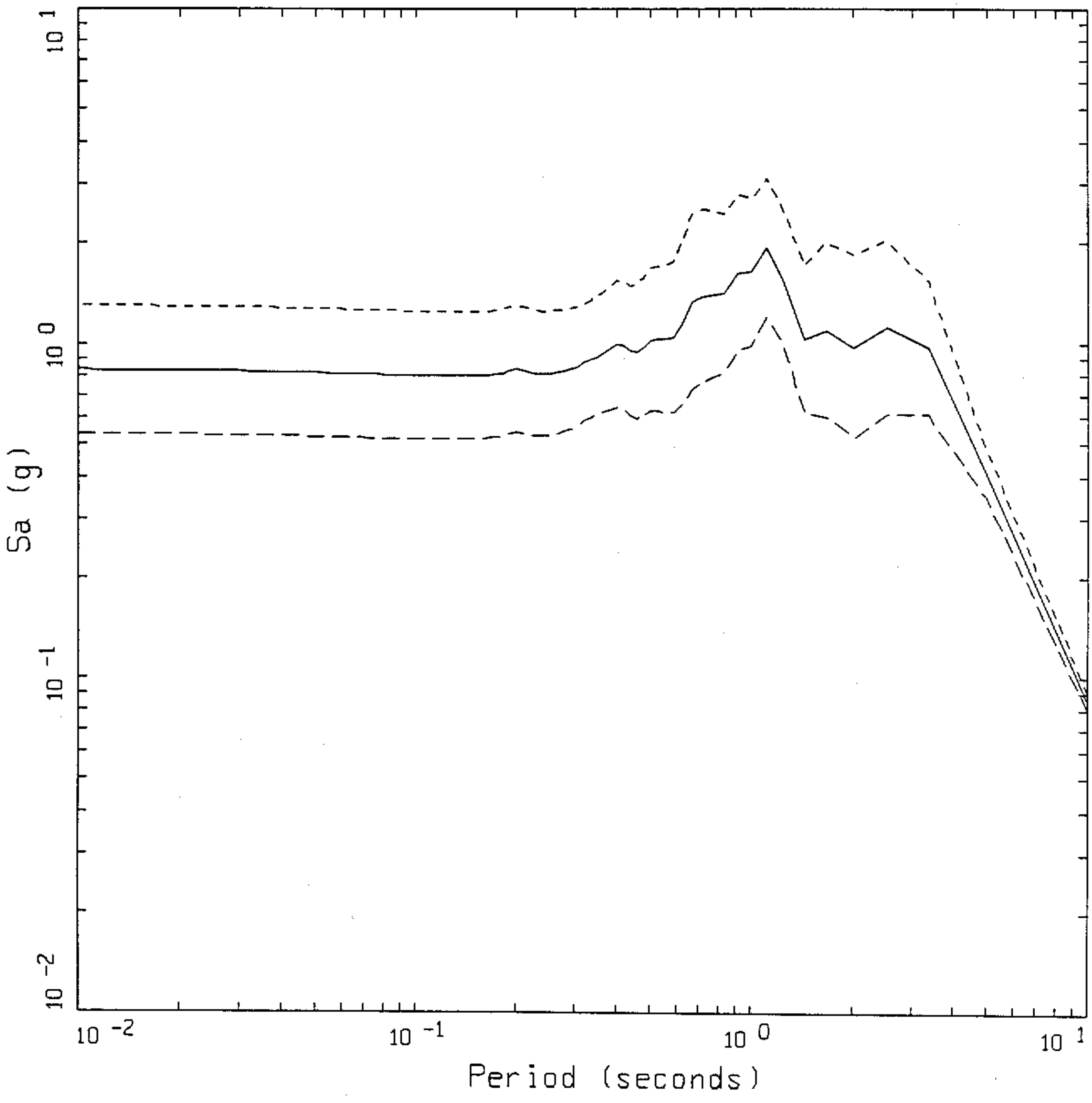
- - - - - 5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.86 g

——— 5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.76 g

— — — 5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.67 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55-VARIATION OF SLIP	Figure N-54
Woodward-Clyde Federal Services			

91C0509A-1300/060293

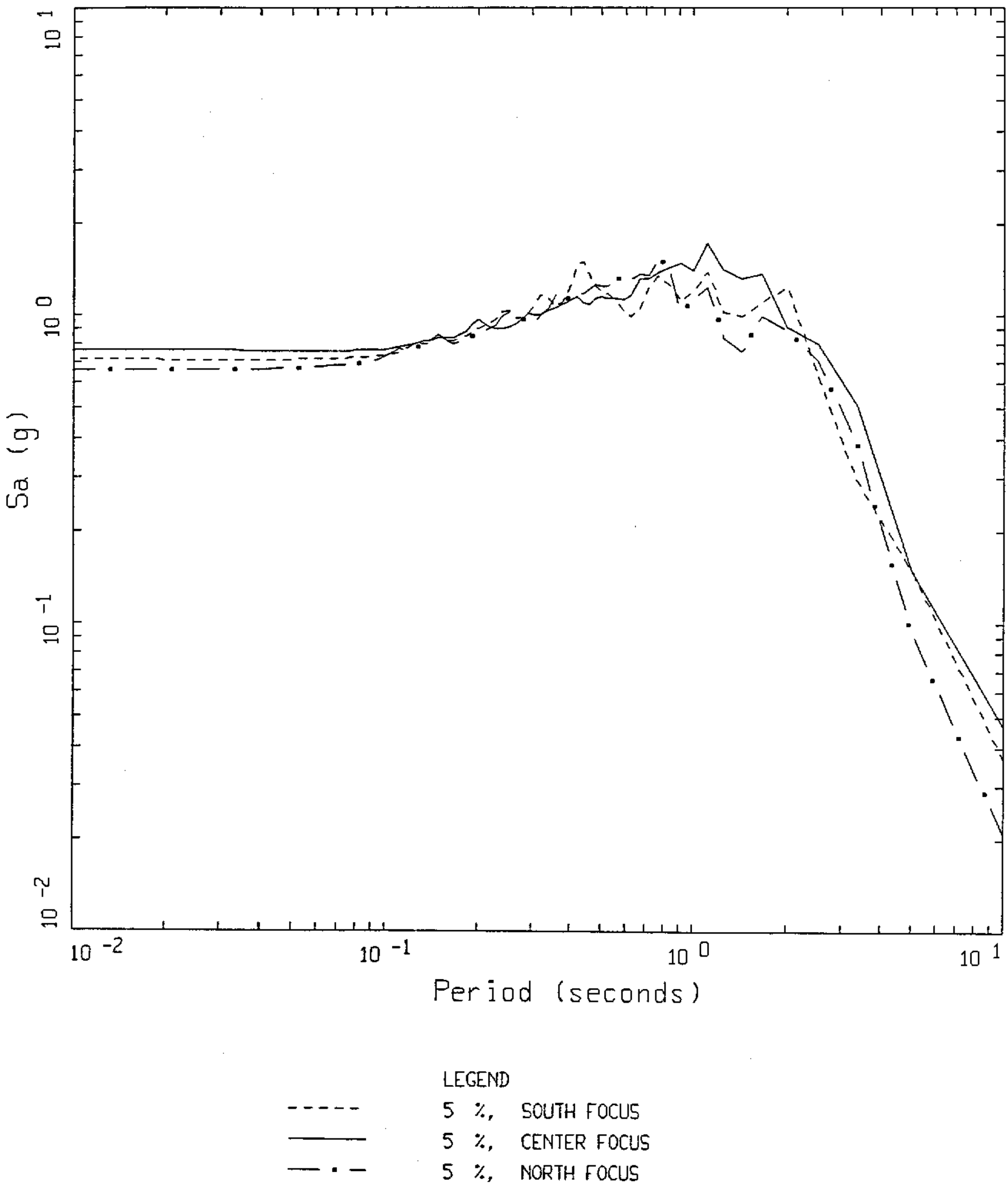


LEGEND

- - - - -	5 %, 84th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 1.30 g
———	5 %, 50th PERCENTILE USING ALL MESA PROFILES, AMAX = 0.84 g
— — —	5 %, 16th PERCENTILE USING AVERAGE MESA PROFILE, AMAX = 0.54 g

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55-VARIATION OF PROFILE	Figure N-55
Woodward-Clyde Federal Services			

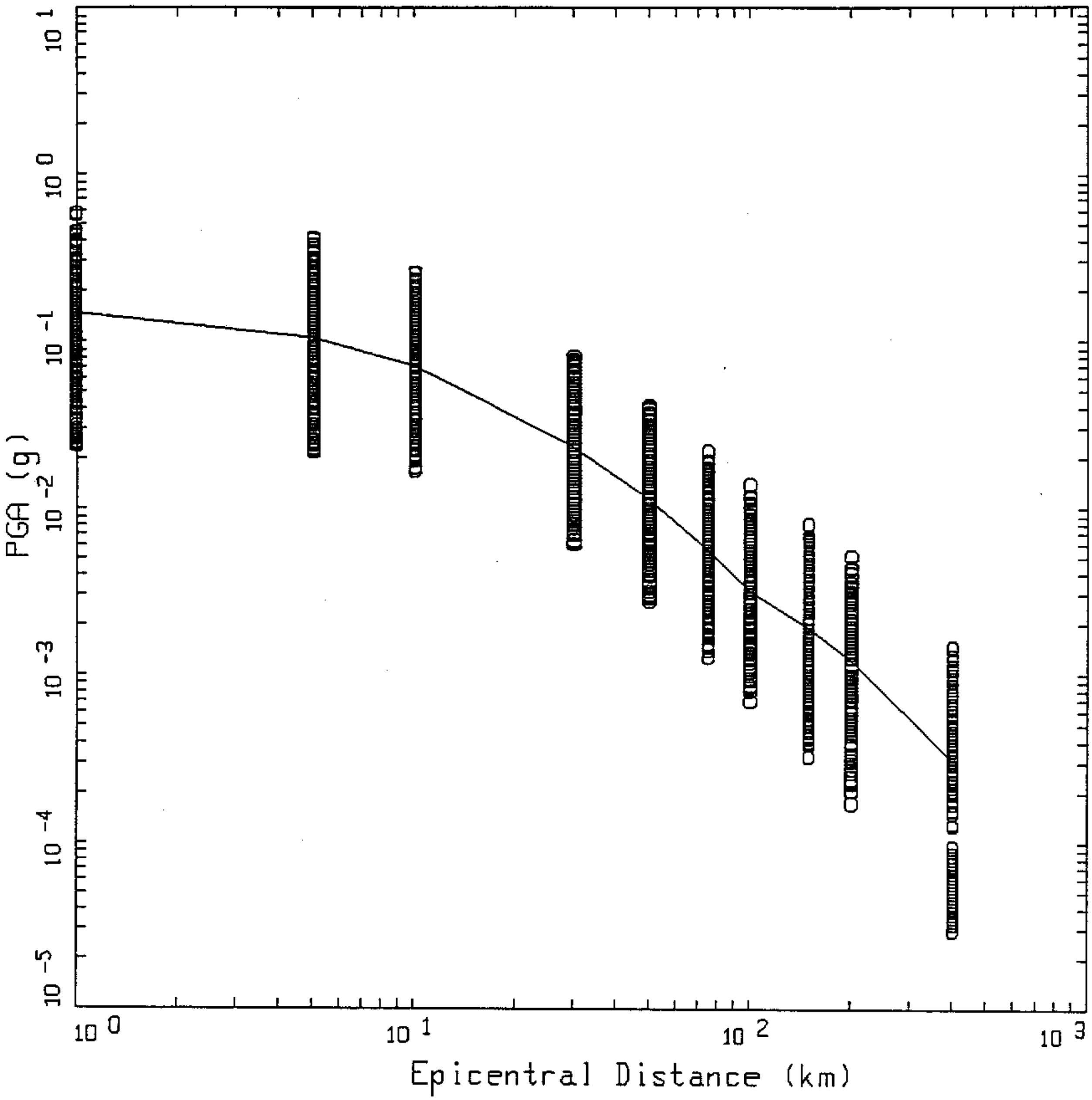
91C0509A-1300/060293



Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ACCELERATION RESPONSE SPECTRA FOR M_W 7 PAJARITO FAULT EARTHQUAKE AT TA-55- EFFECTS OF DIRECTIVITY	Figure N-56
Woodward-Clyde Federal Services			

91C0509A-1300/060293

APPENDIX 0
STOCHASTIC ATTENUATION RELATIONSHIPS FOR LANL SITES



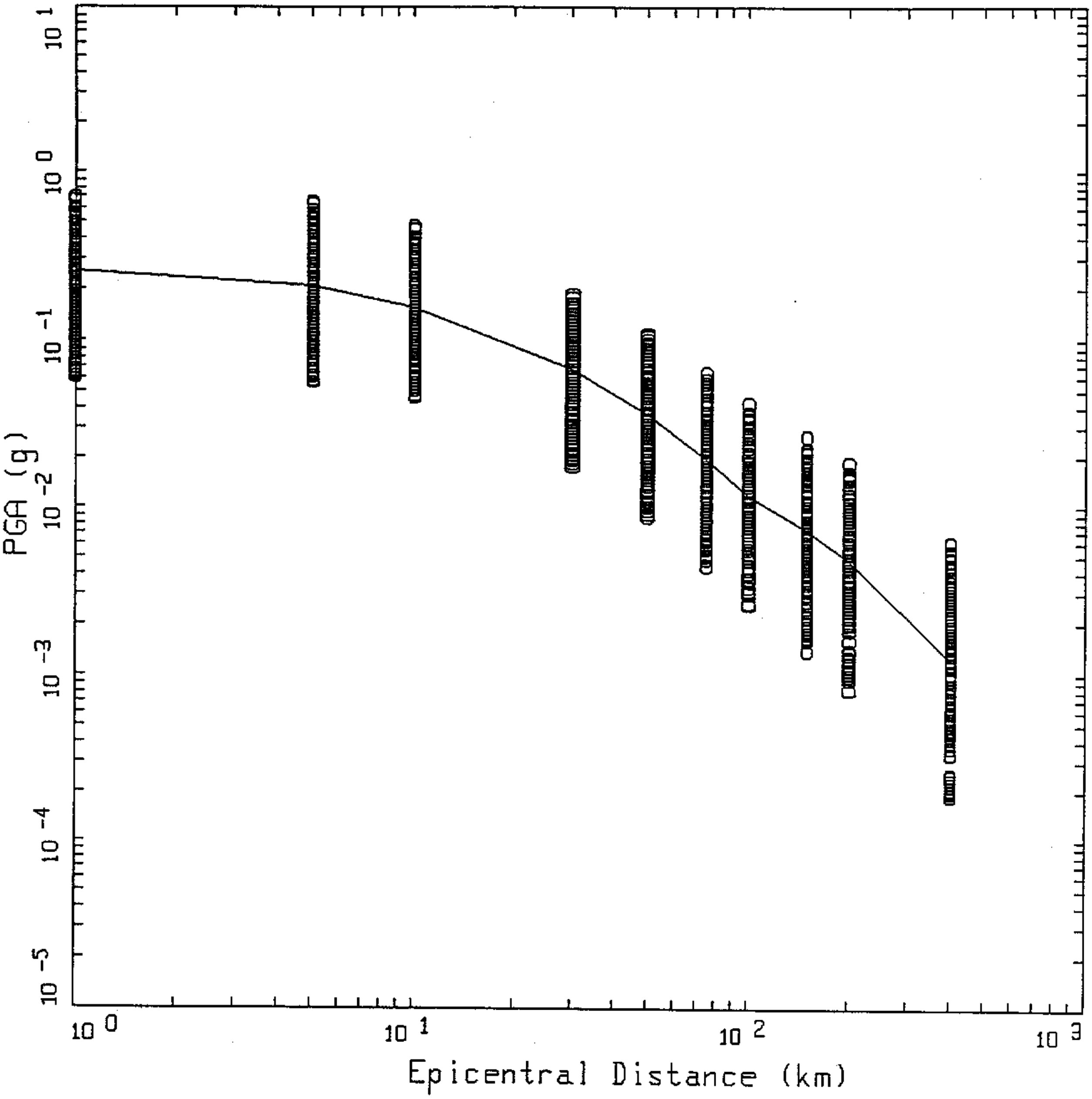
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND PGA, MESA SITES	Figure O-1
Woodward-Clyde Federal Services			

91C0509A-1300/060293



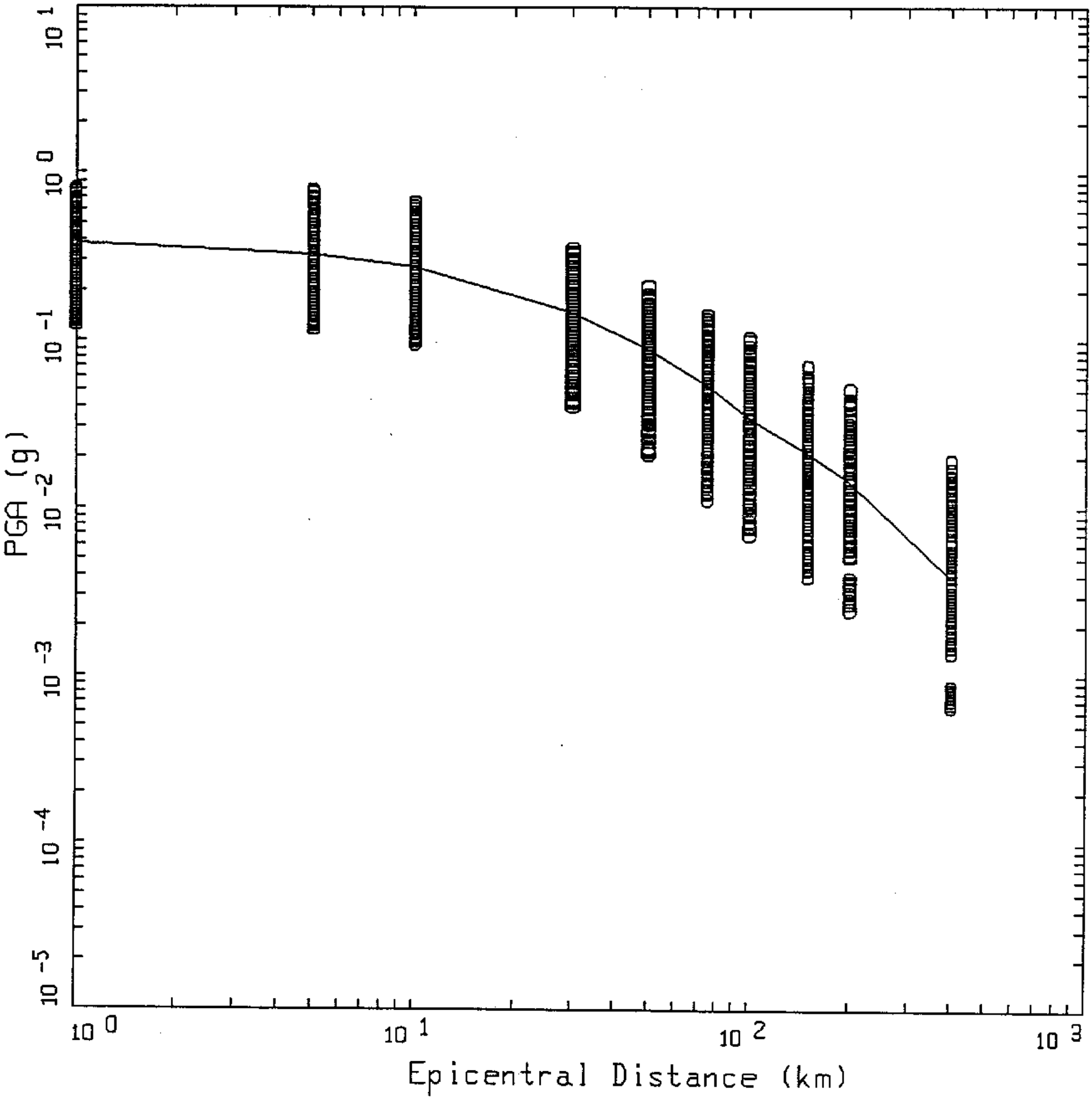
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND PGA, MESA SITES	Figure O-2
Woodward-Clyde Federal Services			

91C0509A-1300/060293



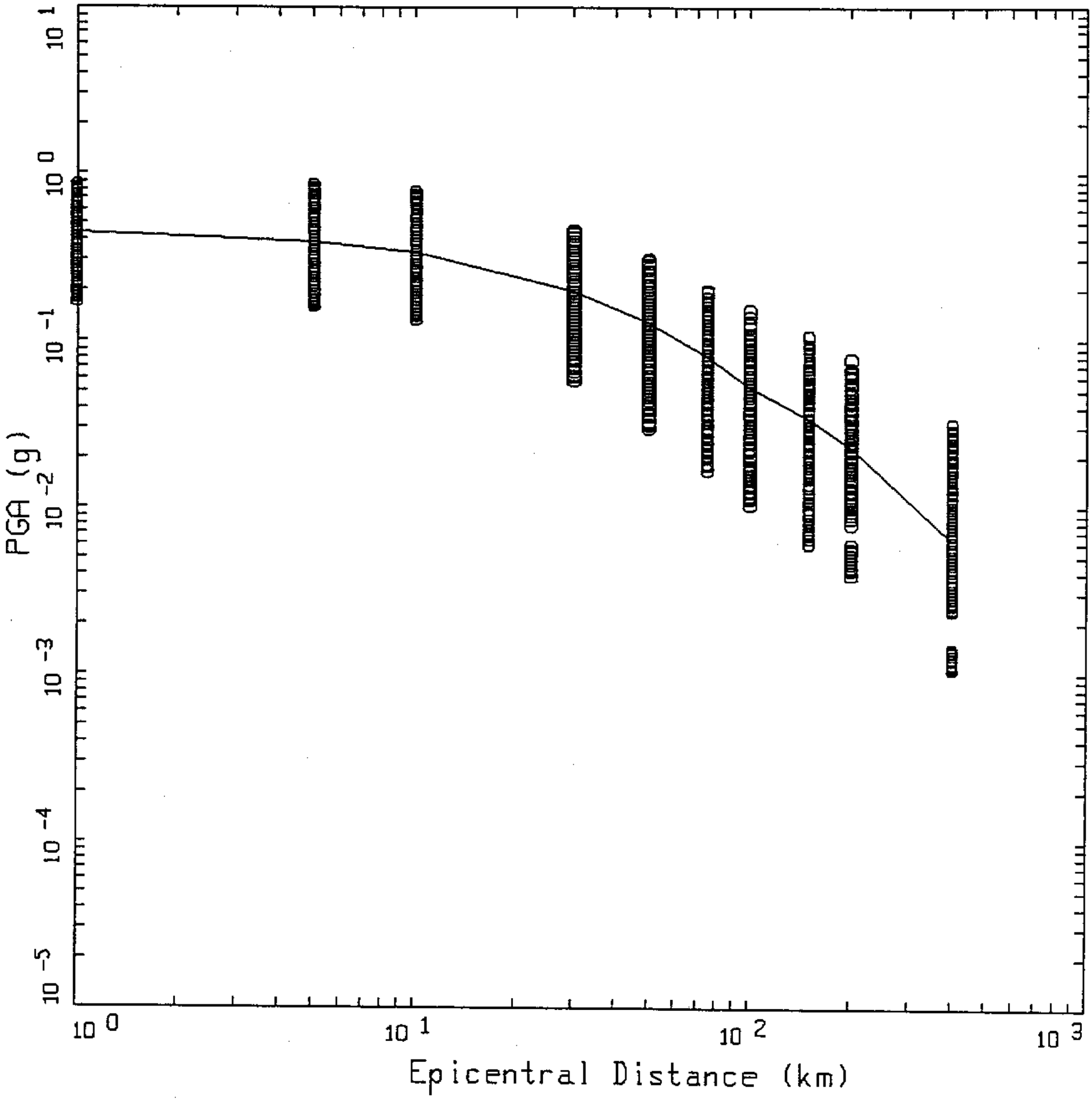
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND PGA, MESA SITES	Figure O-3
Woodward-Clyde Federal Services			

91C0509A-1300/060293



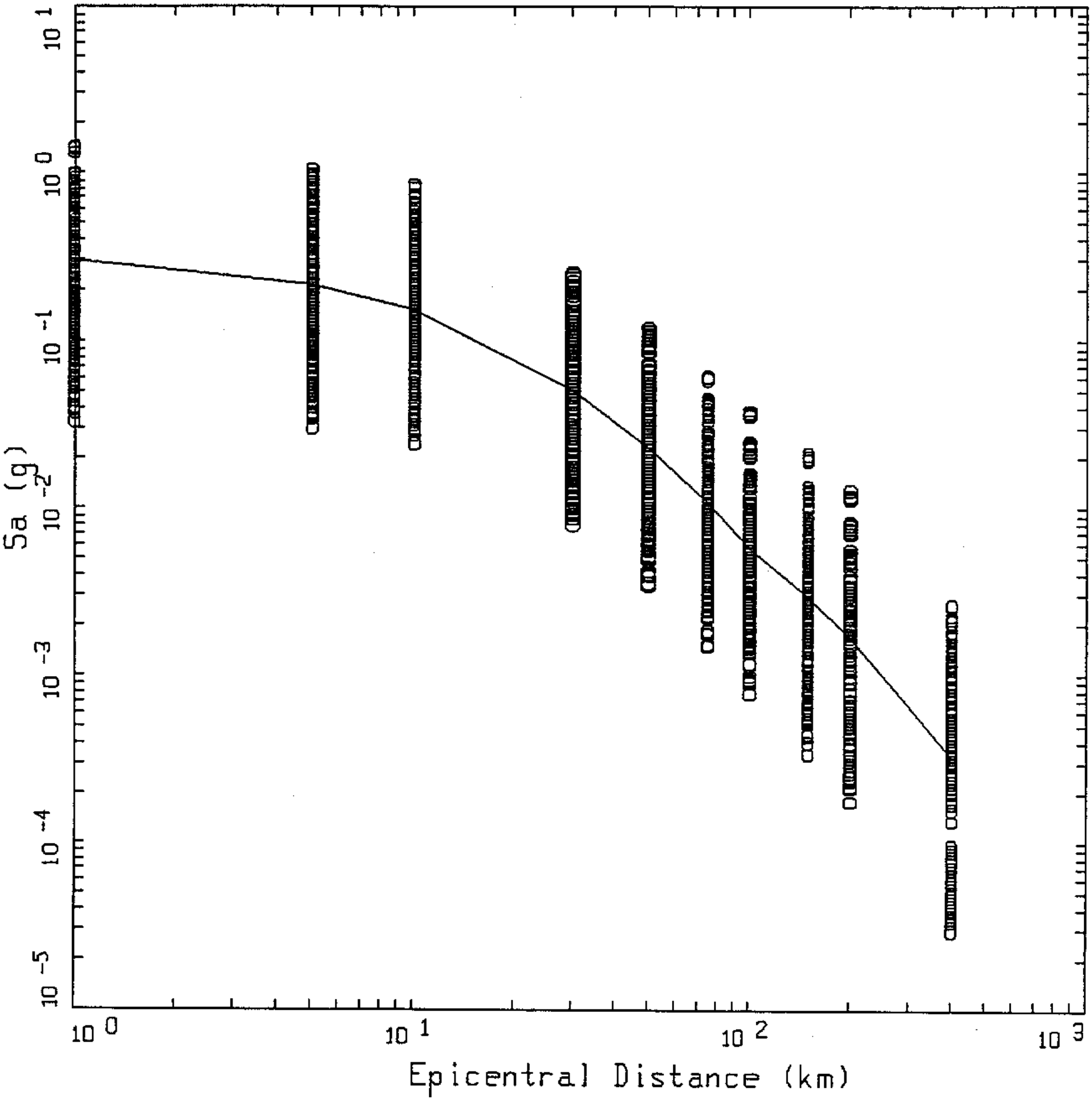
LEGEND

o Data

— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND PGA, MESA SITES	Figure O-4
Woodward-Clyde Federal Services			

91C0509A-1300/060293



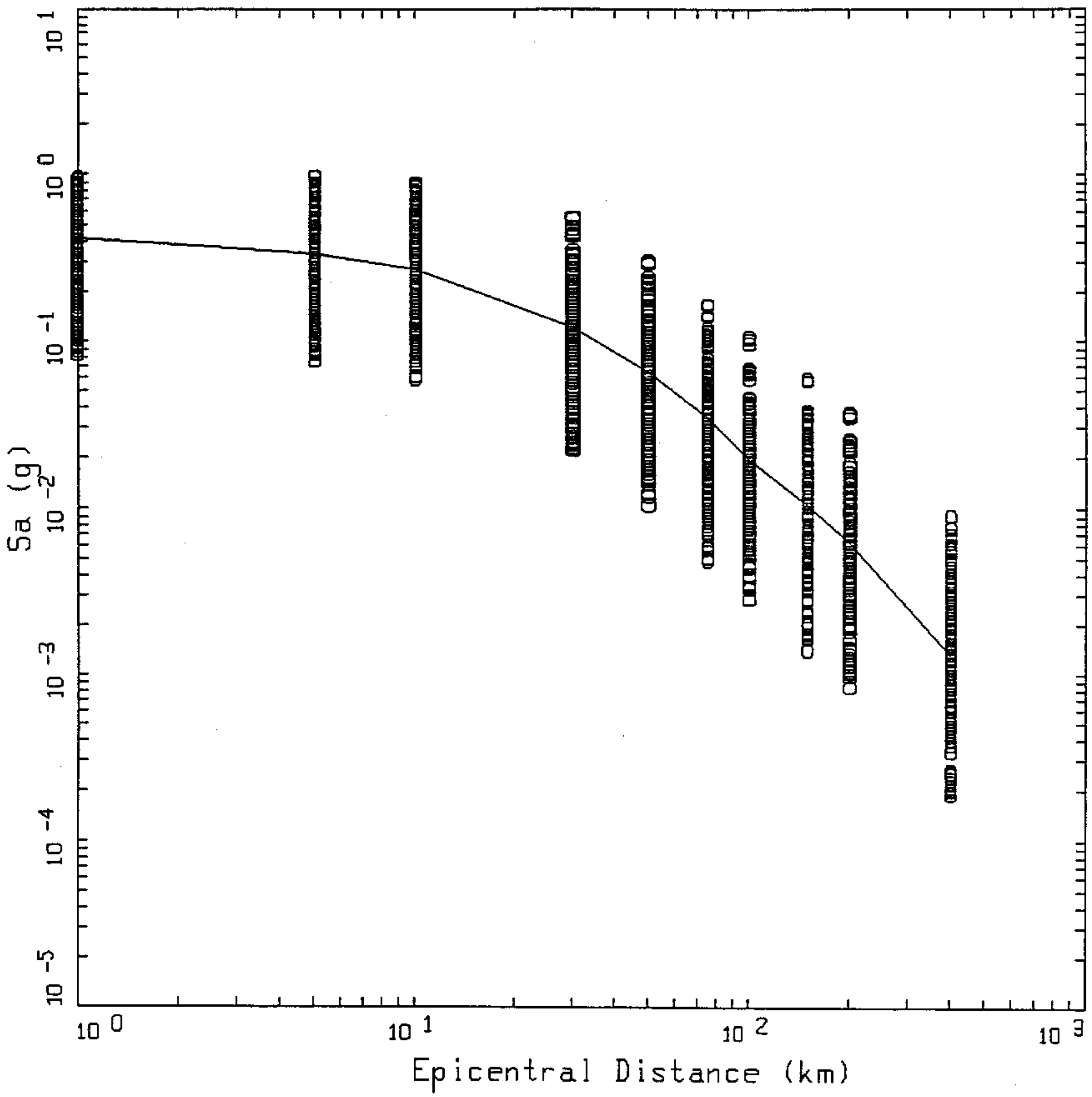
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 10.0 Hz, MESA SITES	Figure O-5
Woodward-Clyde Federal Services			

91C0509A-1300/060293



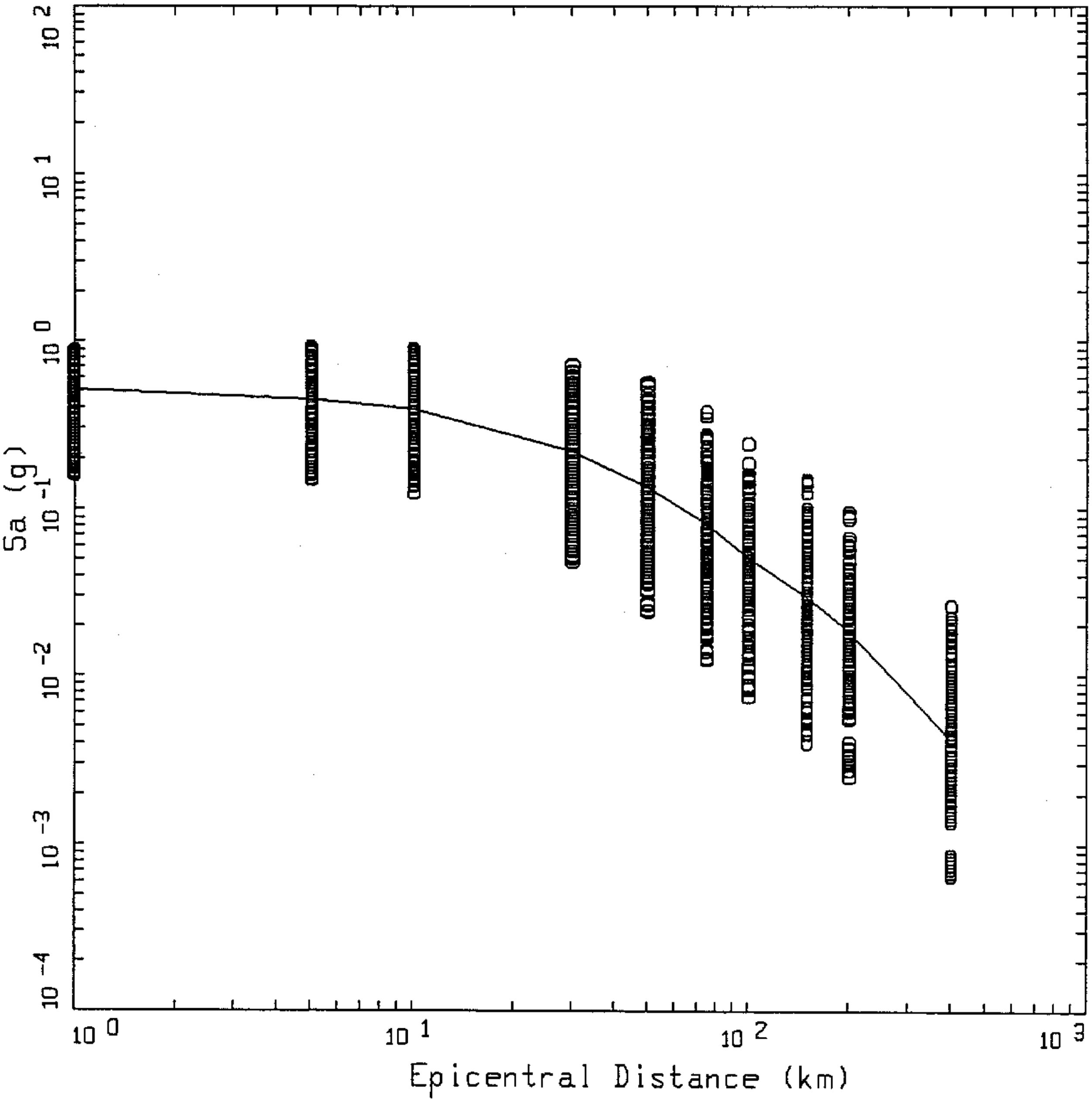
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 10.0 Hz, MESA SITES	Figure O-6
Woodward-Clyde Federal Services			

91C0509A-1300/060293



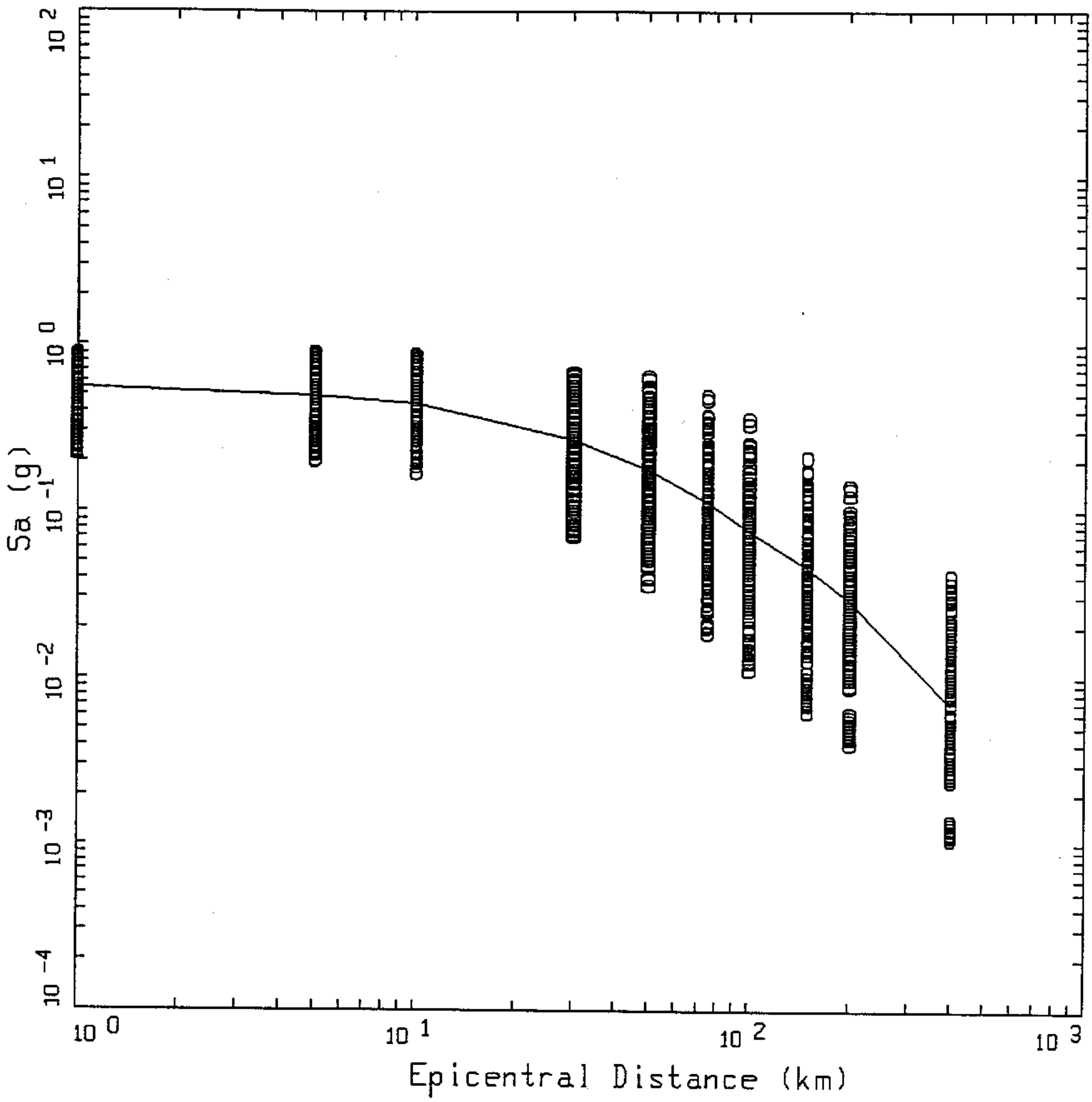
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 10.0 Hz, MESA SITES	Figure O-7
Woodward-Clyde Federal Services			

91C0509A-1300/060293



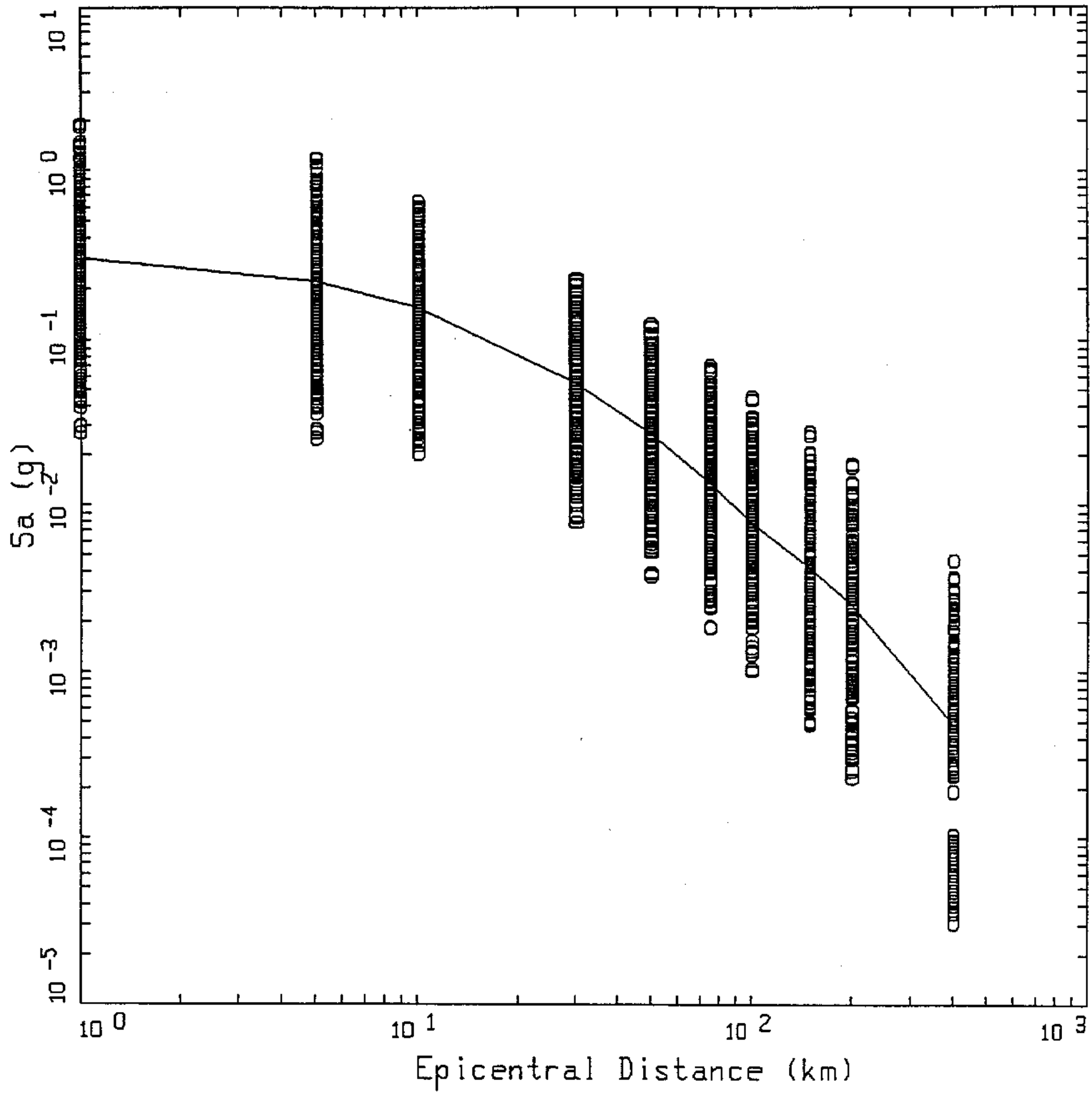
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 10.0 Hz, MESA SITES	Figure O-8
Woodward-Clyde Federal Services			

91C0509A-1300/060293



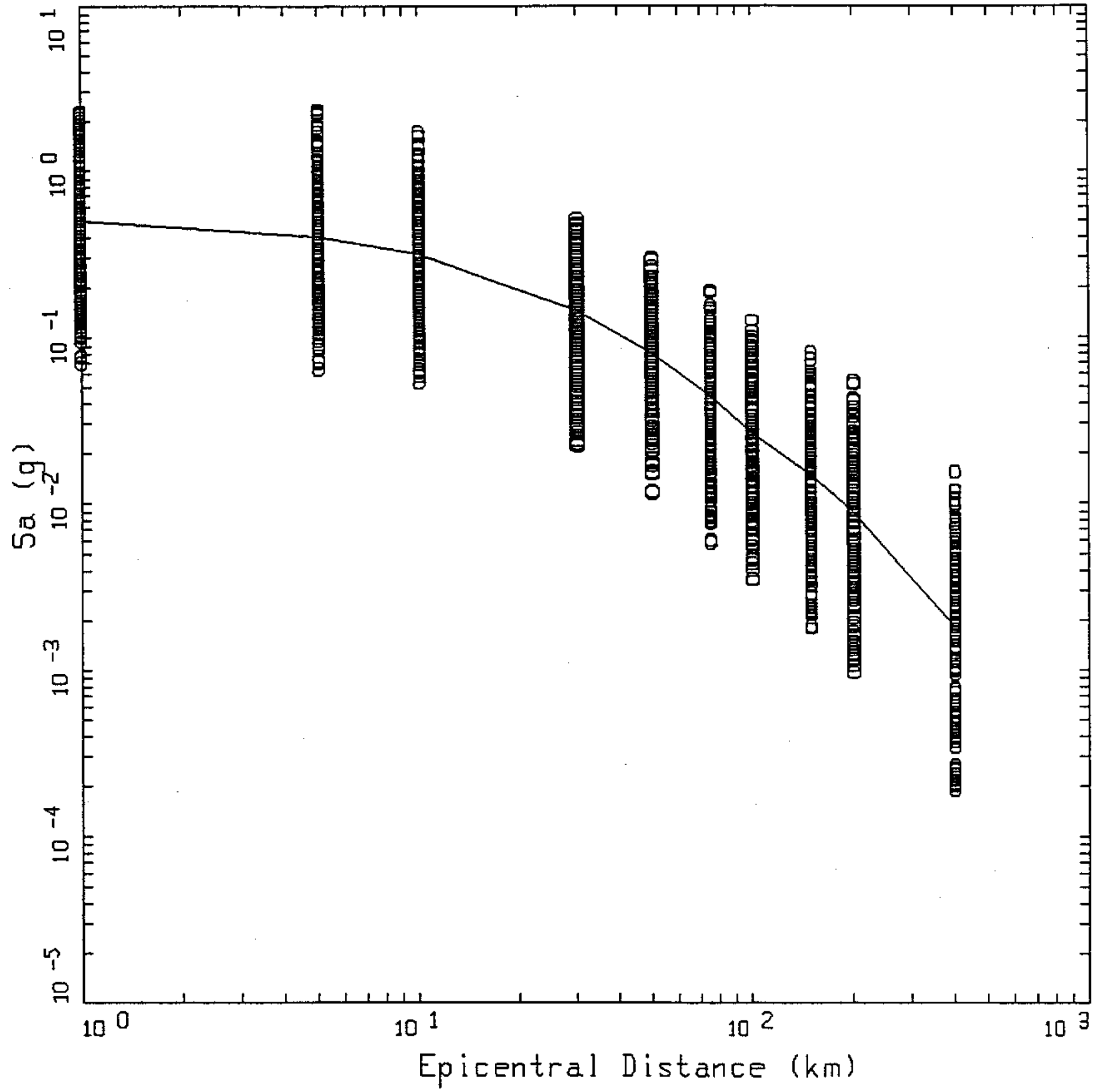
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 5.00 Hz, MESA SITES	Figure O-9
Woodward-Clyde Federal Services			

91C0509A-1300/060293



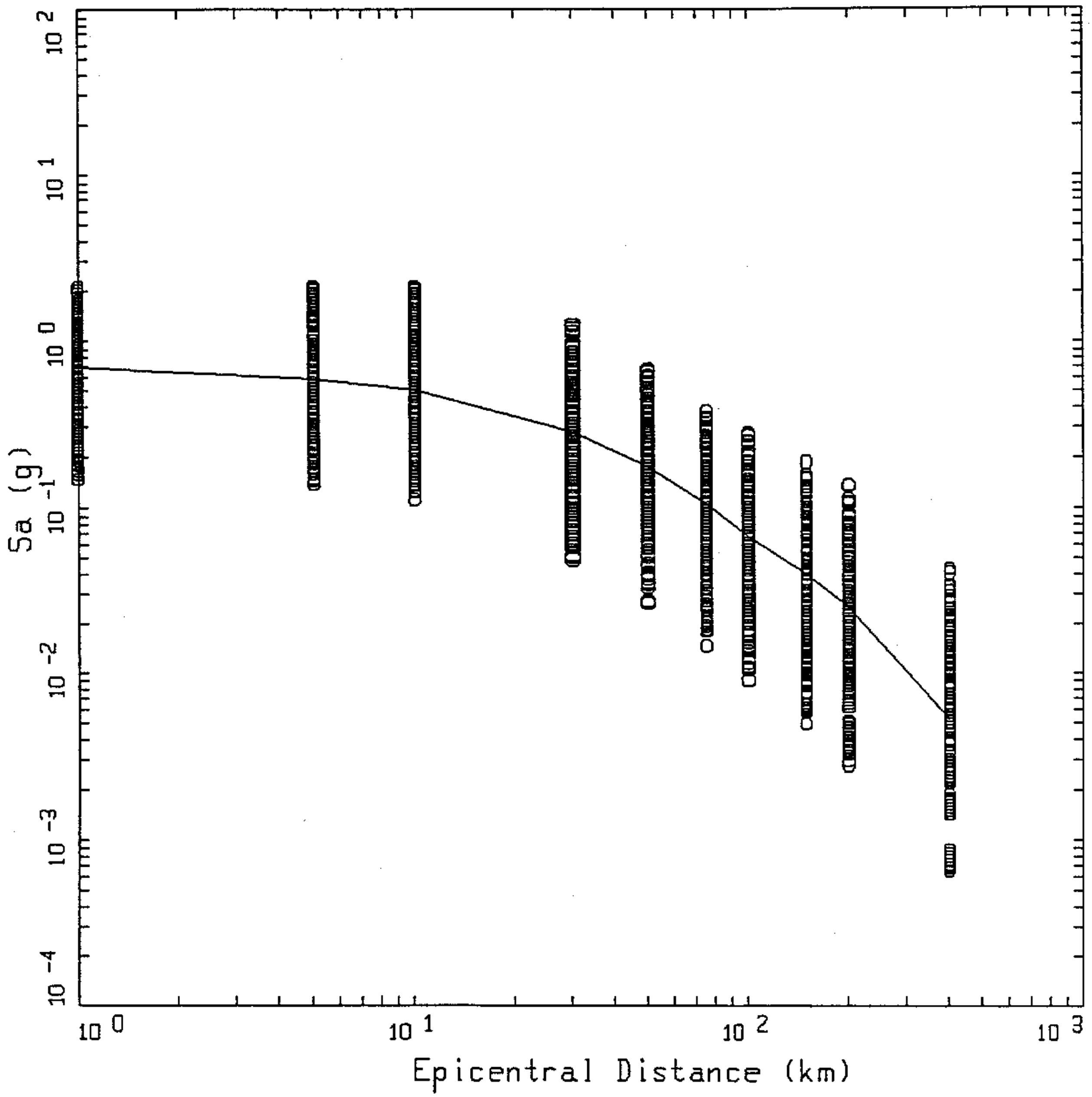
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 5.00 Hz, MESA SITES	Figure O-10
Woodward-Clyde Federal Services			

91C0509A-1300/060293



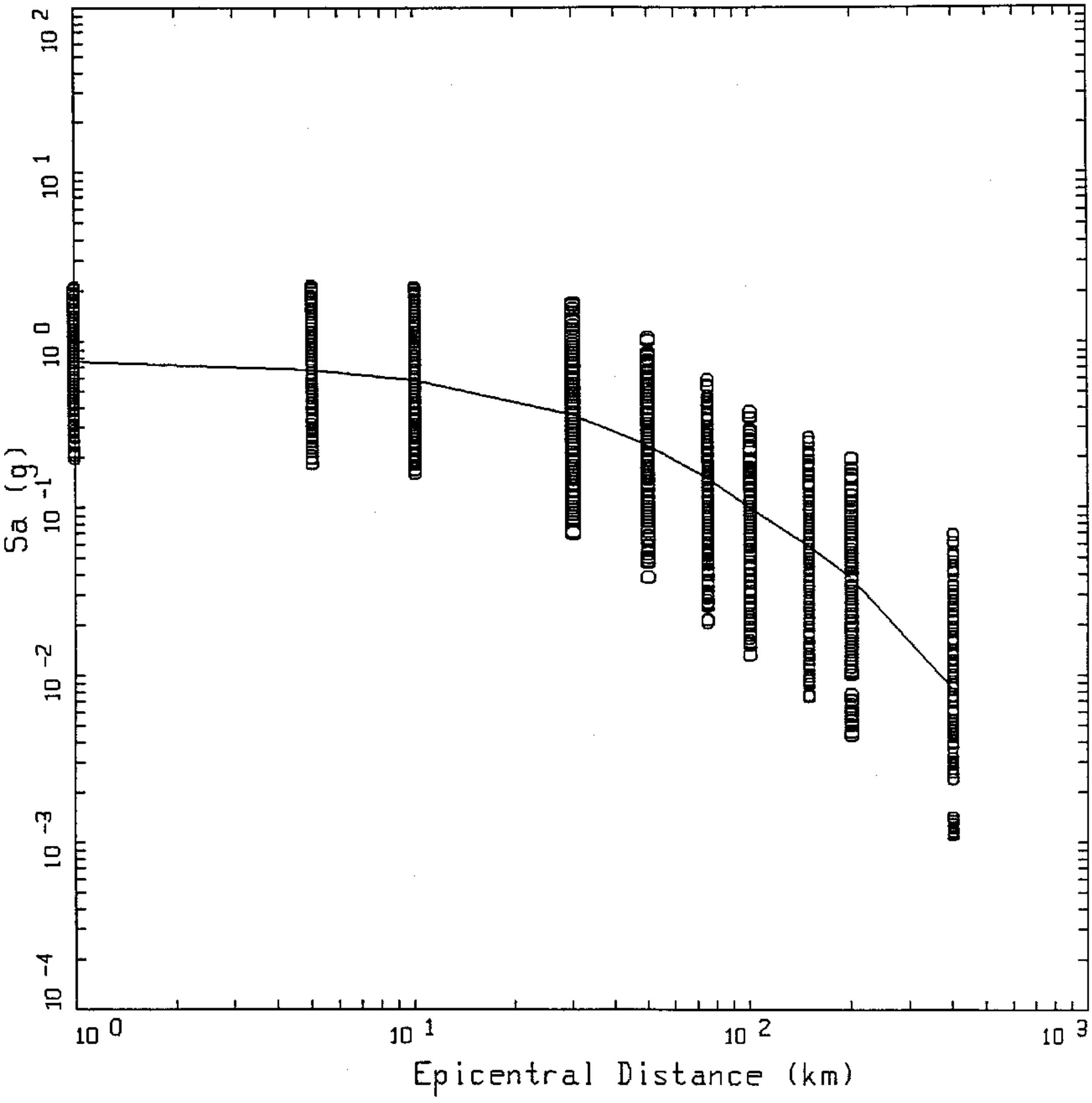
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 5.00 Hz, MESA SITES	Figure O-11
Woodward-Clyde Federal Services			

91C0509A-1300/060293

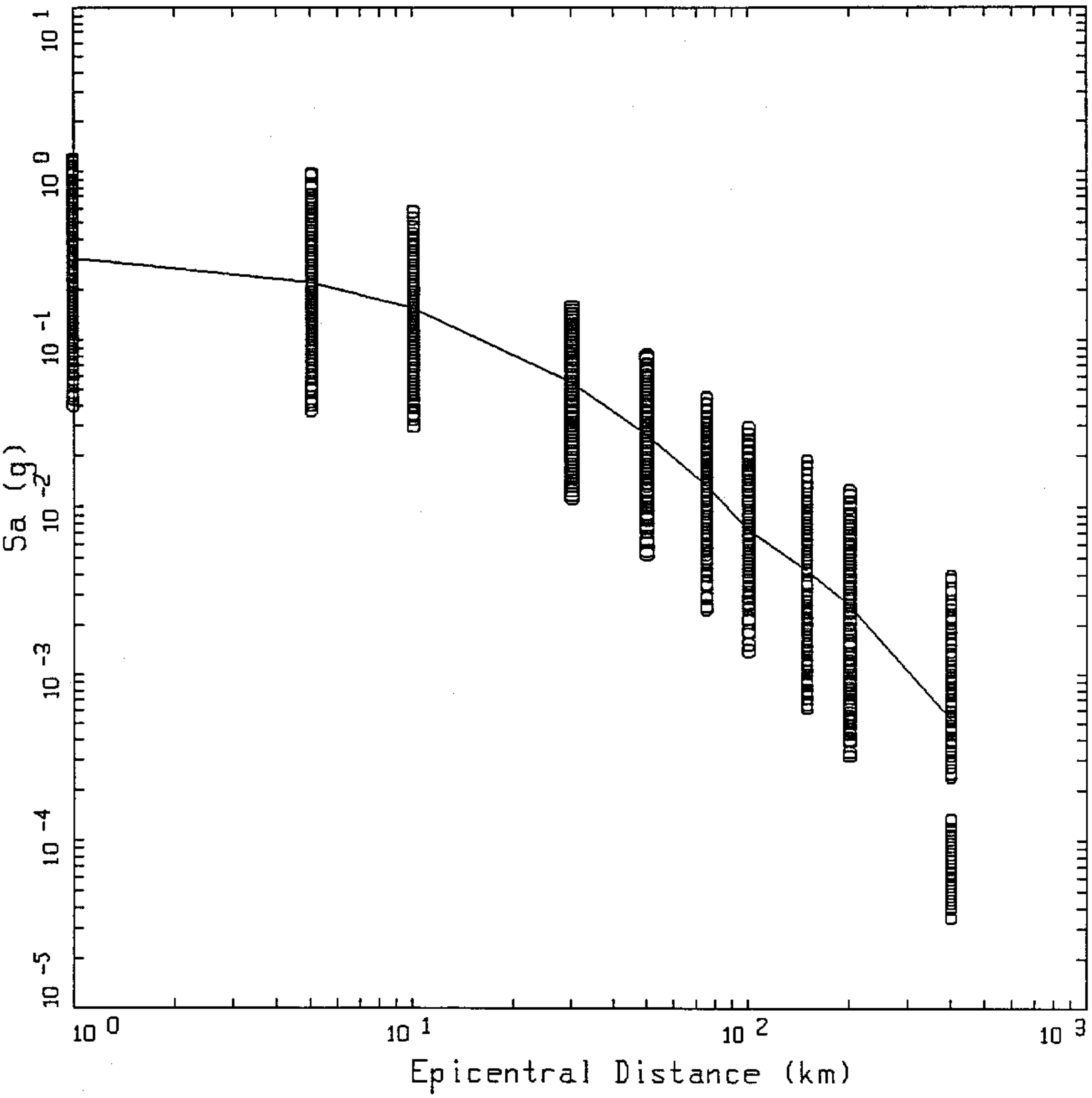


LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 5.00 Hz, MESA SITES	Figure O-12
Woodward-Clyde Federal Services			



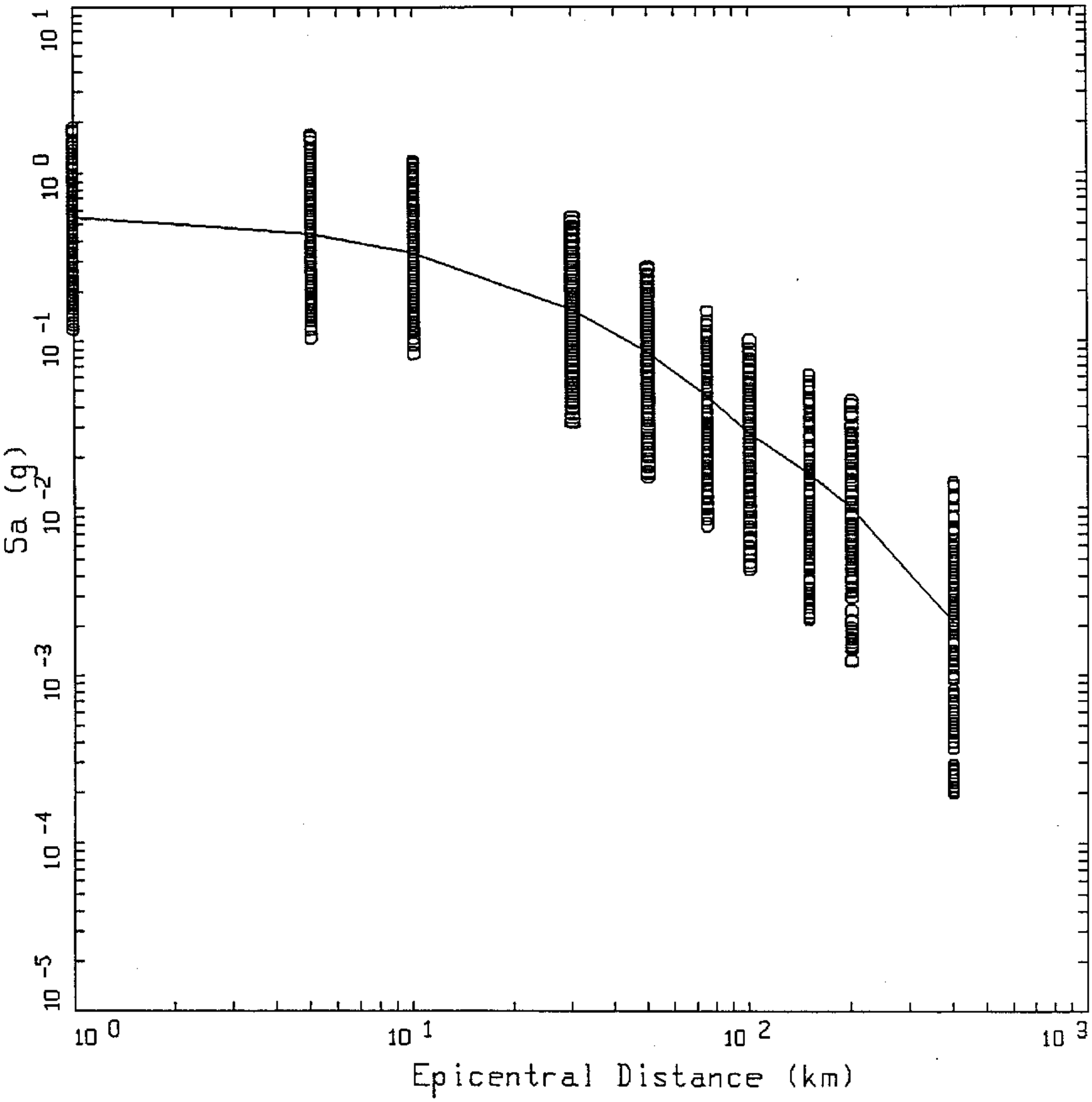
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 3.33 Hz, MESA SITES	Figure O-13
Woodward-Clyde Federal Services			

91C0509A-1300/060293



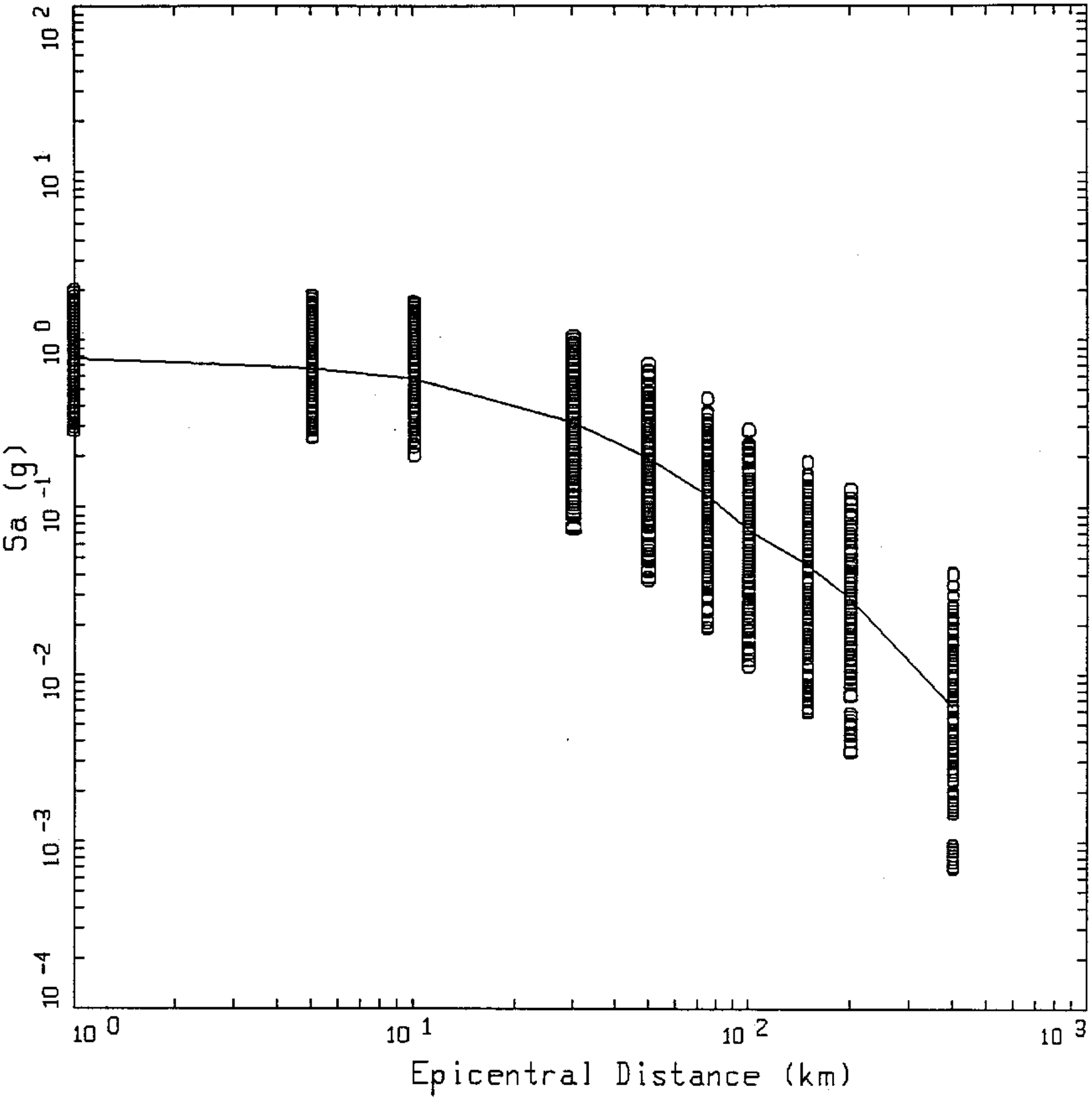
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 3.33 Hz, MESA SITES	Figure O-14
Woodward-Clyde Federal Services			

91C0509A-1300/060293



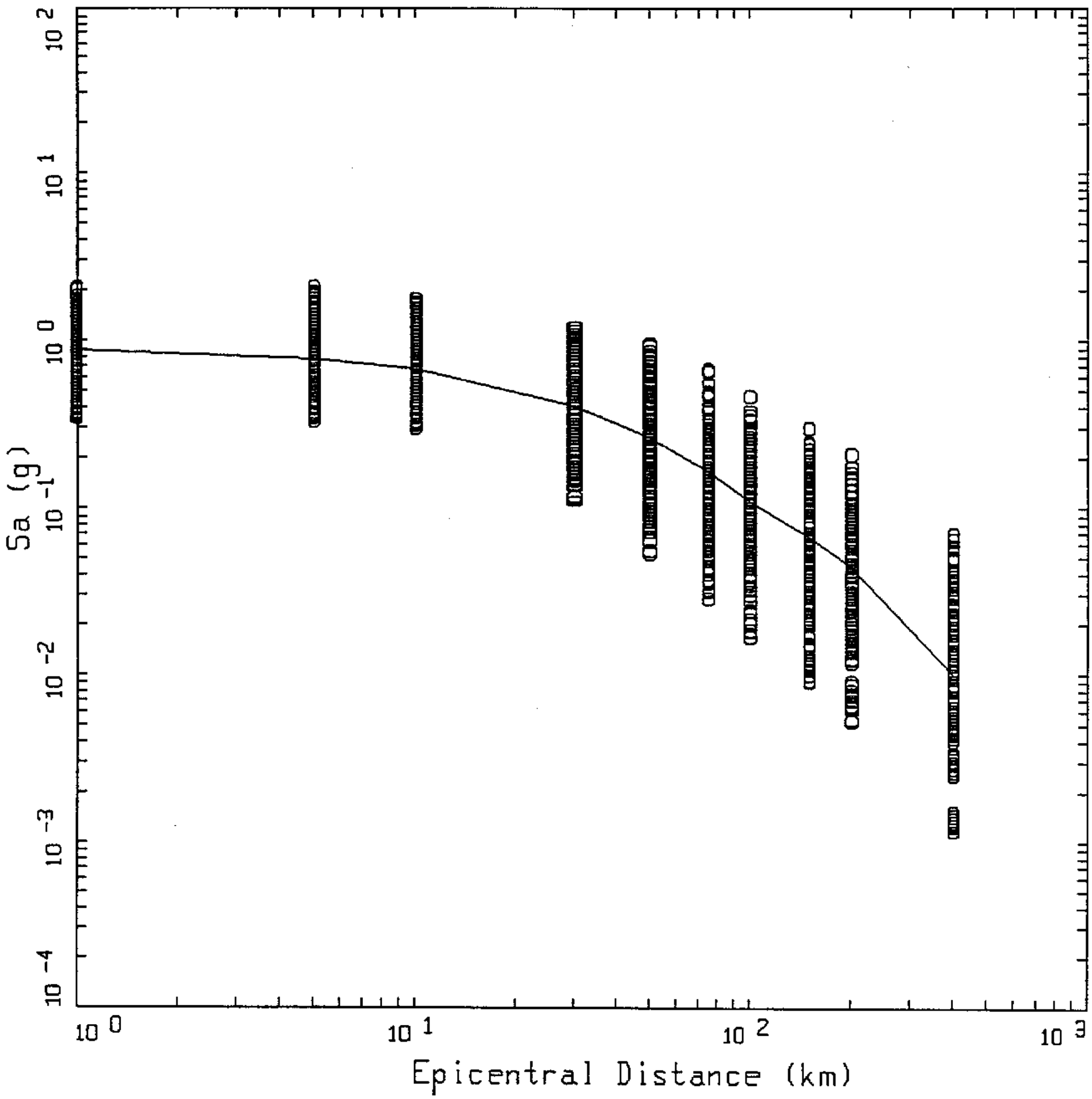
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 3.33 Hz, MESA SITES	Figure O-15
Woodward-Clyde Federal Services			

91C0509A-1300/060293



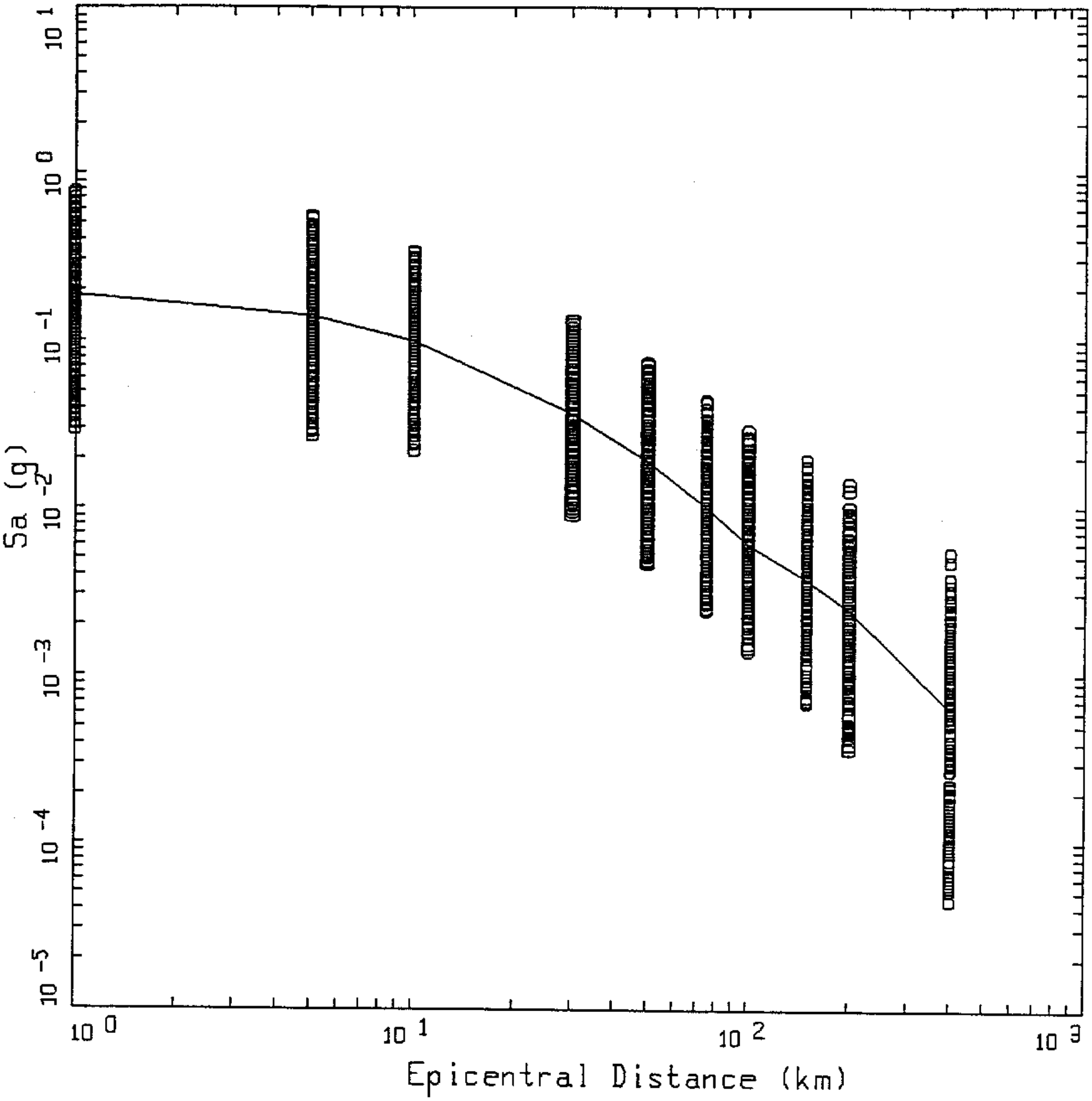
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 3.33 Hz, MESA SITES	Figure O-16
Woodward-Clyde Federal Services			

91C0509A-1300/060293



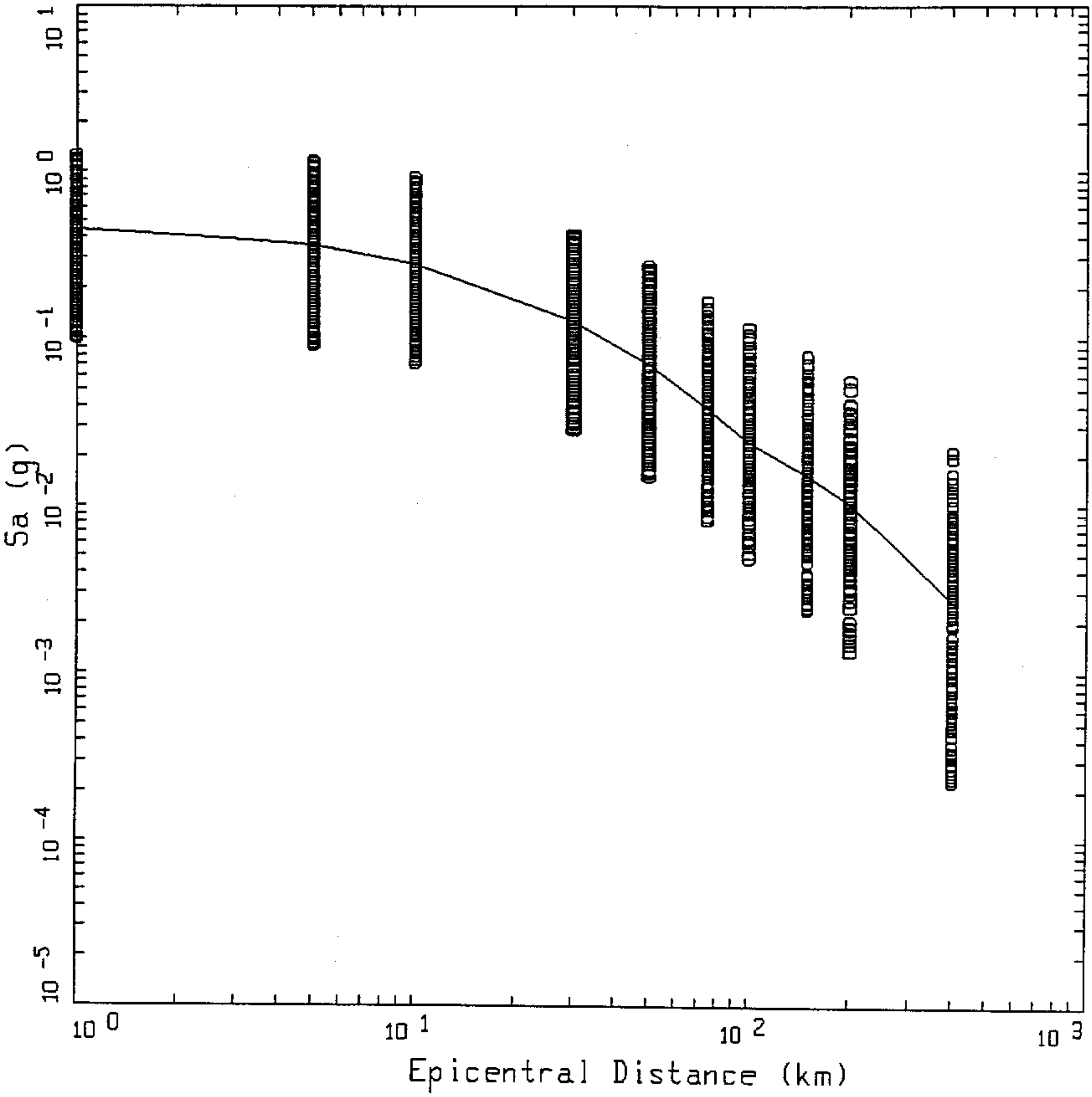
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 2.00 Hz, MESA SITES	Figure O-17
Woodward-Clyde Federal Services			

91C0509A-1300/060293



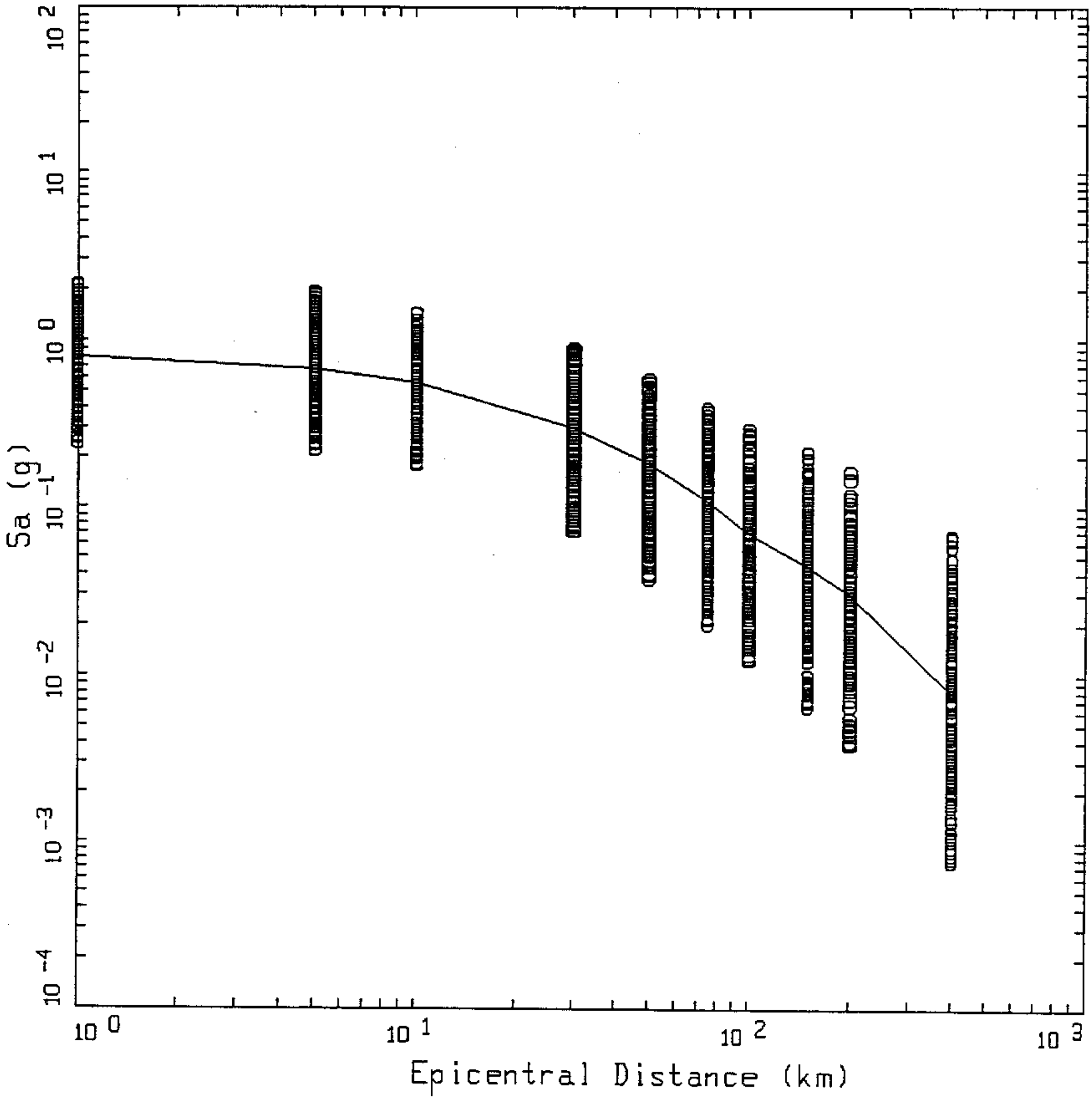
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 2.00 Hz, MESA SITES	Figure O-18
Woodward-Clyde Federal Services			

91C0509A-1300/060293



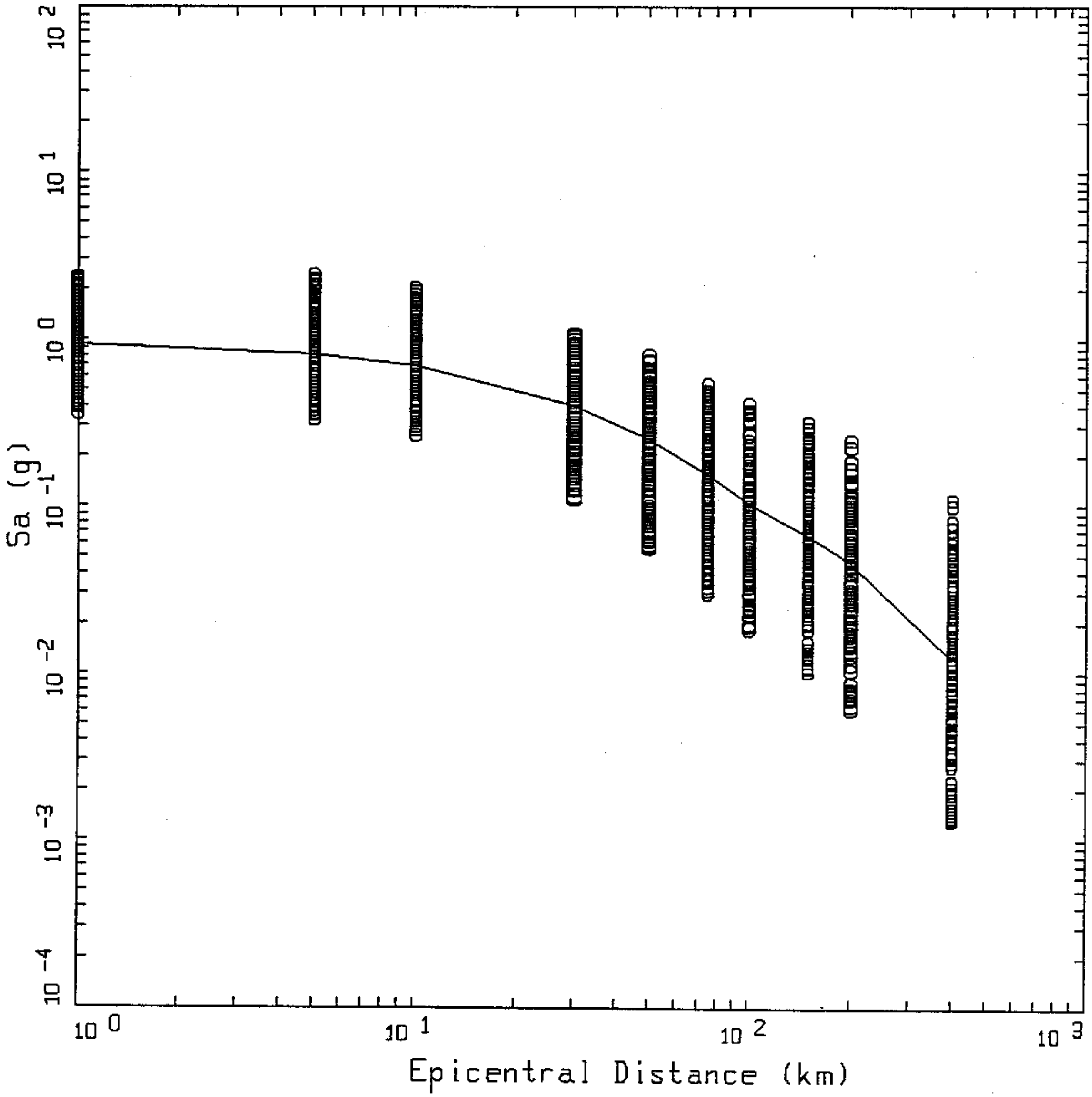
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 2.00 Hz, MESA SITES	Figure O-19
Woodward-Clyde Federal Services			

91C0509A-1300/060293



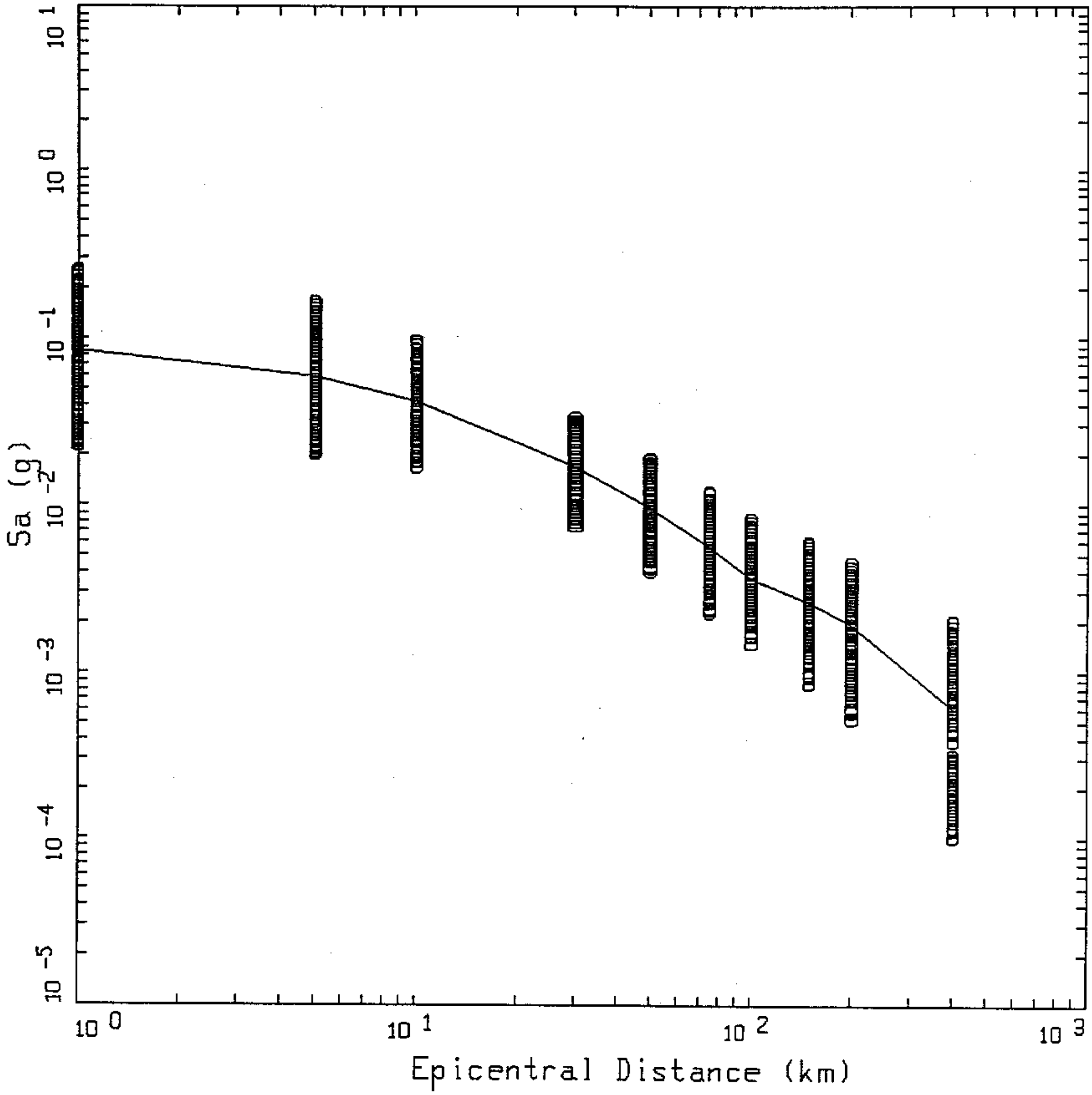
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 2.00 Hz, MESA SITES	Figure O-20
Woodward-Clyde Federal Services			

91C0509A-1300/060293



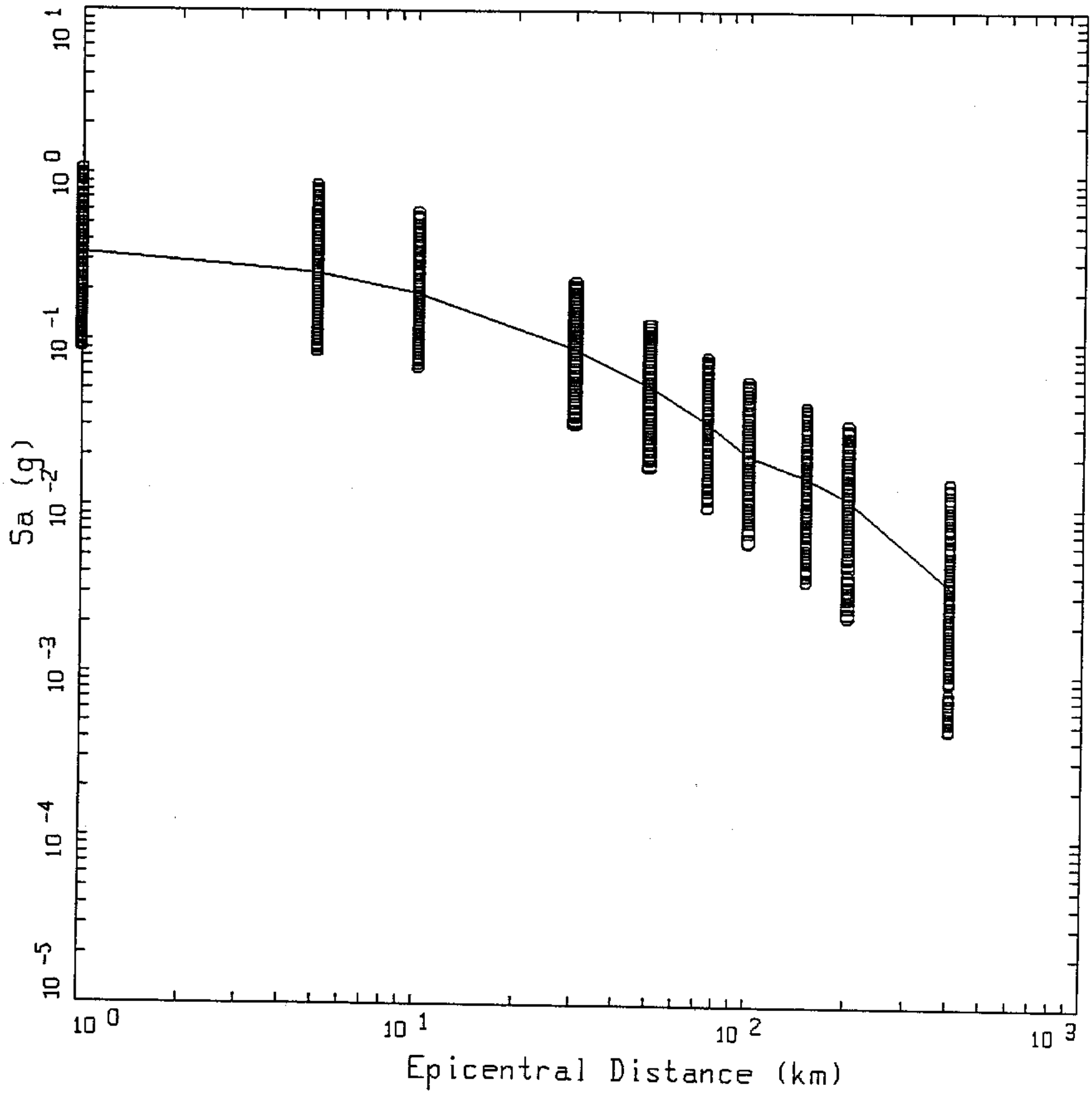
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 1.00 Hz, MESA SITES	Figure O-21
Woodward-Clyde Federal Services			

91C0509A-1300/060293



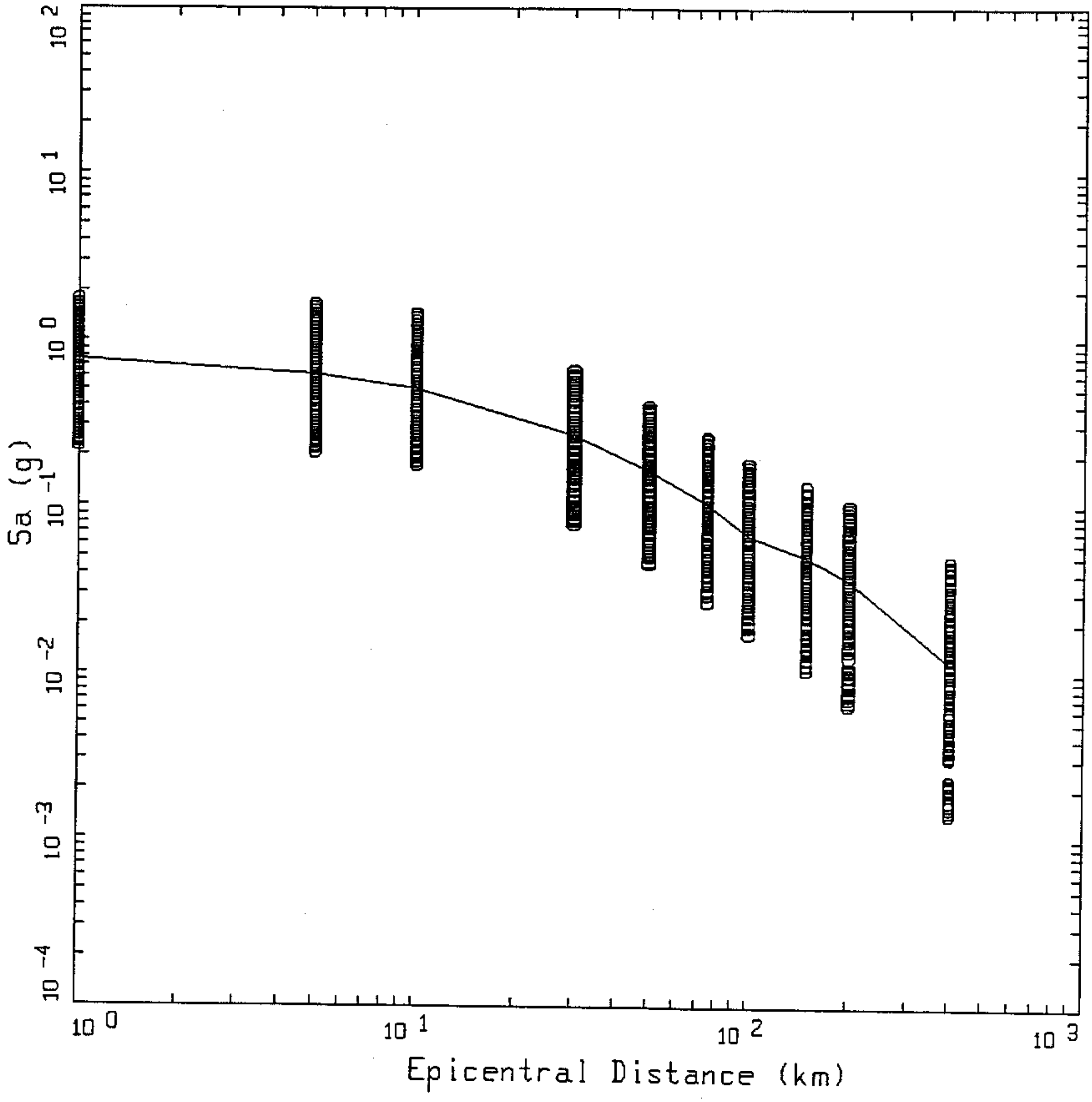
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 1.00 Hz, MESA SITES	Figure O-22
Woodward-Clyde Federal Services			

91C0509A-1300/060293



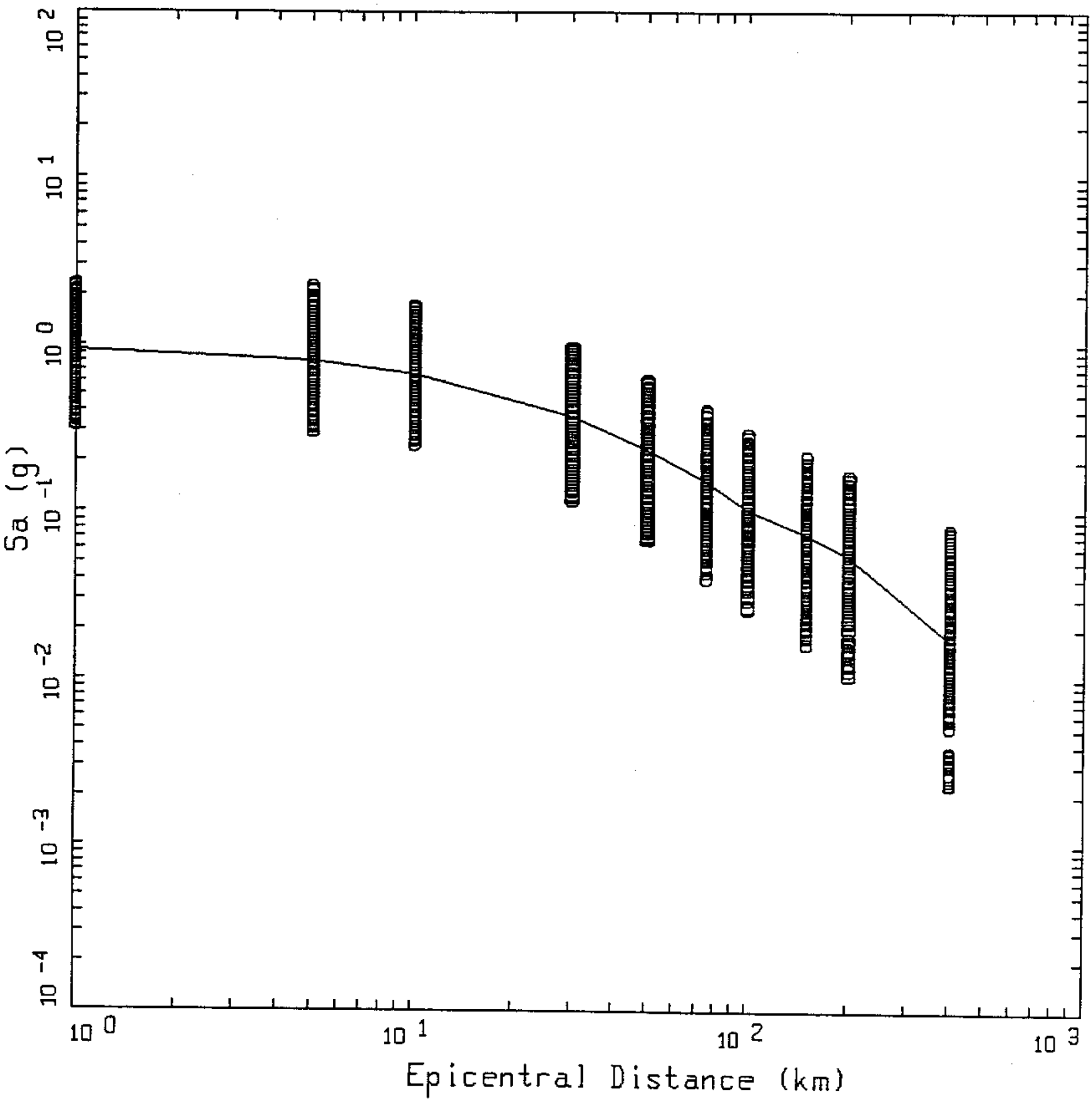
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 1.00 Hz, MESA SITES	Figure O-23
Woodward-Clyde Federal Services			

91C0509A-1300/060293



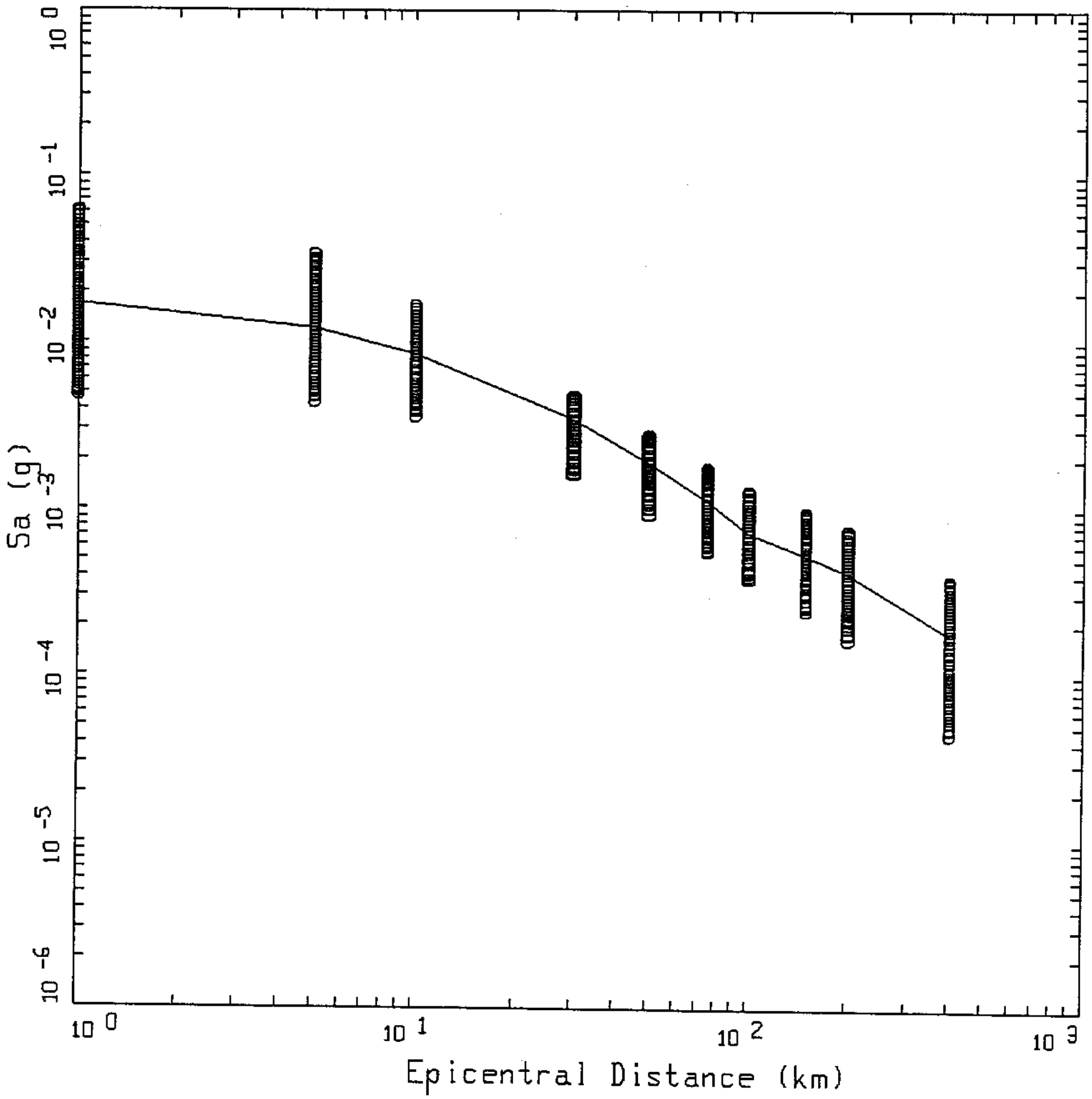
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 1.00 Hz, MESA SITES	Figure O-24
Woodward-Clyde Federal Services			

91C0509A-1300/060293



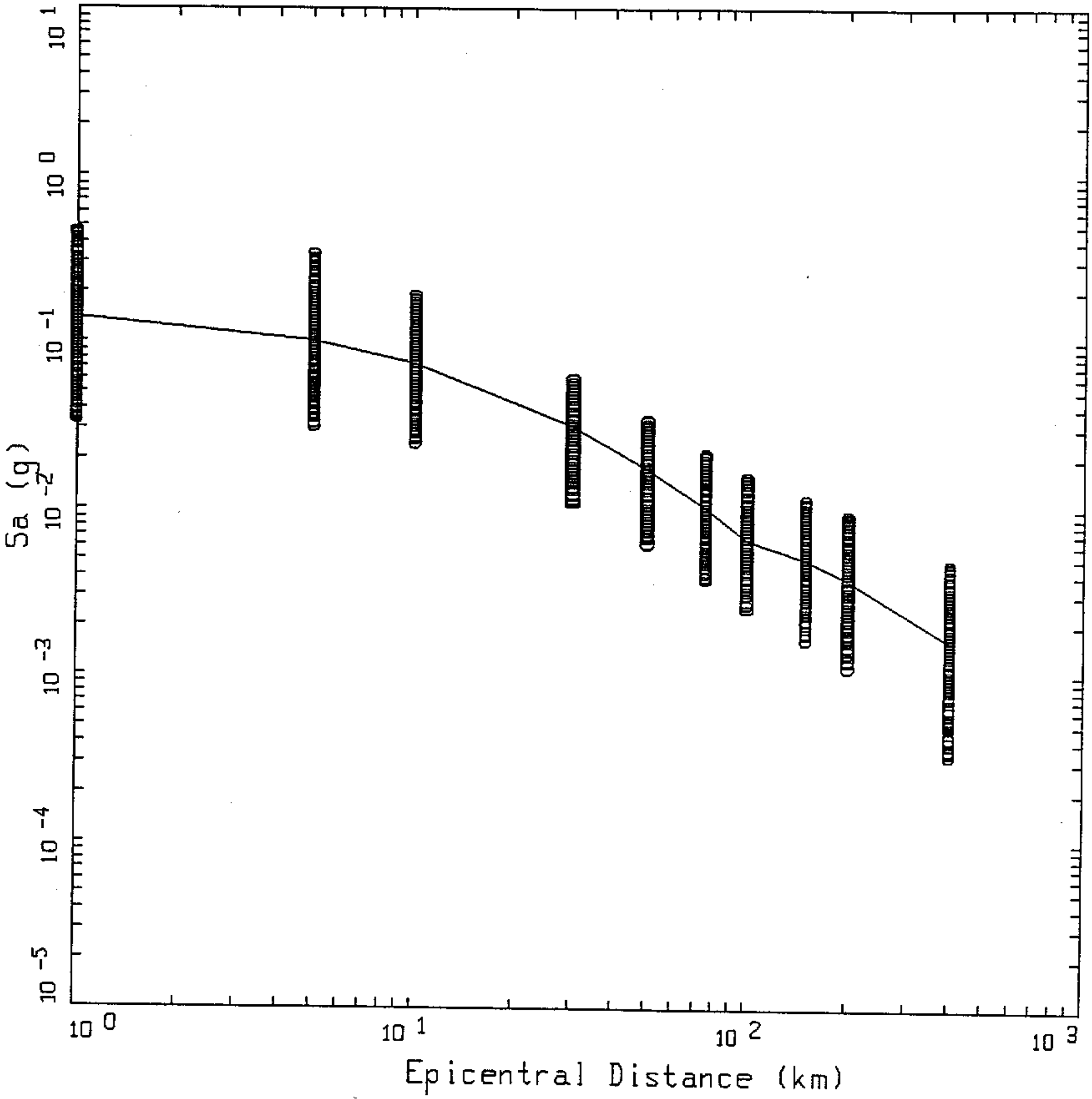
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 0.50 Hz, MESA SITES	Figure O-25
Woodward-Clyde Federal Services			

91C0509A-1300/060293



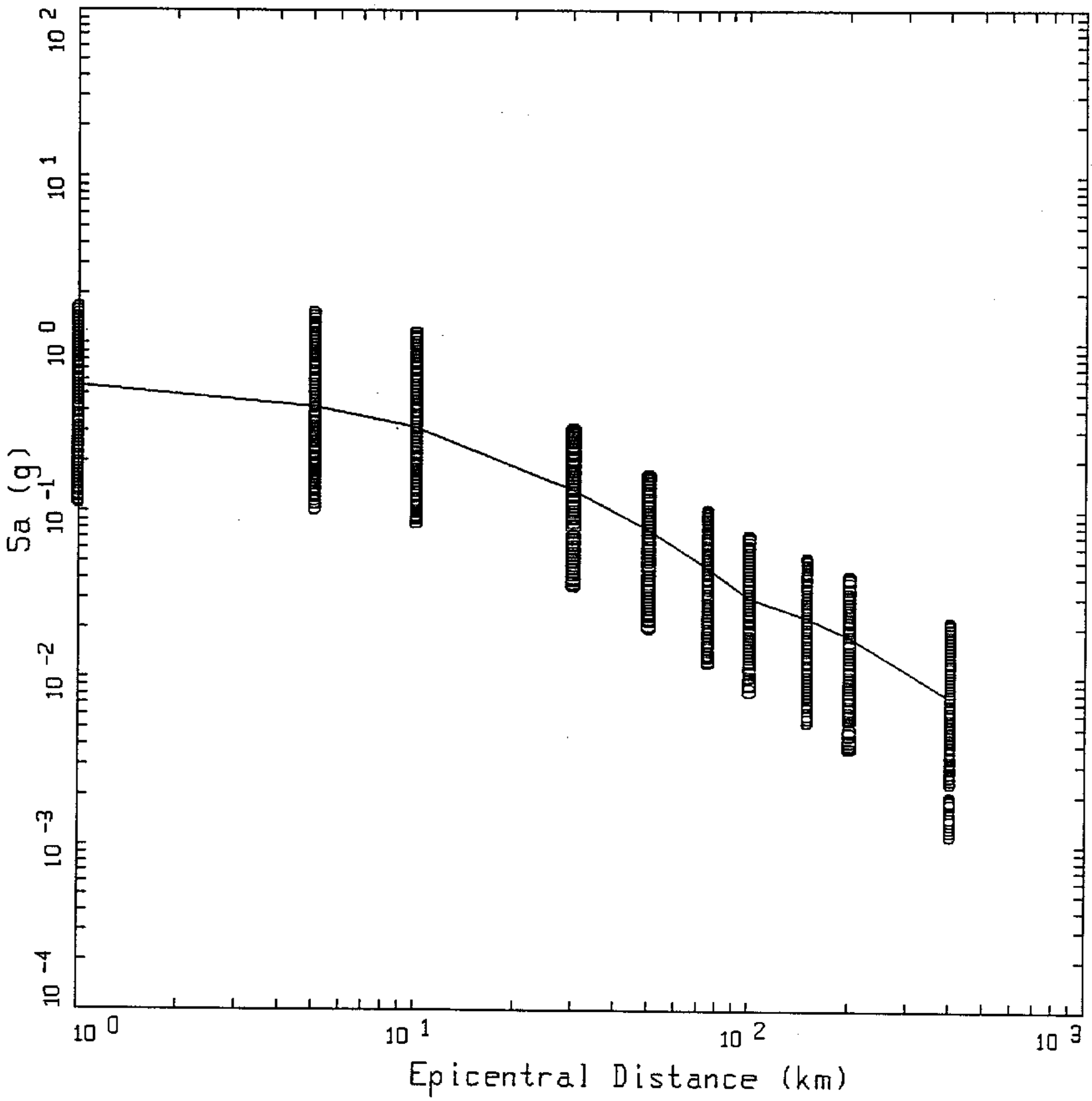
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 0.50 Hz, MESA SITES	Figure O-26
Woodward-Clyde Federal Services			

91C0509A-1300/060293



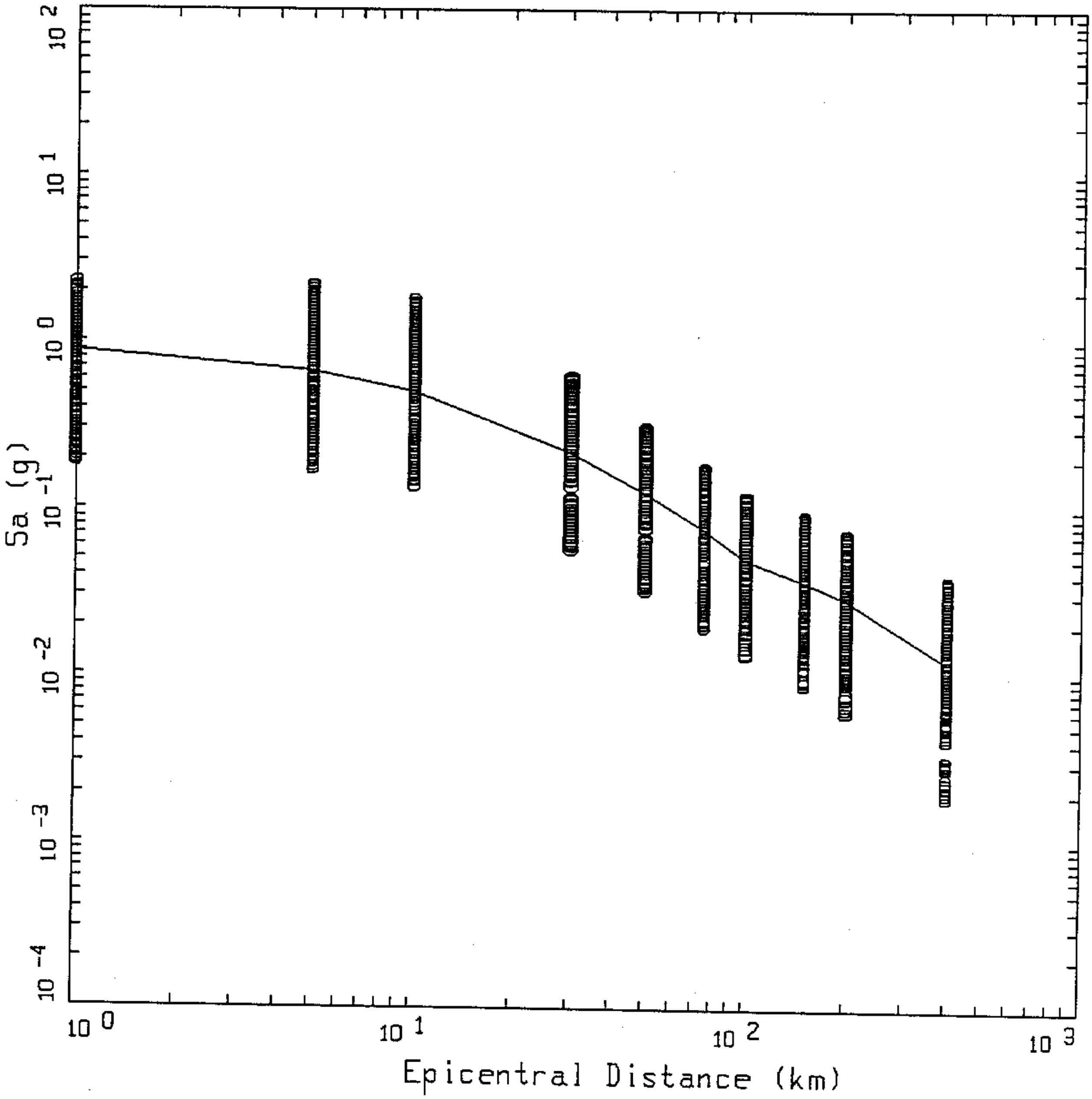
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 0.50 Hz, MESA SITES	Figure O-27
Woodward-Clyde Federal Services			

91C0509A-1300/060293



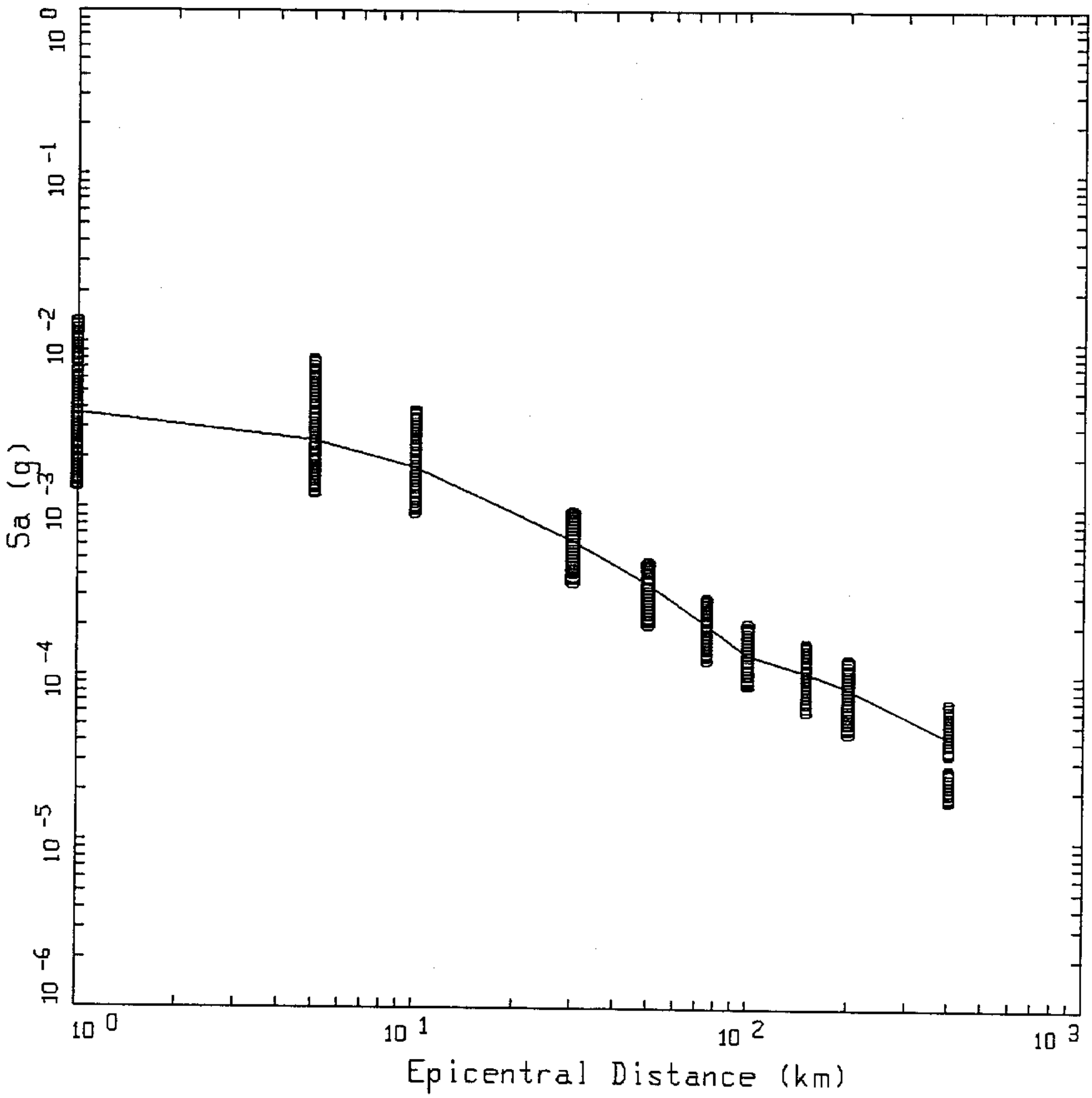
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 0.50 Hz, MESA SITES	Figure O-28
Woodward-Clyde Federal Services			

91C0509A-1300/060293



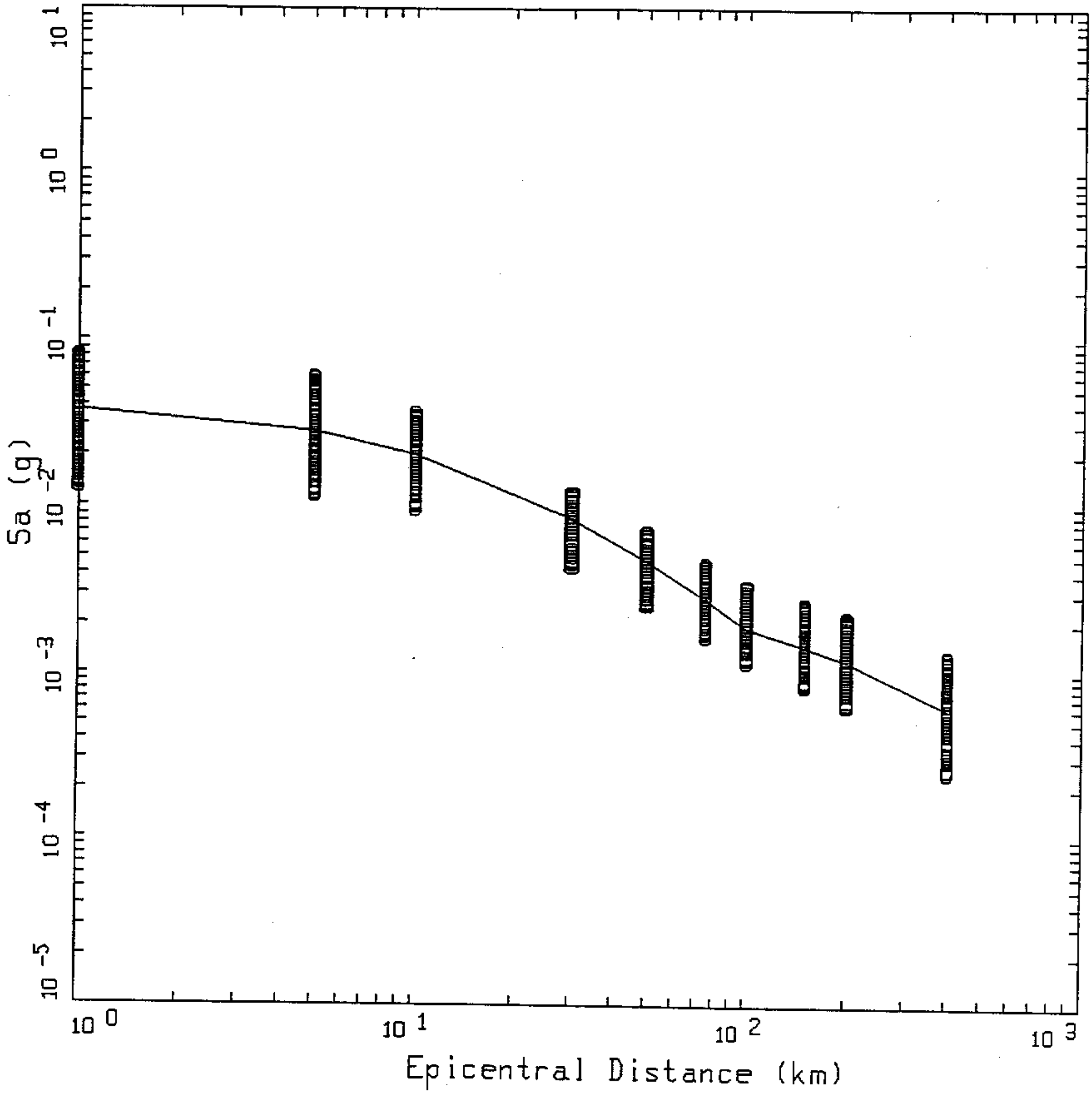
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 0.25 Hz, MESA SITES	Figure O-29
Woodward-Clyde Federal Services			

91C0509A-1300/060293



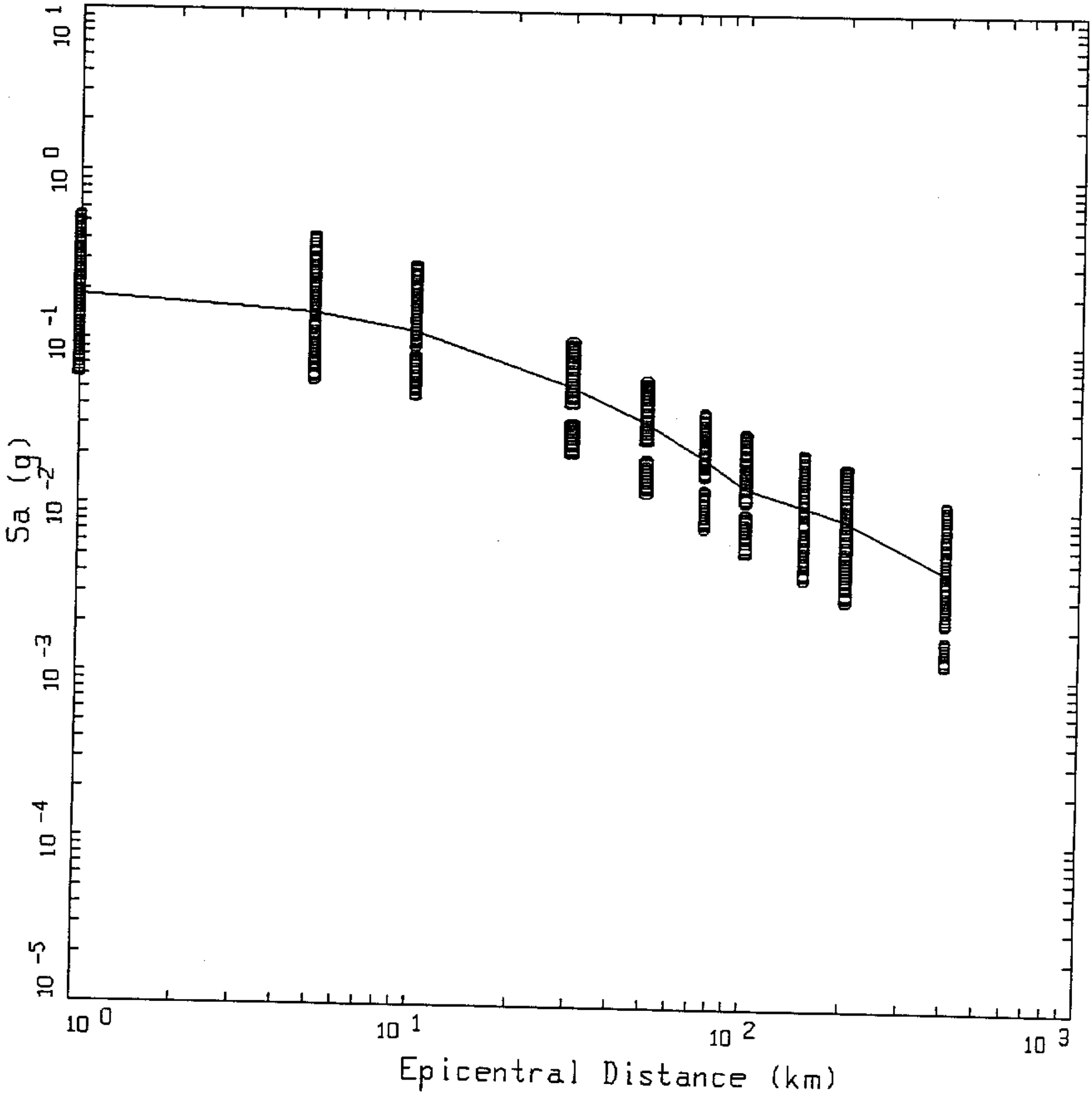
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 0.25 Hz, MESA SITES	Figure O-30
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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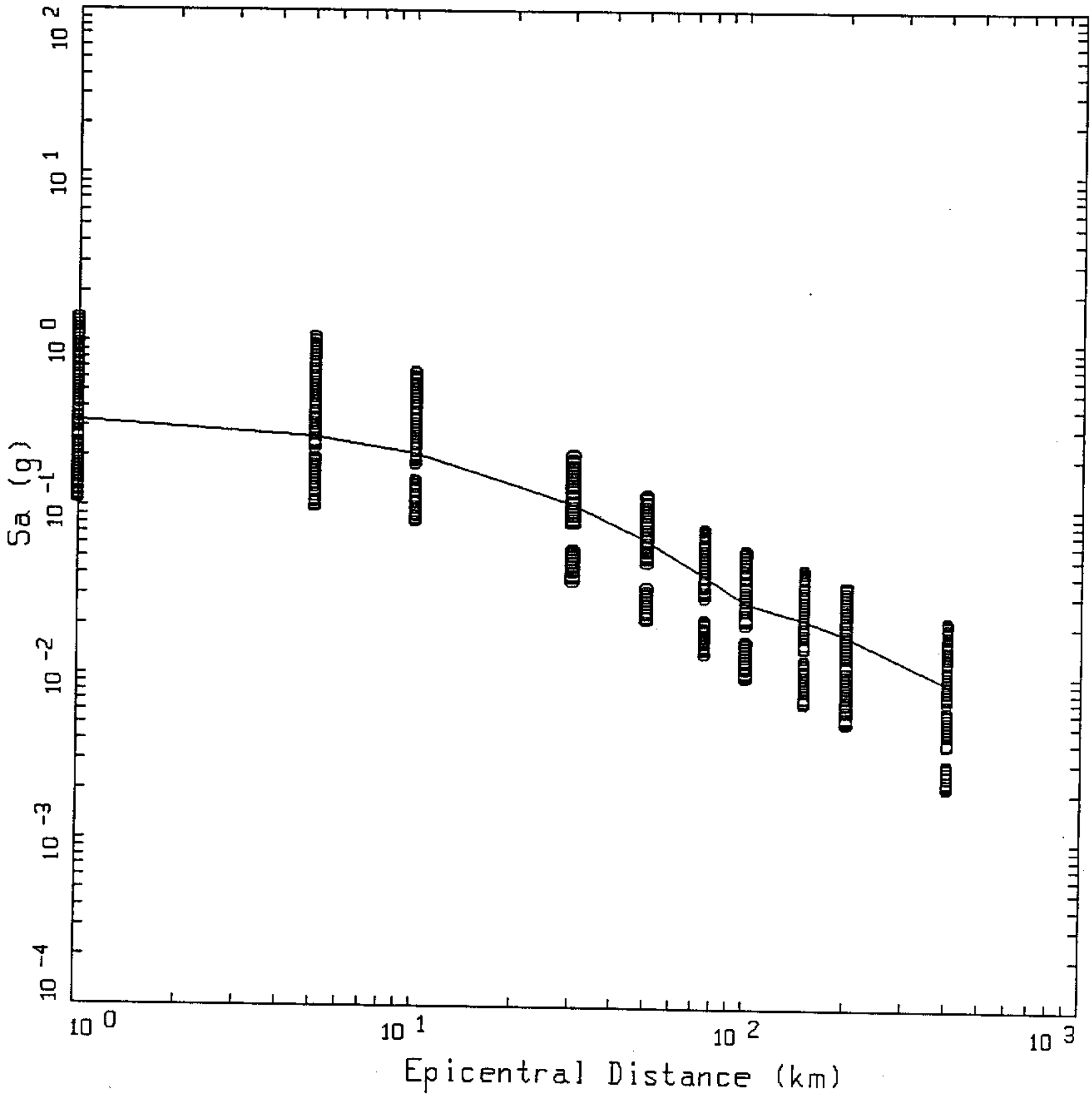
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 0.25 Hz, MESA SITES	Figure O-31
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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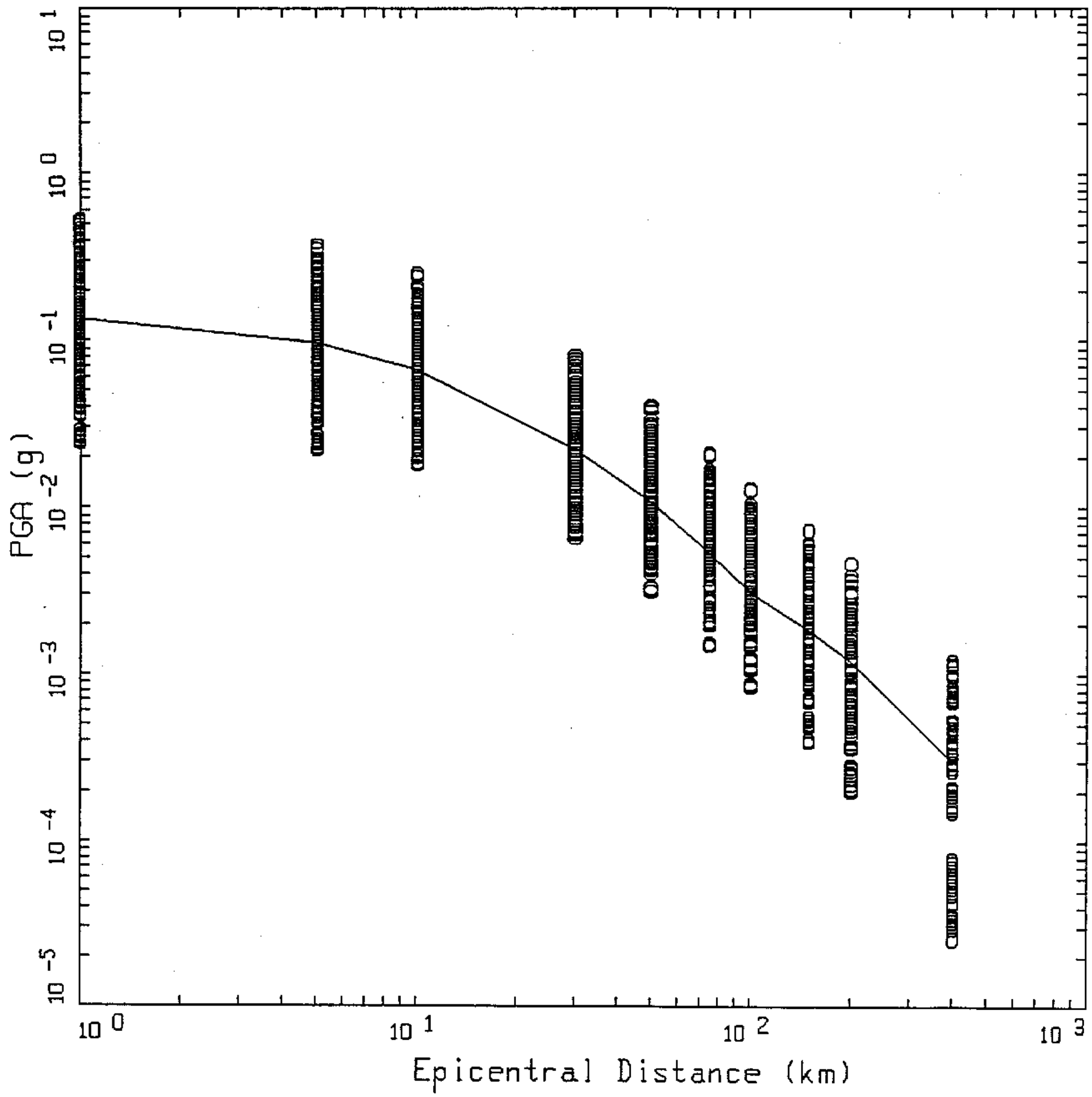
o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 0.25 Hz, MESA SITES	Figure O-32
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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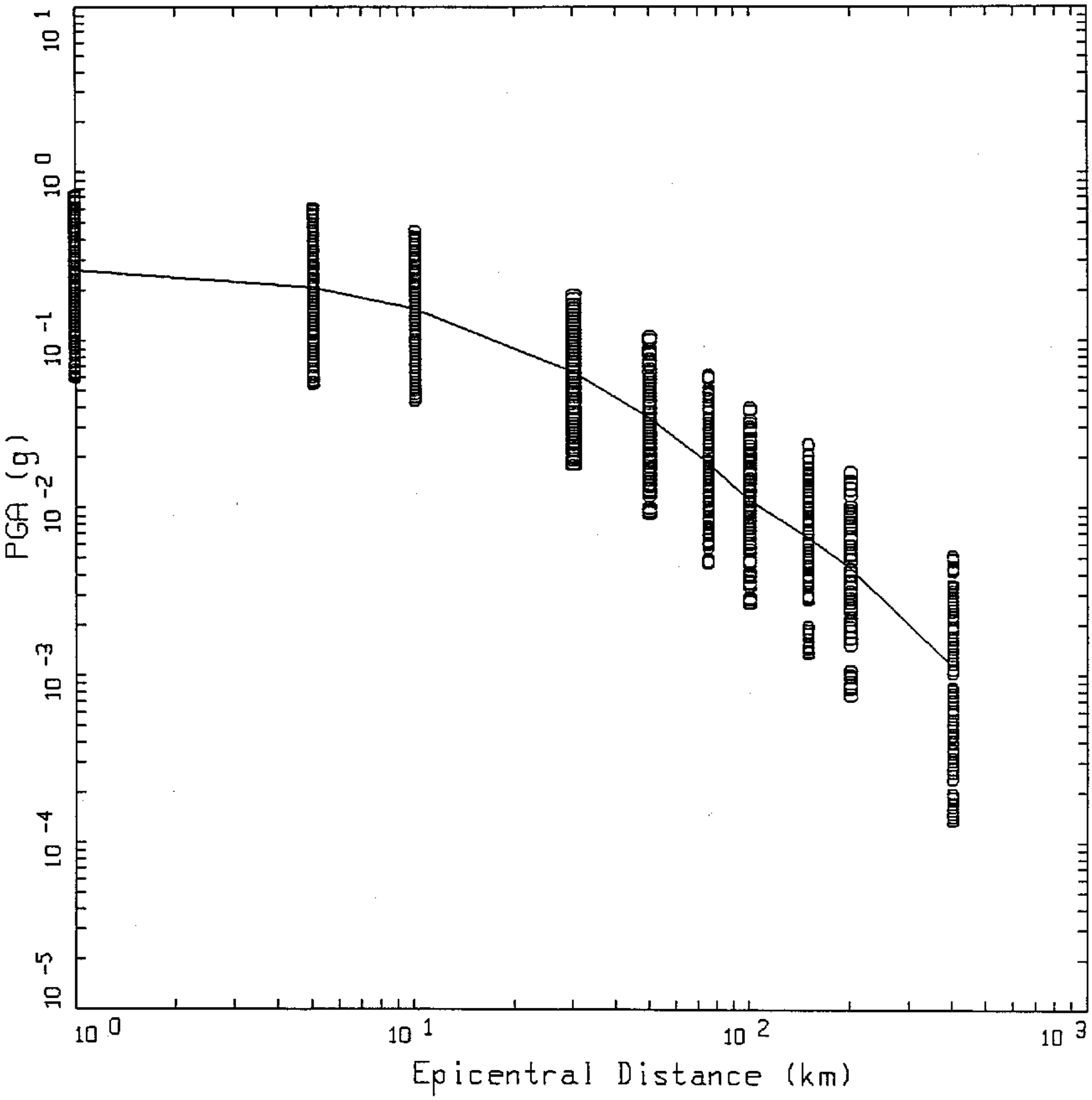
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND PGA, CANYON SITES	Figure O-33
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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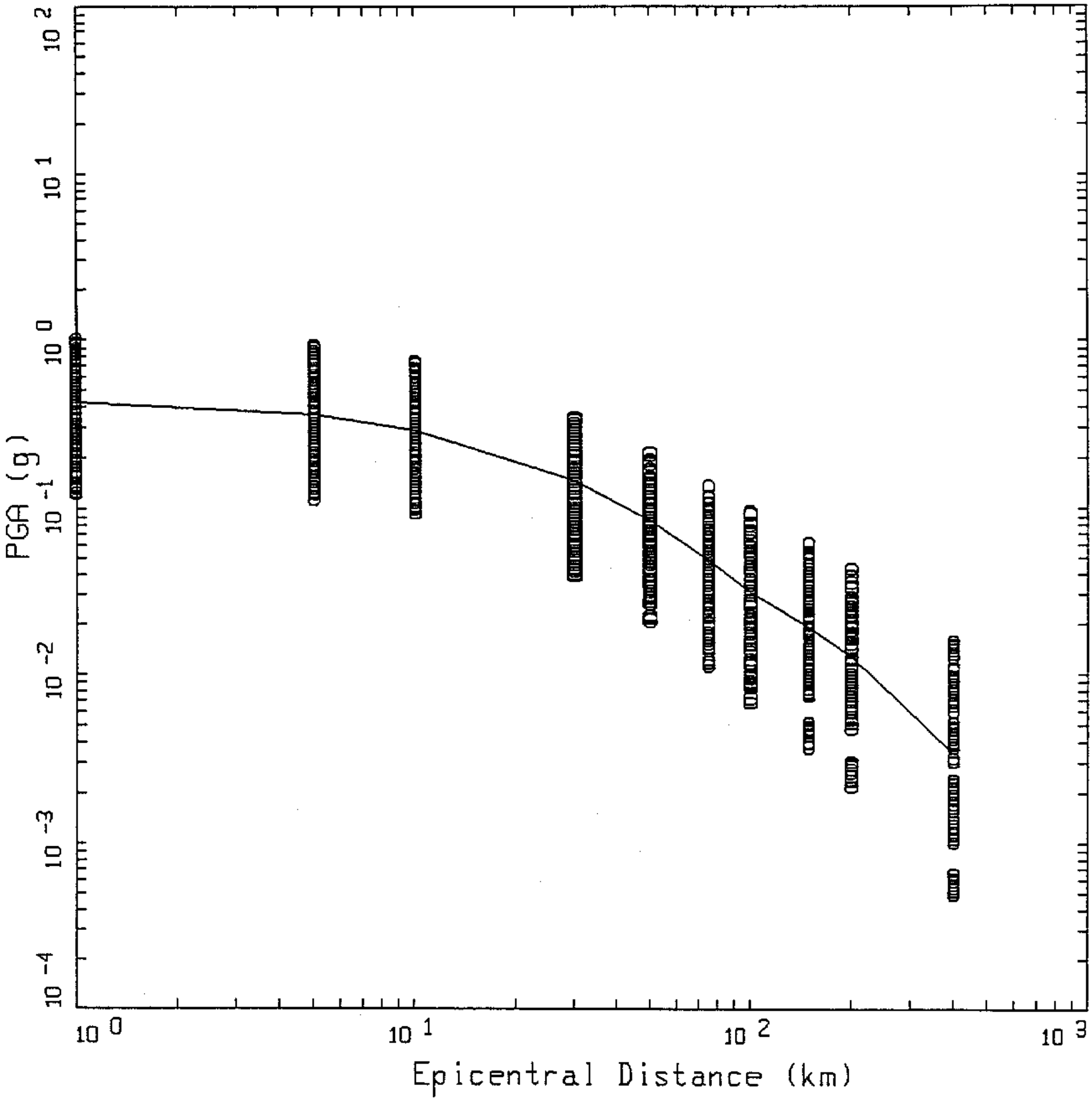
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND PGA, CANYON SITES	Figure O-34
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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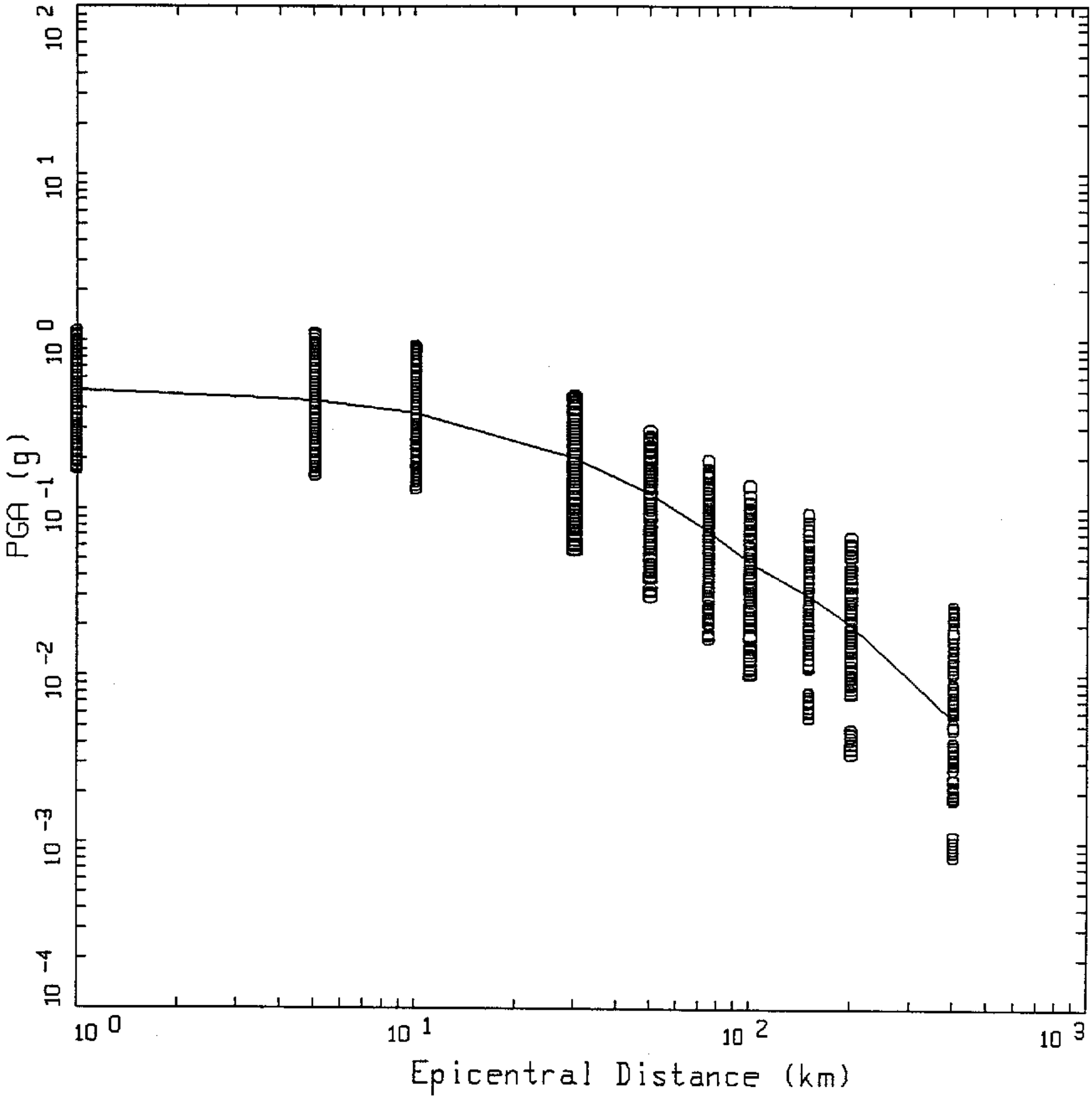
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND PGA, CANYON SITES	Figure O-35
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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o Data

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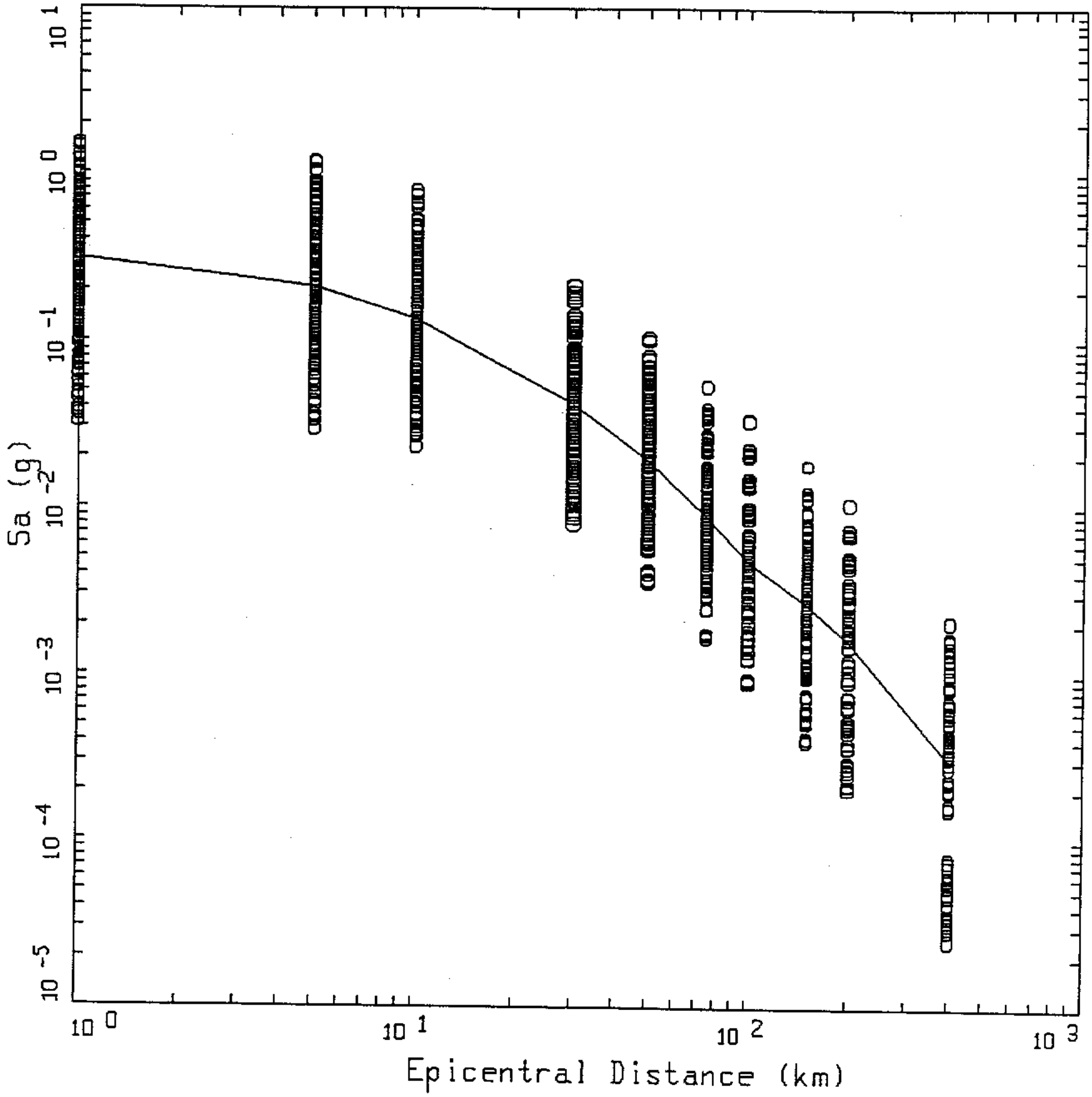
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND PGA, CANYON SITES	Figure O-36
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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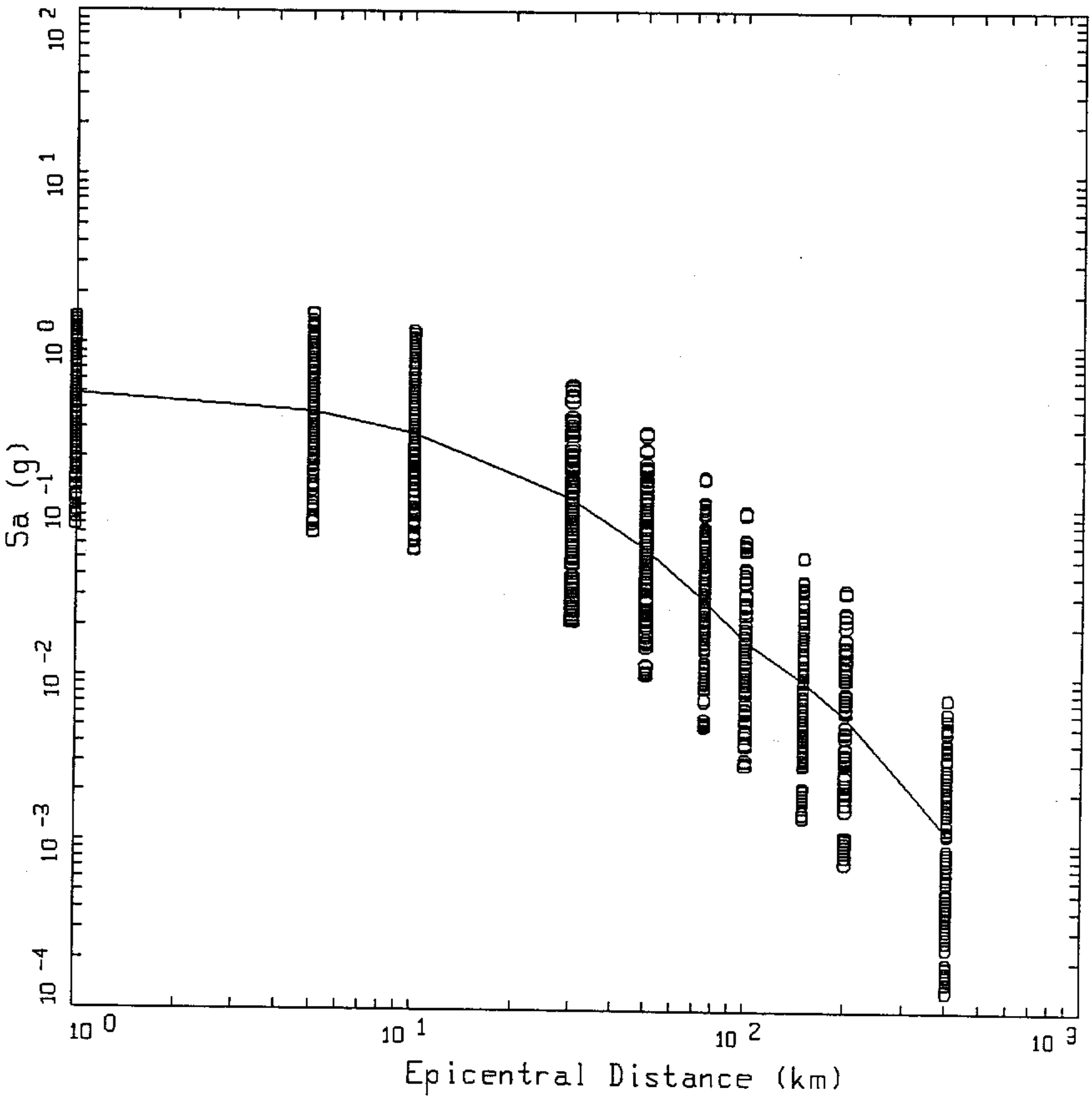
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 10.0 Hz, CANYON SITES	Figure O-37
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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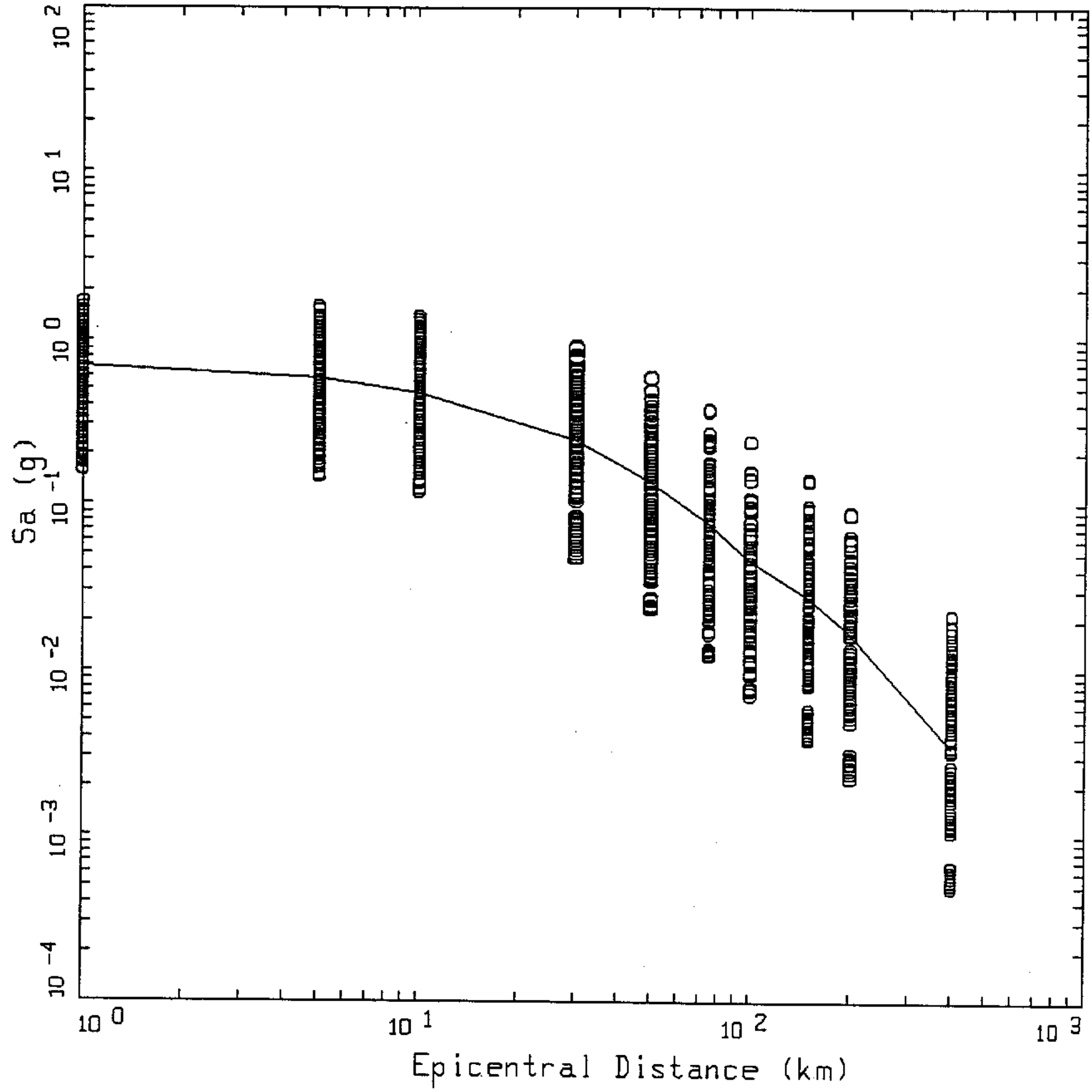
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 10.0 Hz, CANYON SITES	Figure O-38
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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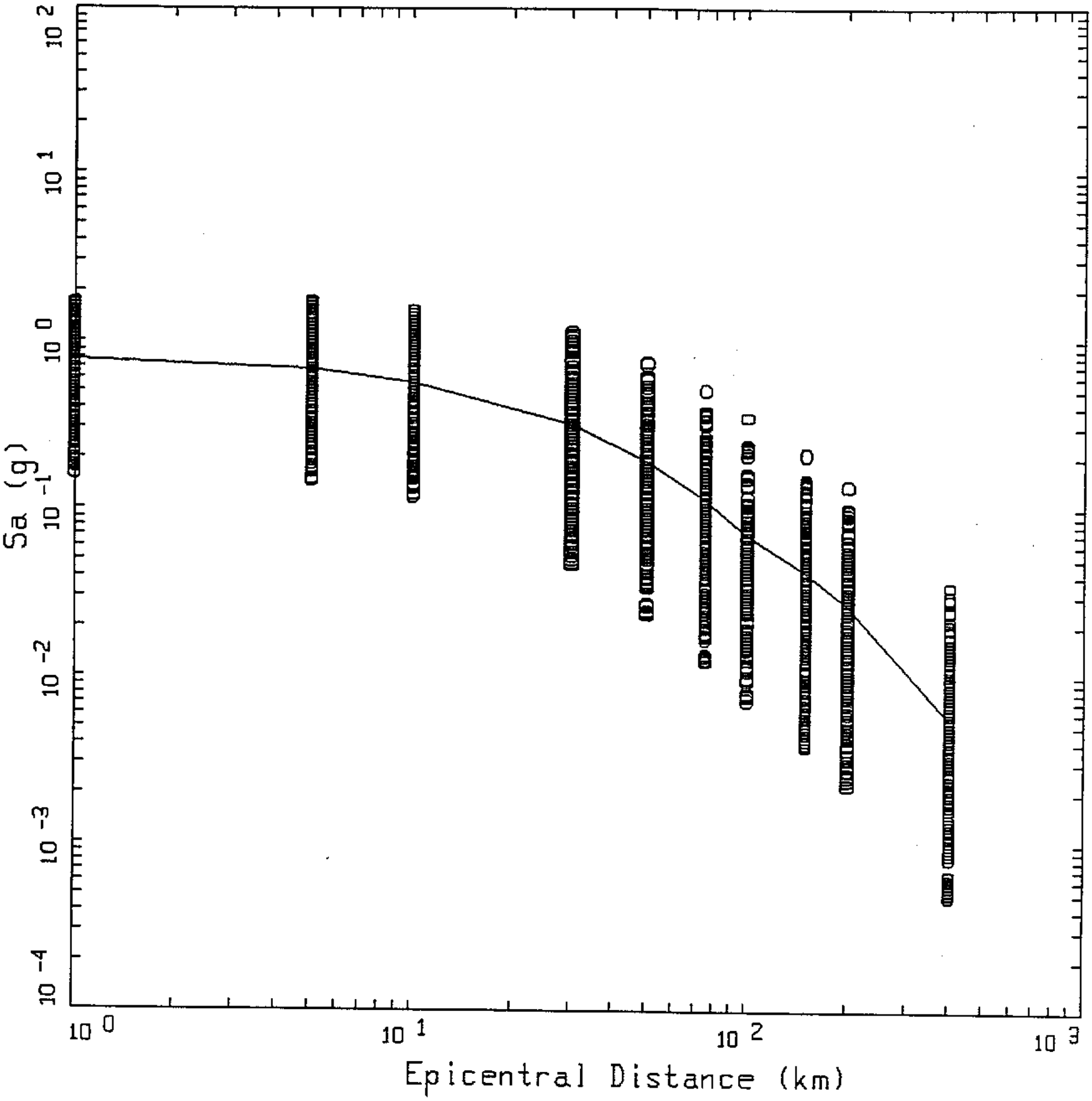
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 10.0 Hz, CANYON SITES	Figure O-39
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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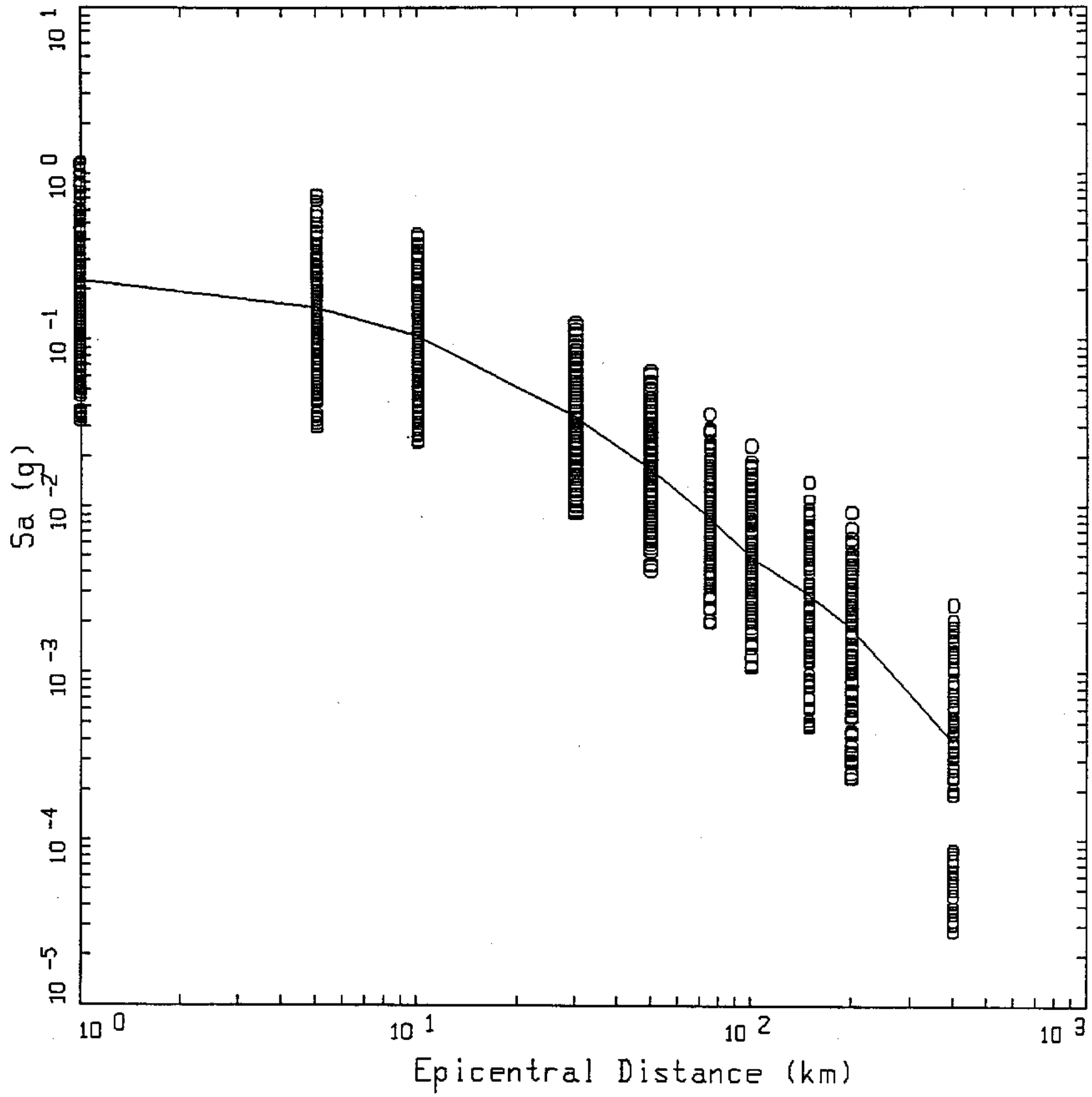
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 10.0 Hz, CANYON SITES	Figure O-40
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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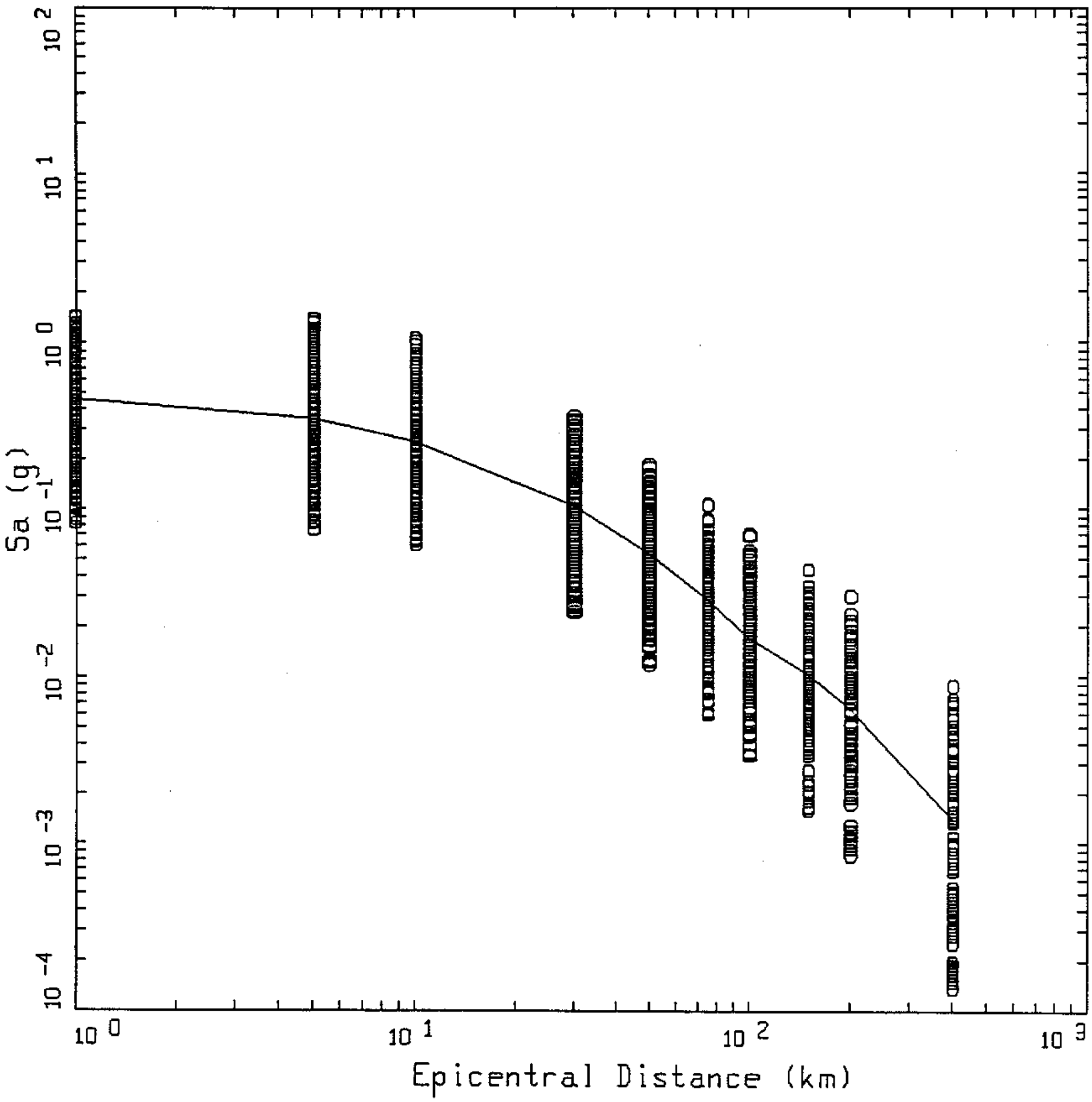
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 5.00 Hz, CANYON SITES	Figure O-41
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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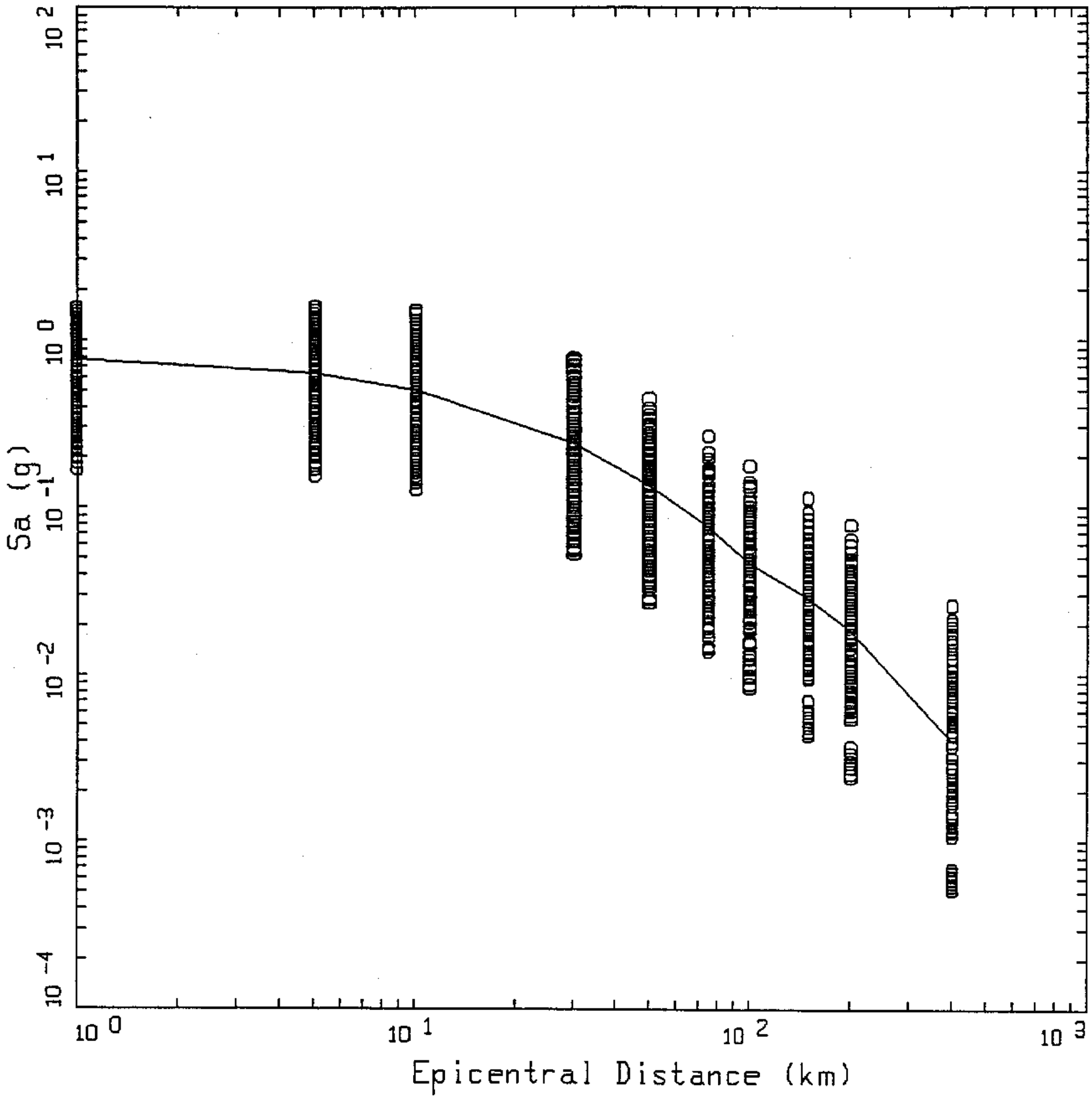
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 5.00 Hz, CANYON SITES	Figure O-42
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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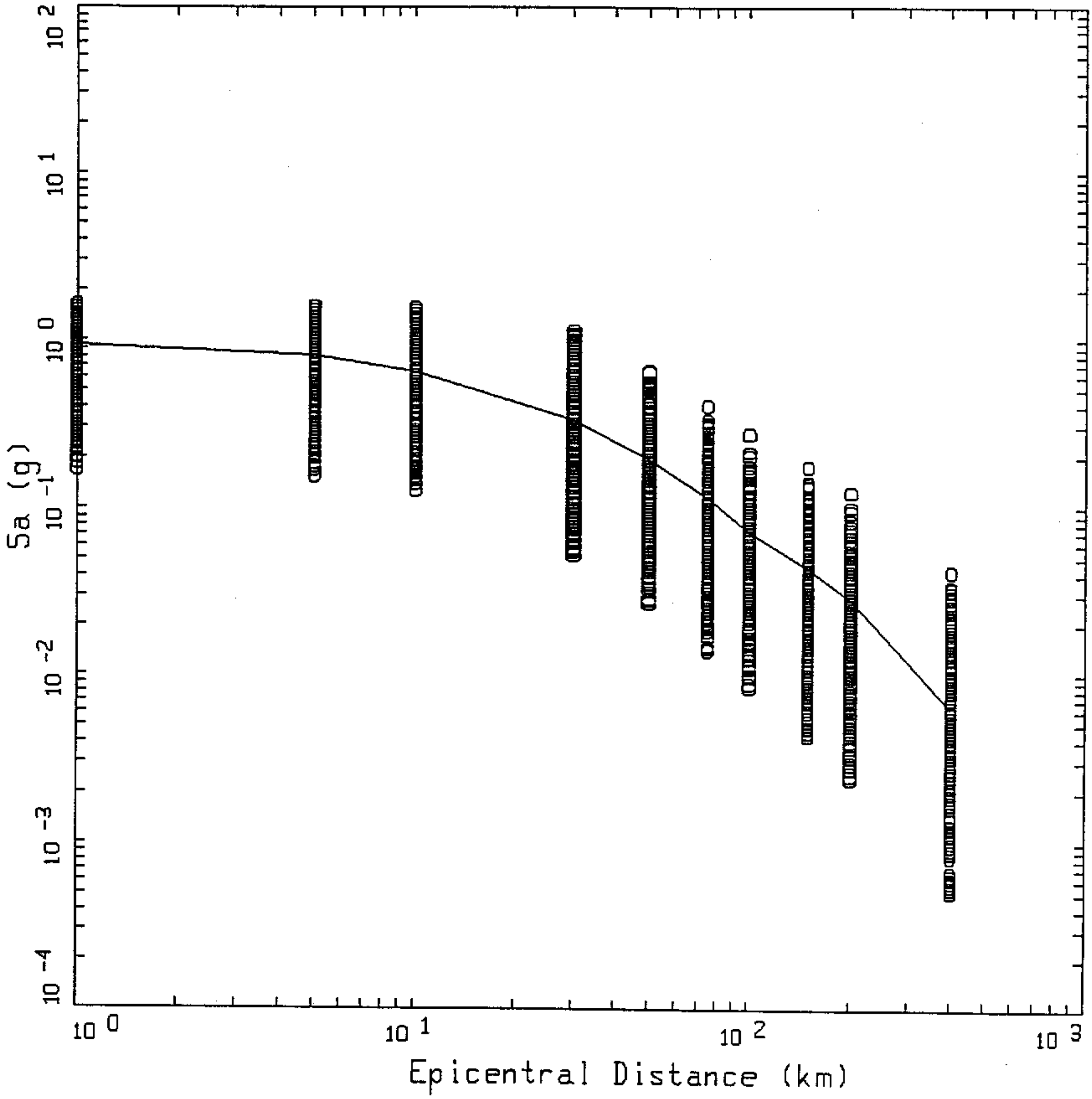
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 5.00 Hz, CANYON SITES	Figure O-43
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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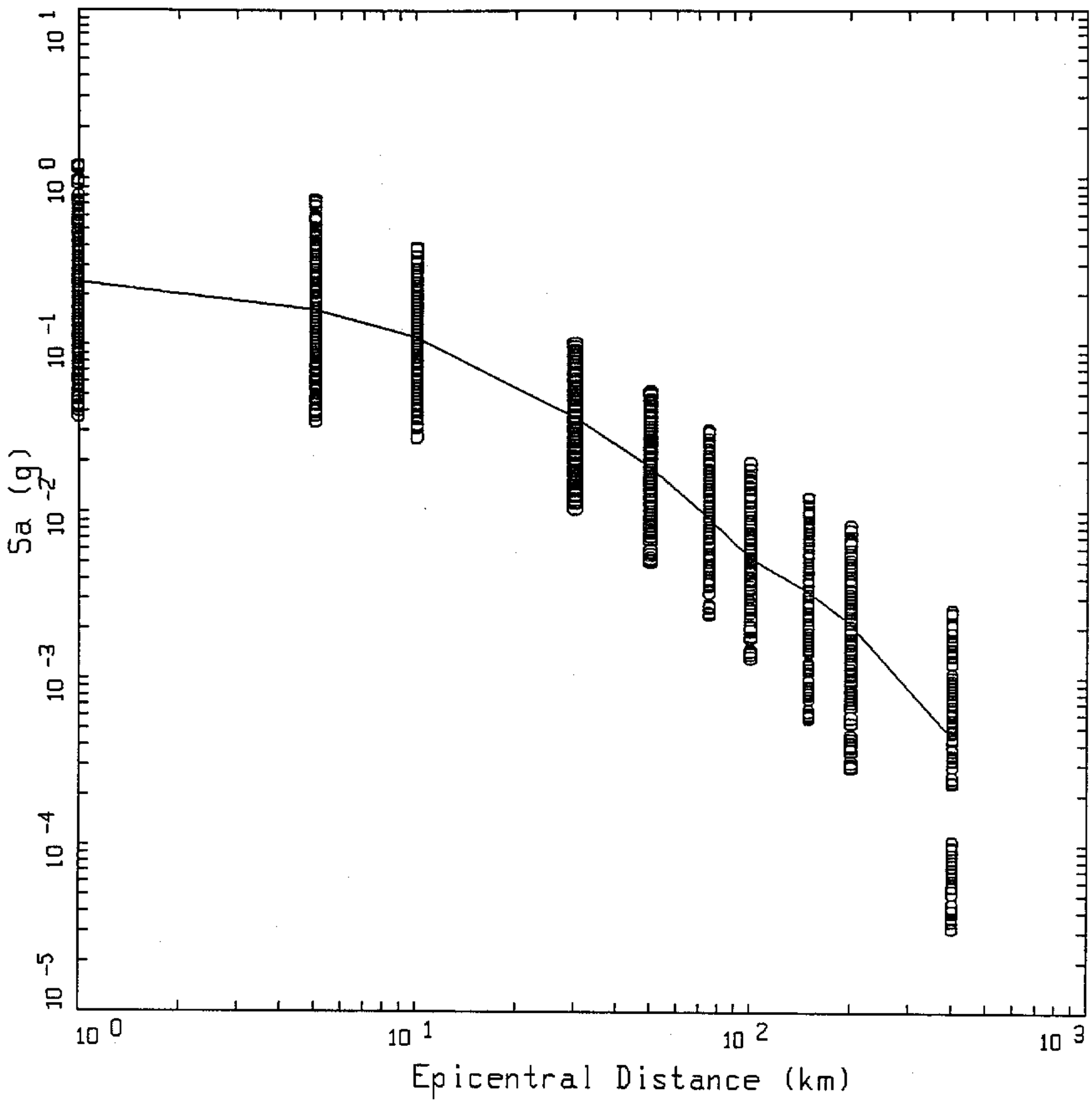
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 5.00 Hz, CANYON SITES	Figure O-44
Woodward-Clyde Federal Services			

91C0509A-1300/060293



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Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 3.33 Hz, CANYON SITES	Figure O-45
Woodward-Clyde Federal Services			

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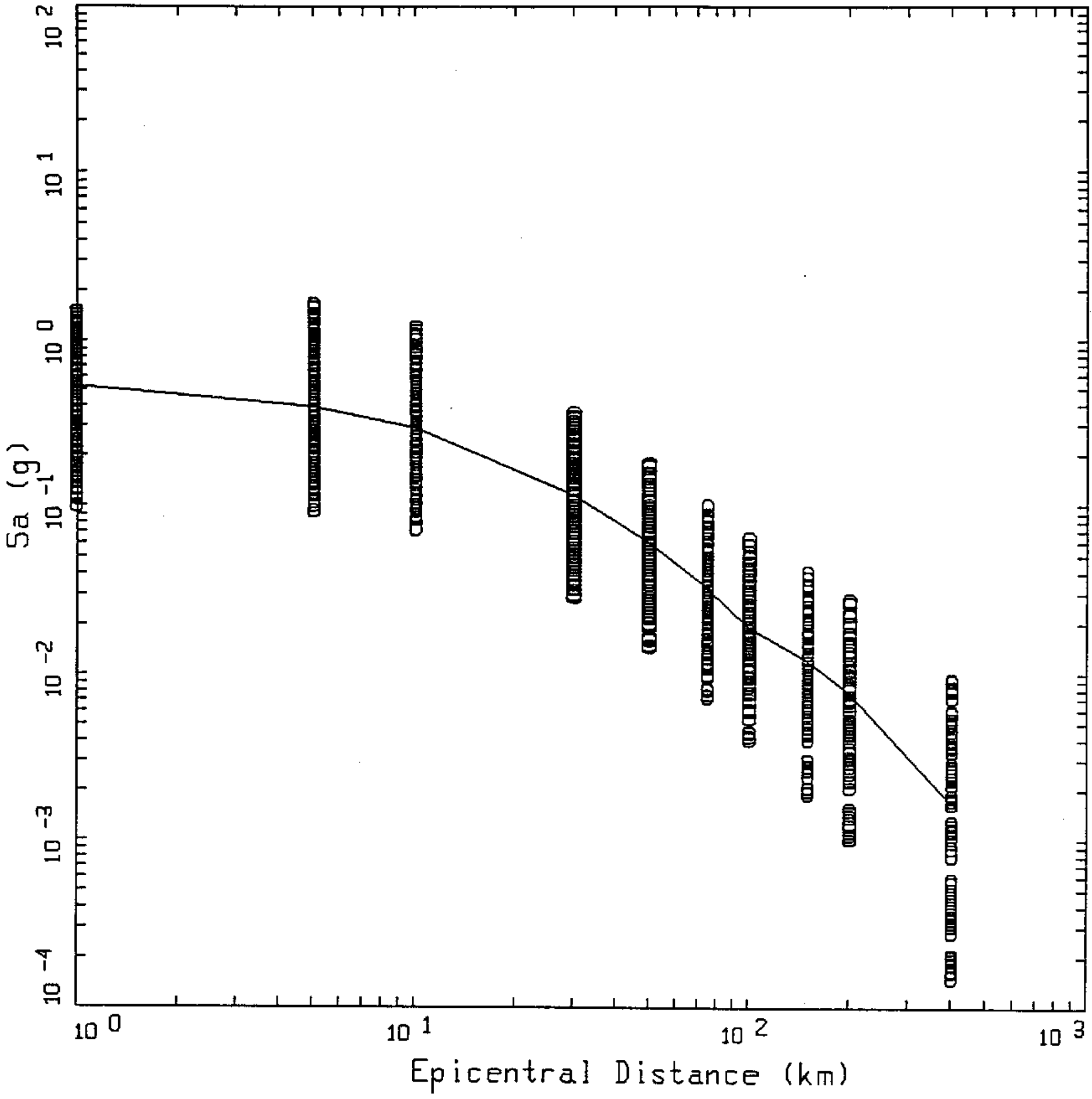

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o Data

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Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 3.33 Hz, CANYON SITES	Figure O-46
Woodward-Clyde Federal Services			

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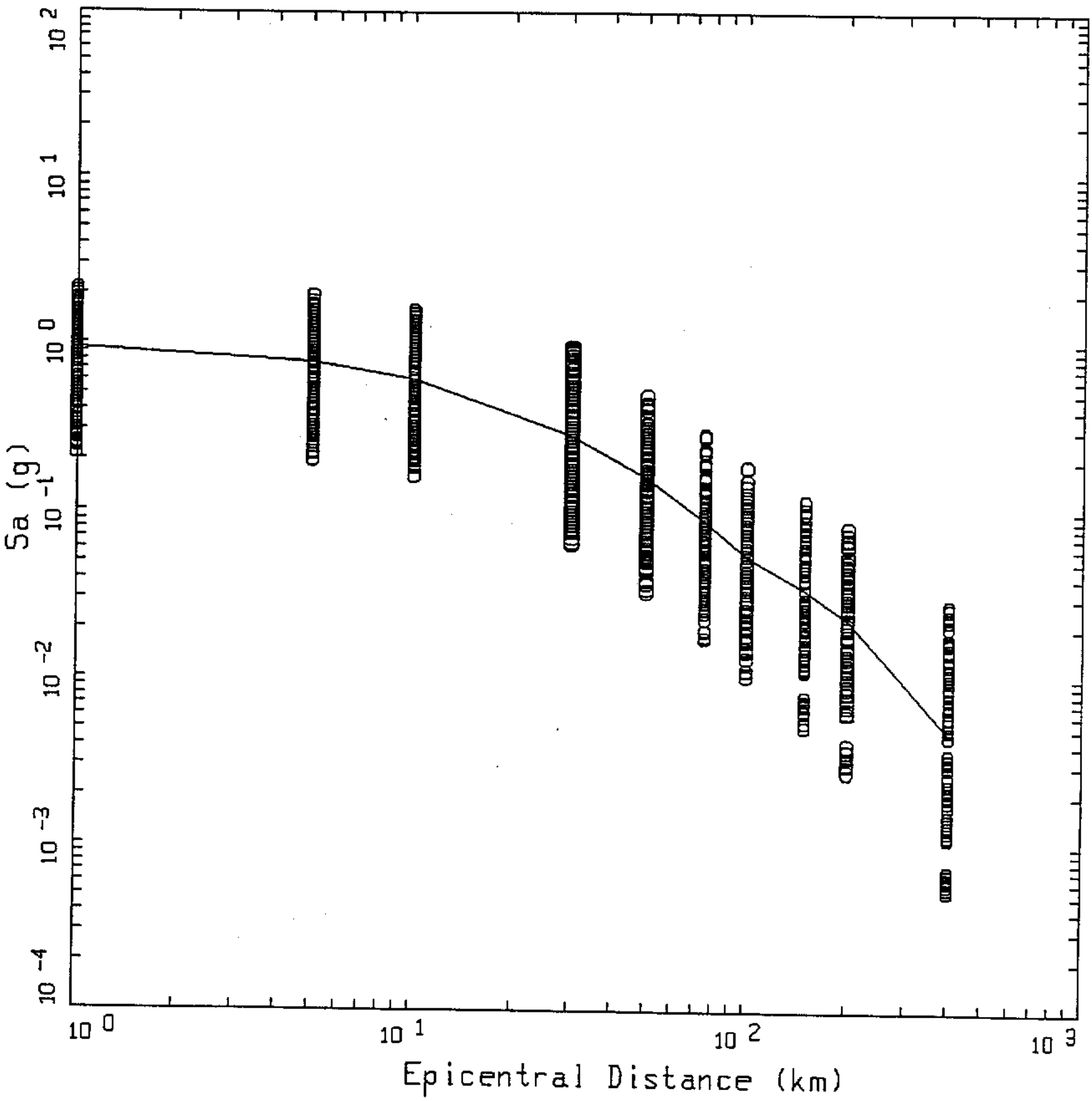

LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 3.33 Hz, CANYON SITES	Figure O-47
Woodward-Clyde Federal Services			

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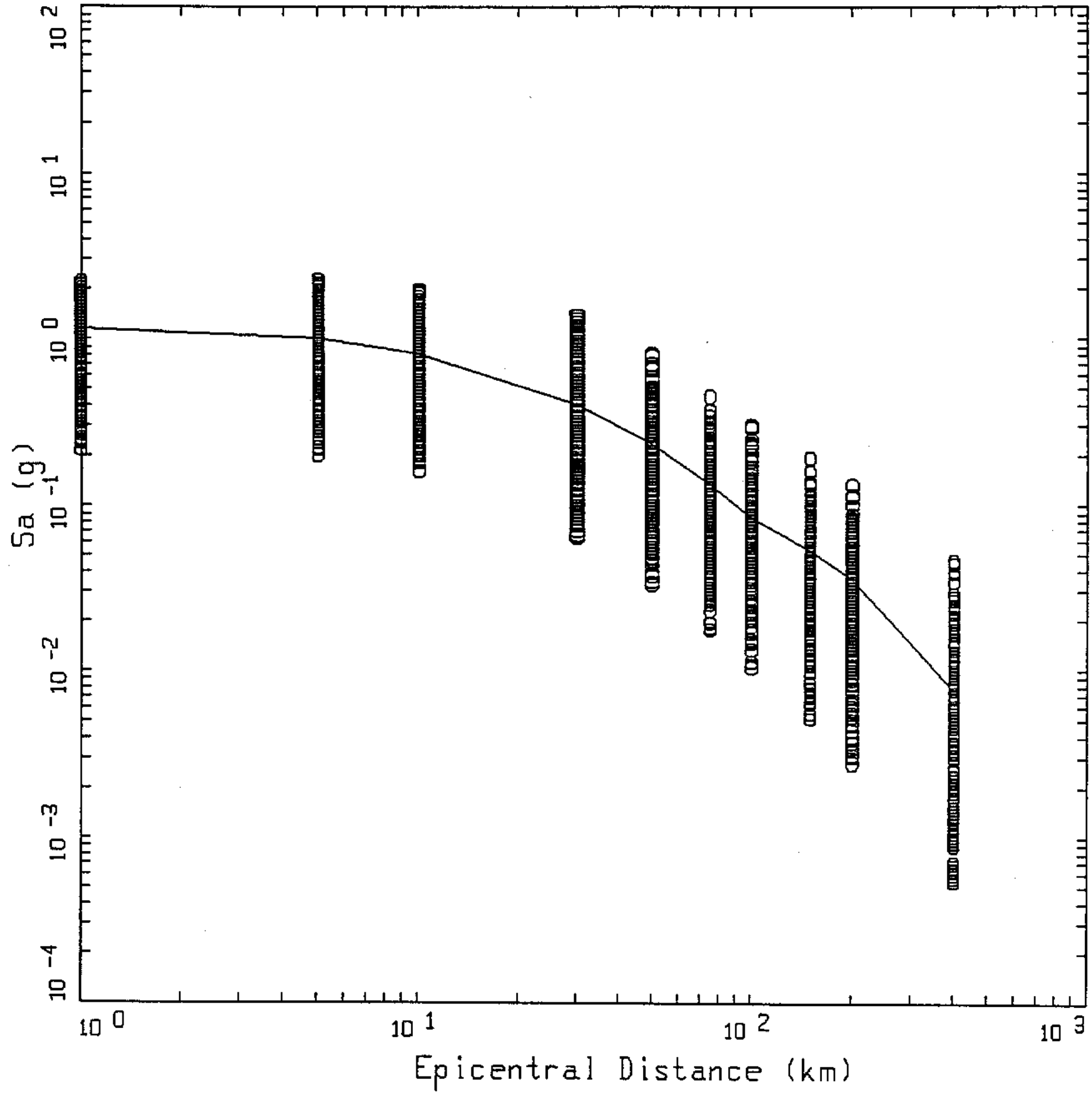

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Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 3.33 Hz, CANYON SITES	Figure O-48
Woodward-Clyde Federal Services			

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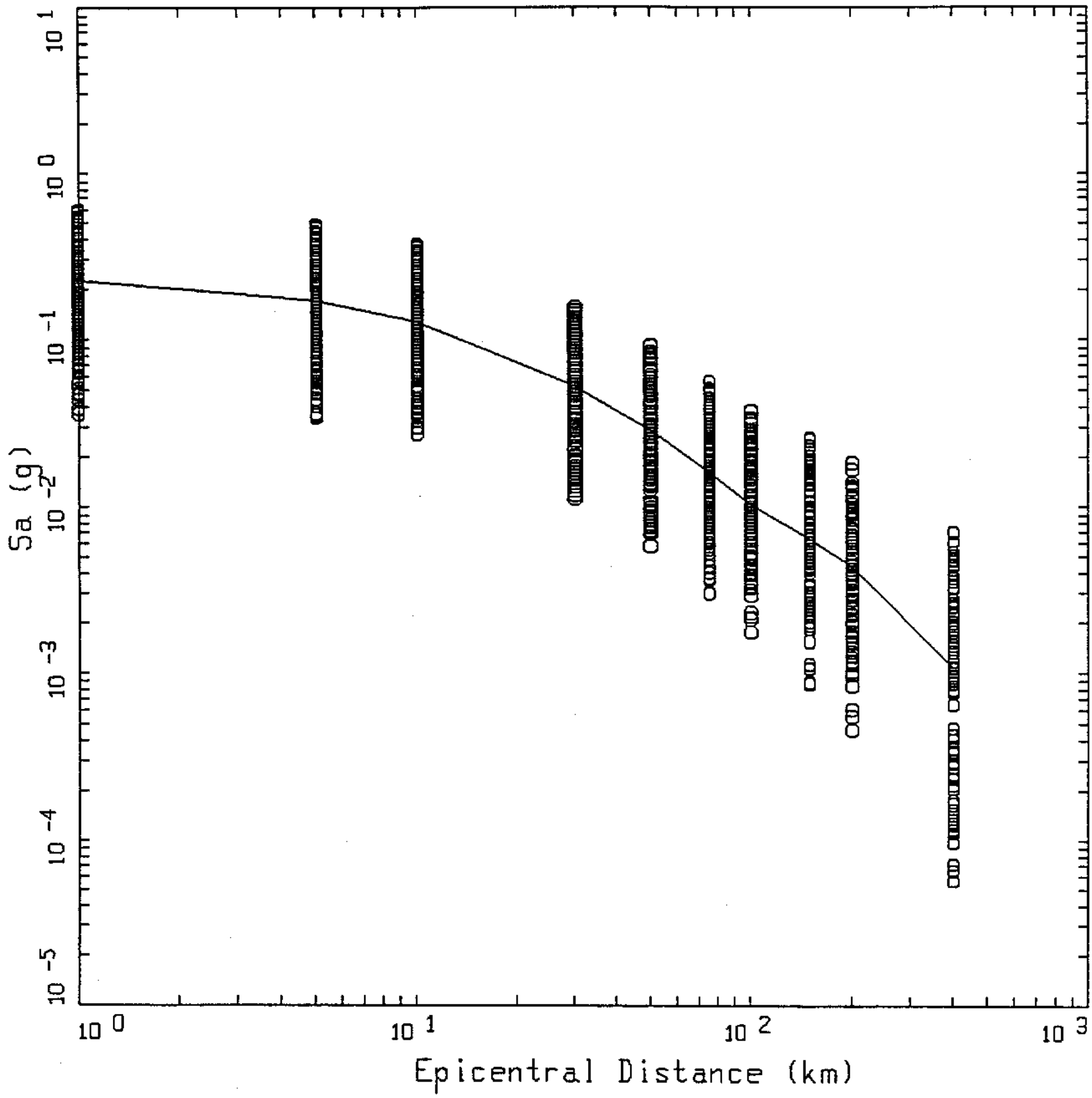

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Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 2.00 Hz, CANYON SITES	Figure O-49
Woodward-Clyde Federal Services			

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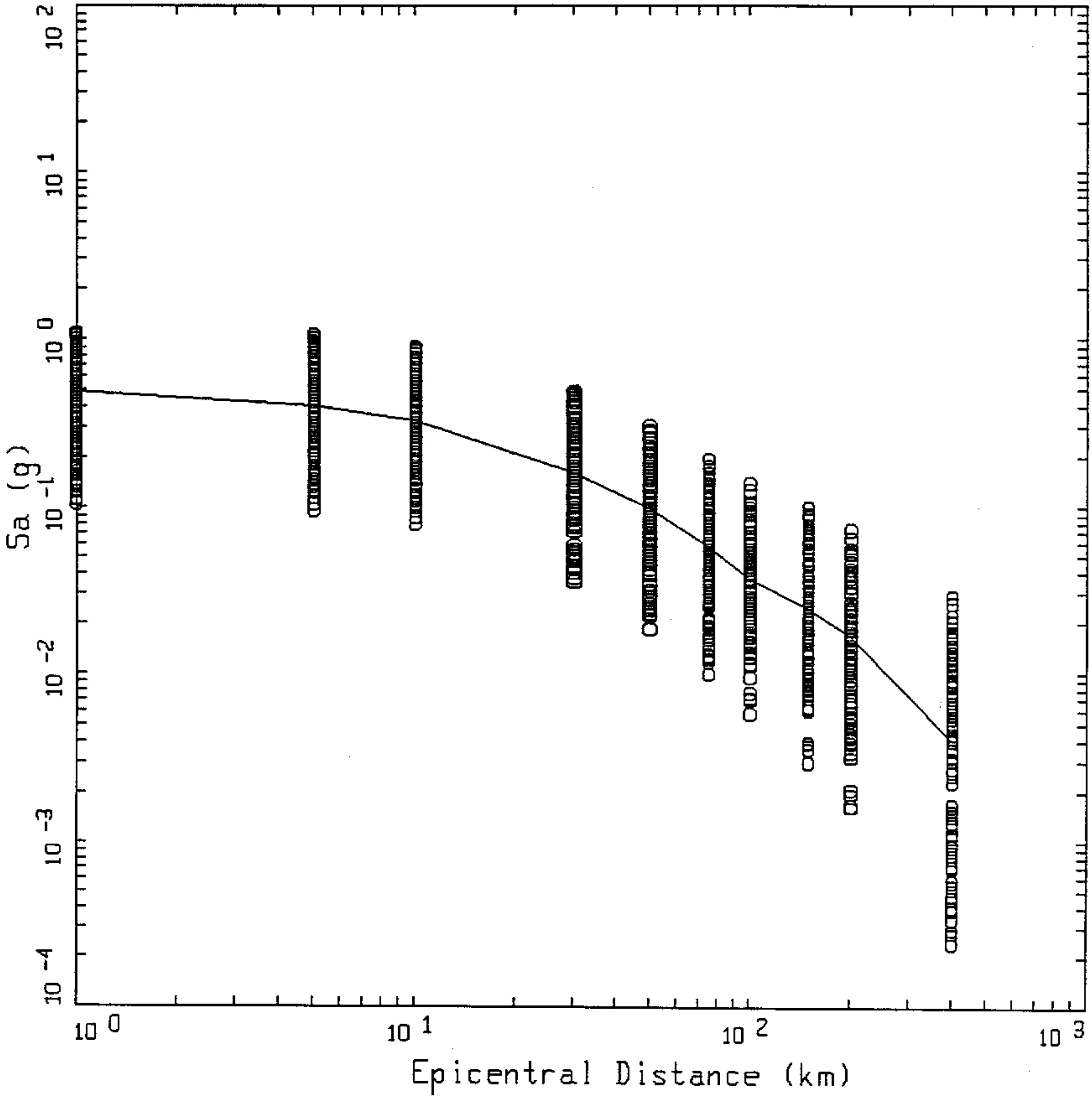

LEGEND

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Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 2.00 Hz, CANYON SITES	Figure O-50
Woodward-Clyde Federal Services			

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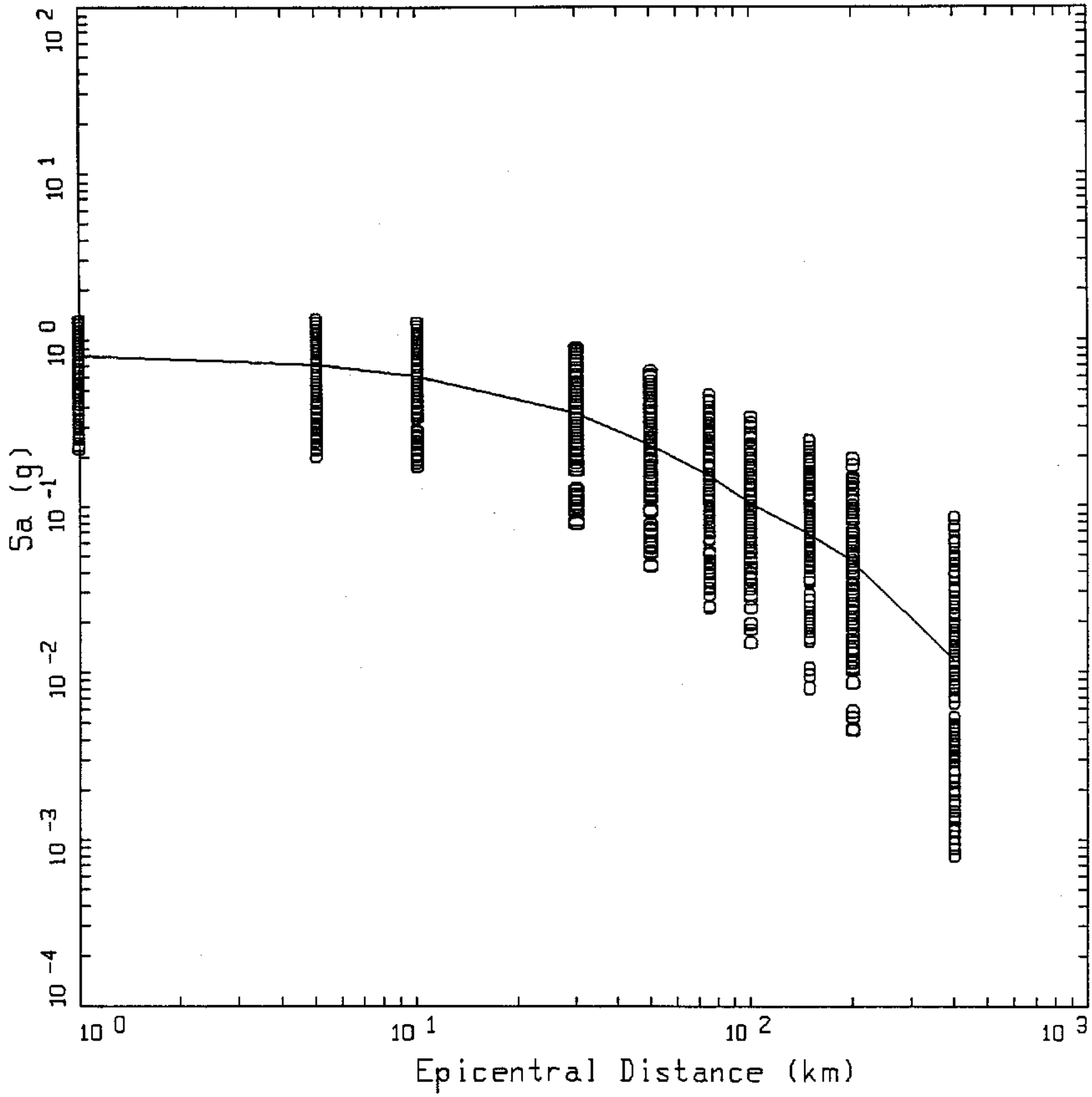

LEGEND

o Data

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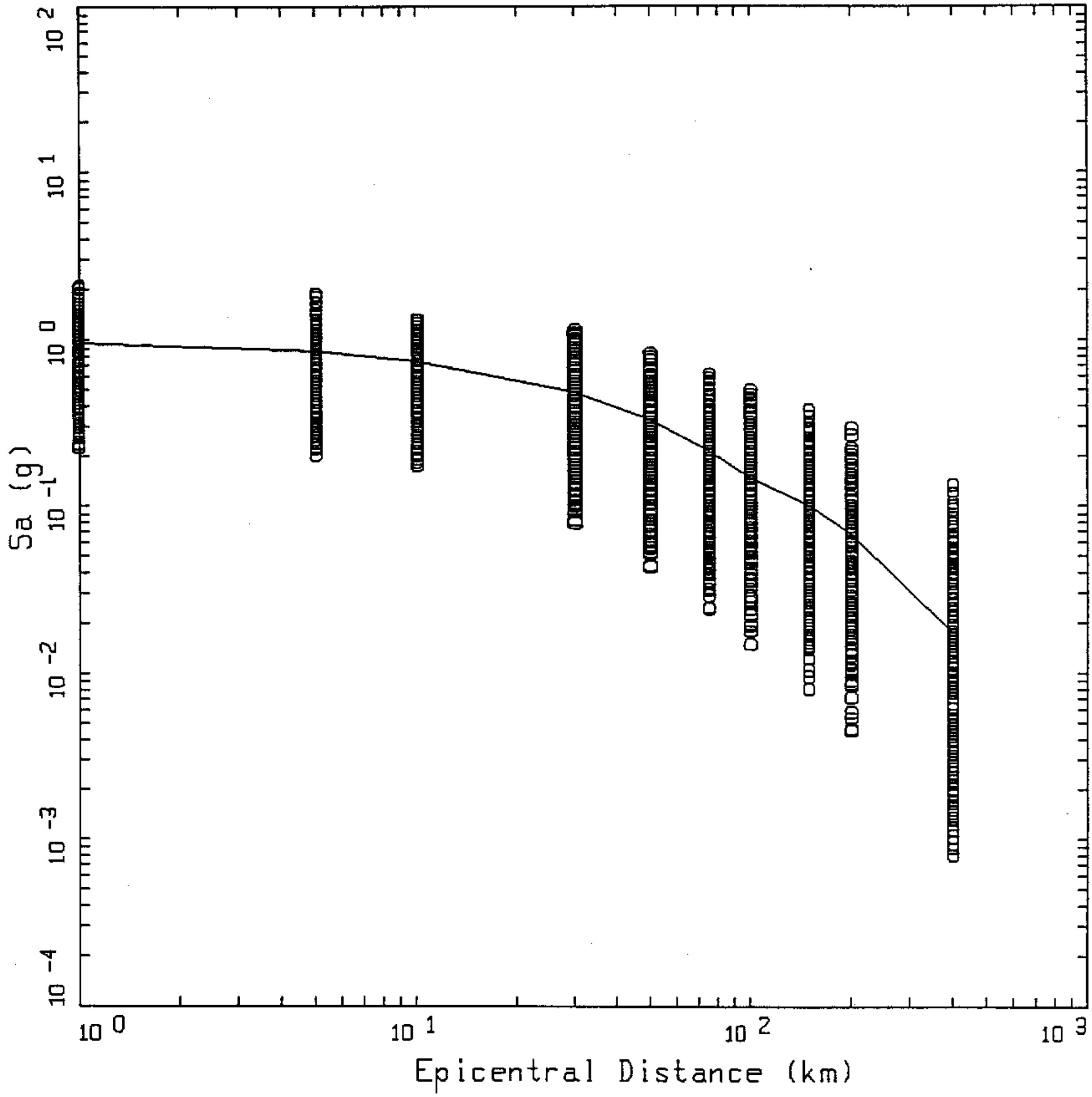
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 2.00 Hz, CANYON SITES	Figure O-51
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

o Data

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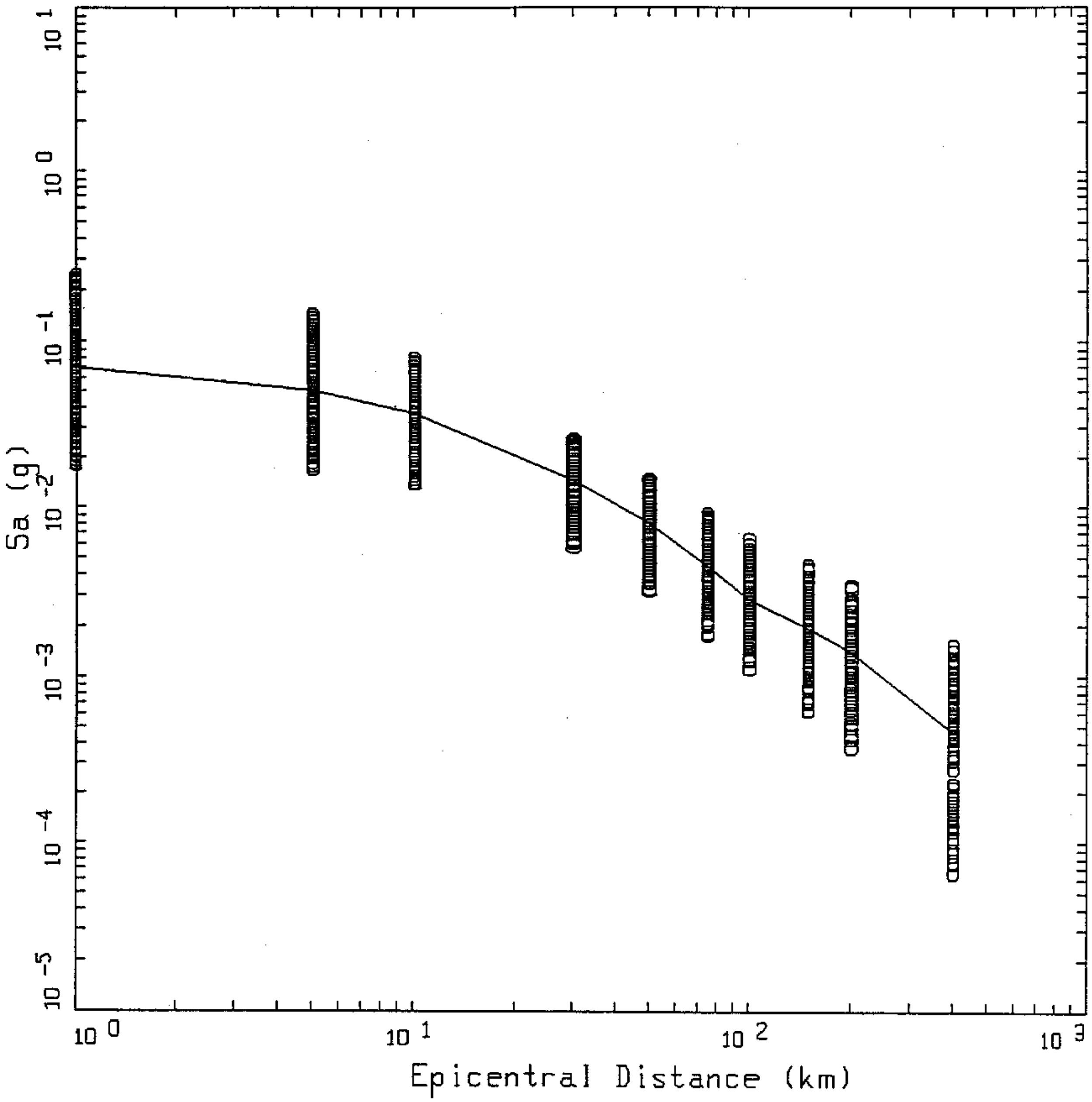
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 2.00 Hz, CANYON SITES	Figure O-52
Woodward-Clyde Federal Services			

91C0509A-1300/060293



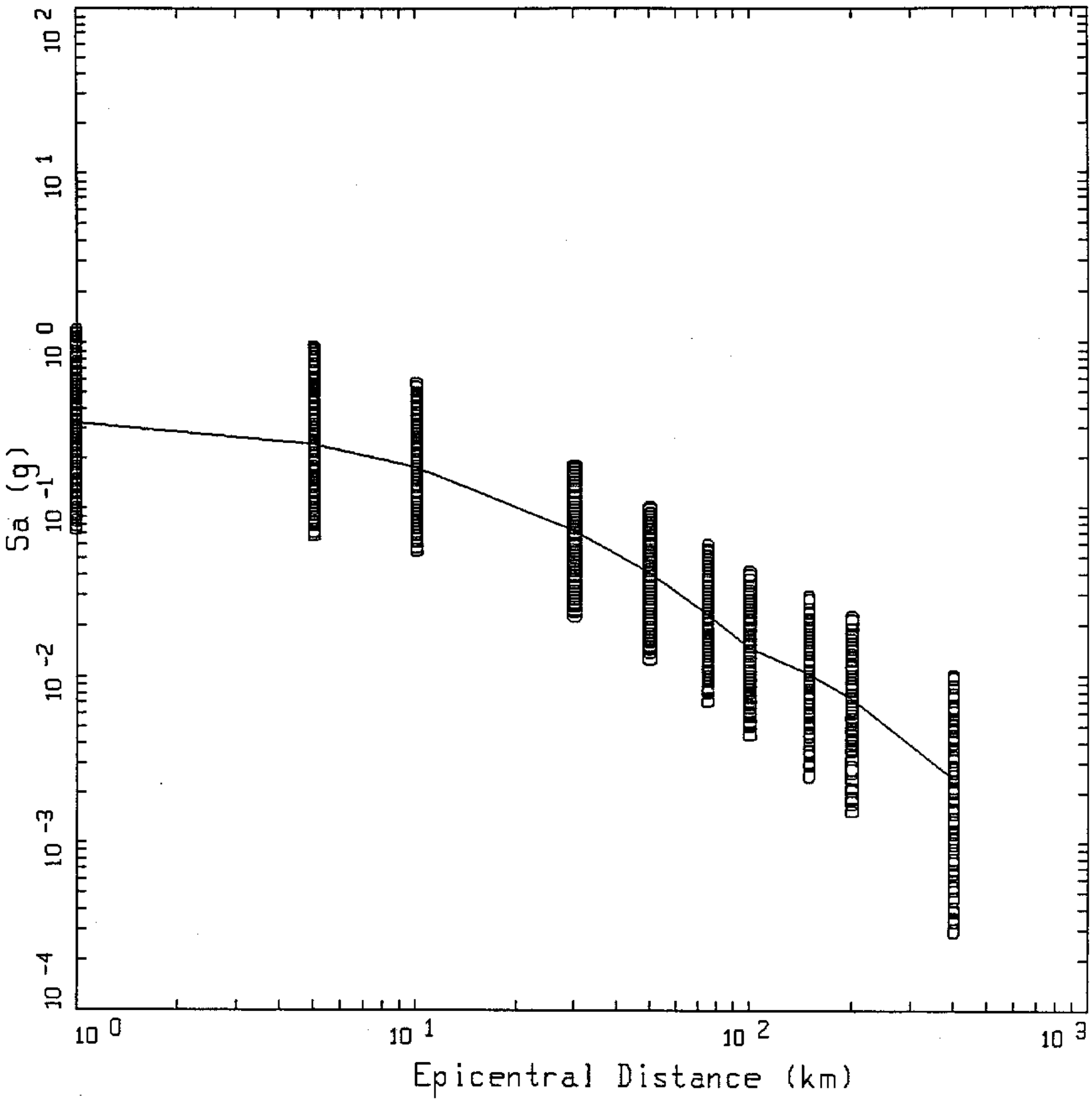
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 1.00 Hz, CANYON SITES	Figure O-53
Woodward-Clyde Federal Services			

91C0509A-1300/060293



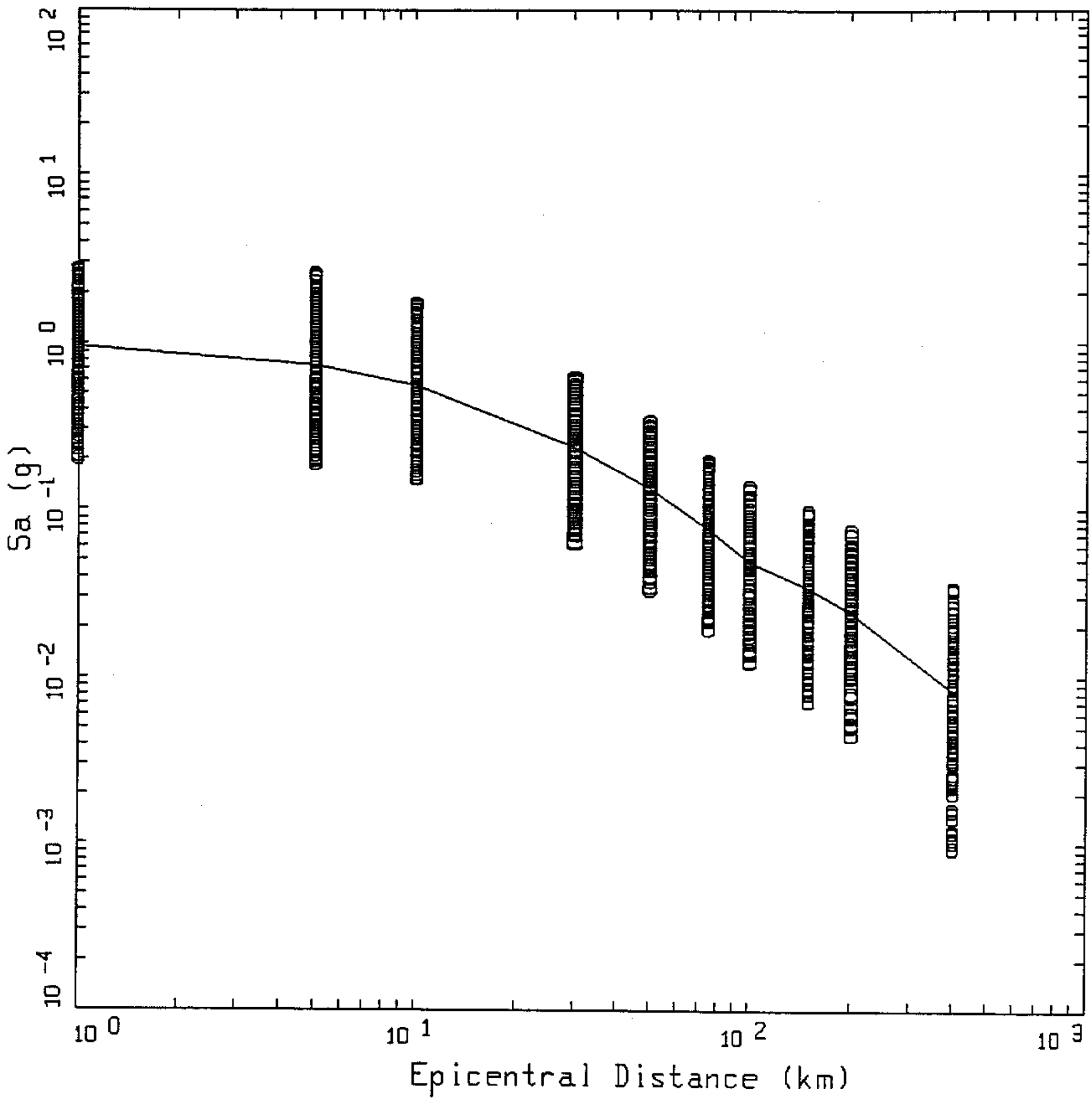
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 1.00 Hz, CANYON SITES	Figure O-54
Woodward-Clyde Federal Services			

91C0509A-1300/060293



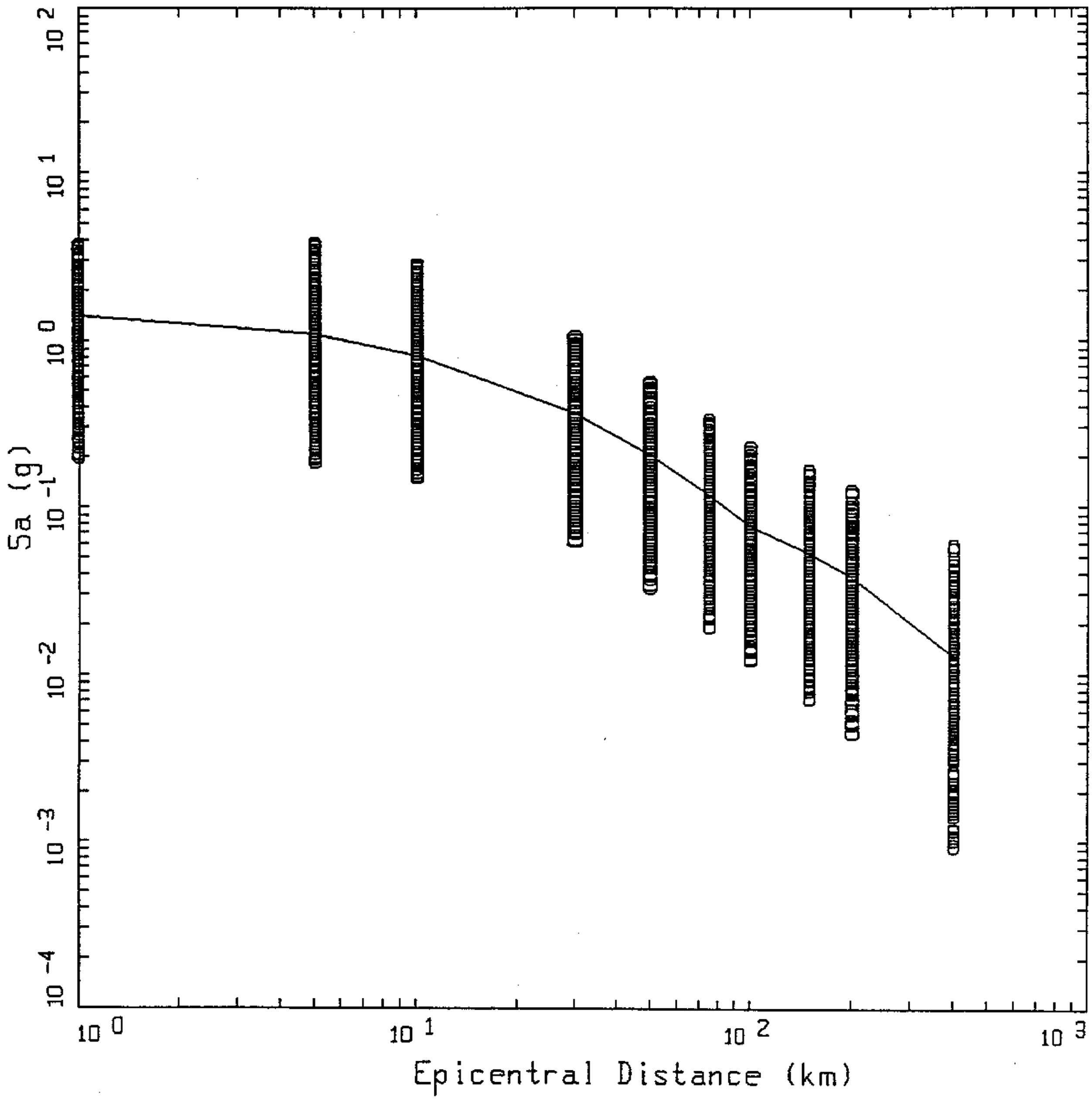
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 1.00 Hz, CANYON SITES	Figure O-55
Woodward-Clyde Federal Services			

91C0509A-1300/060293



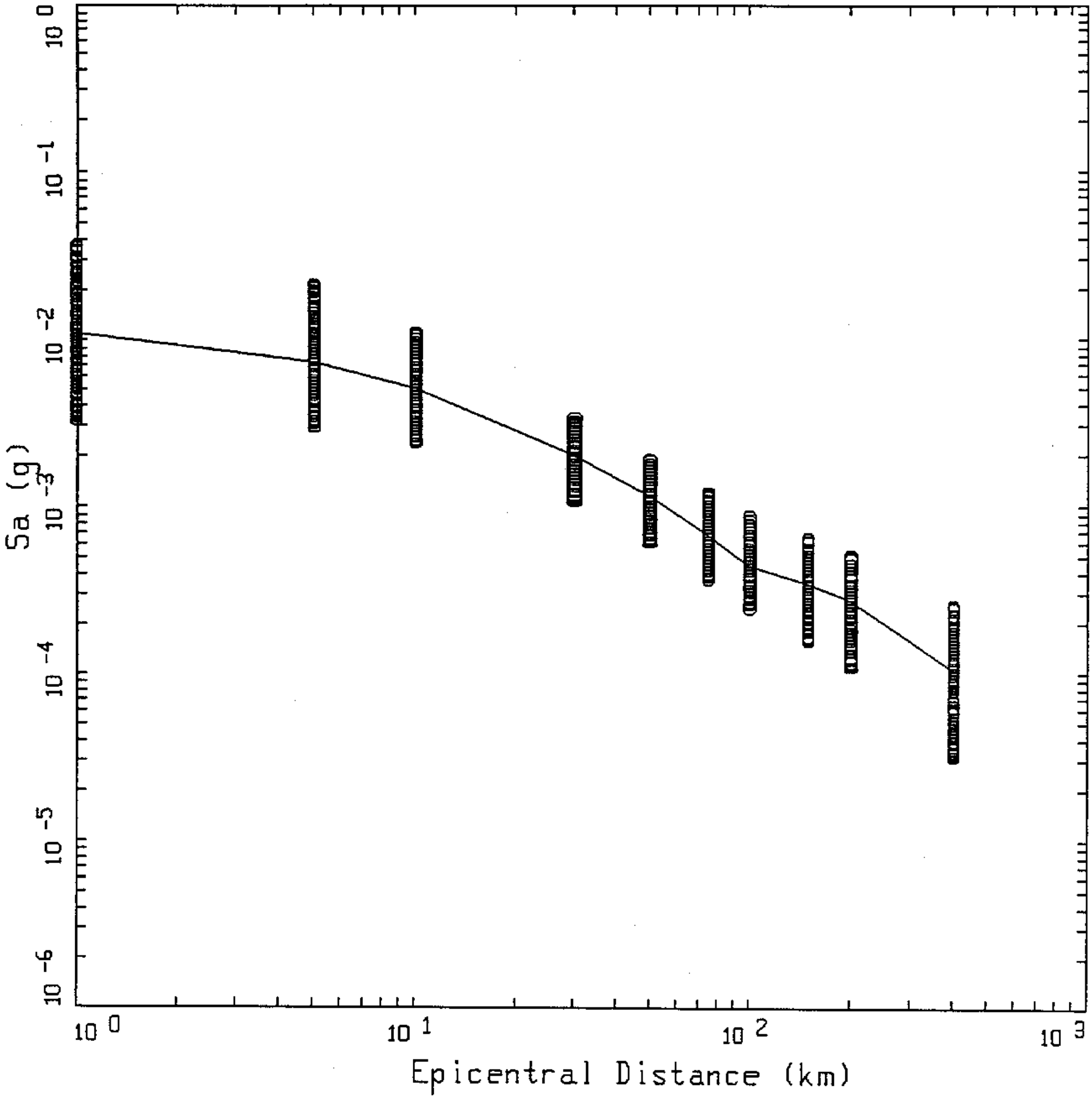
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 1.00 Hz, CANYON SITES	Figure O-56
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

o Data

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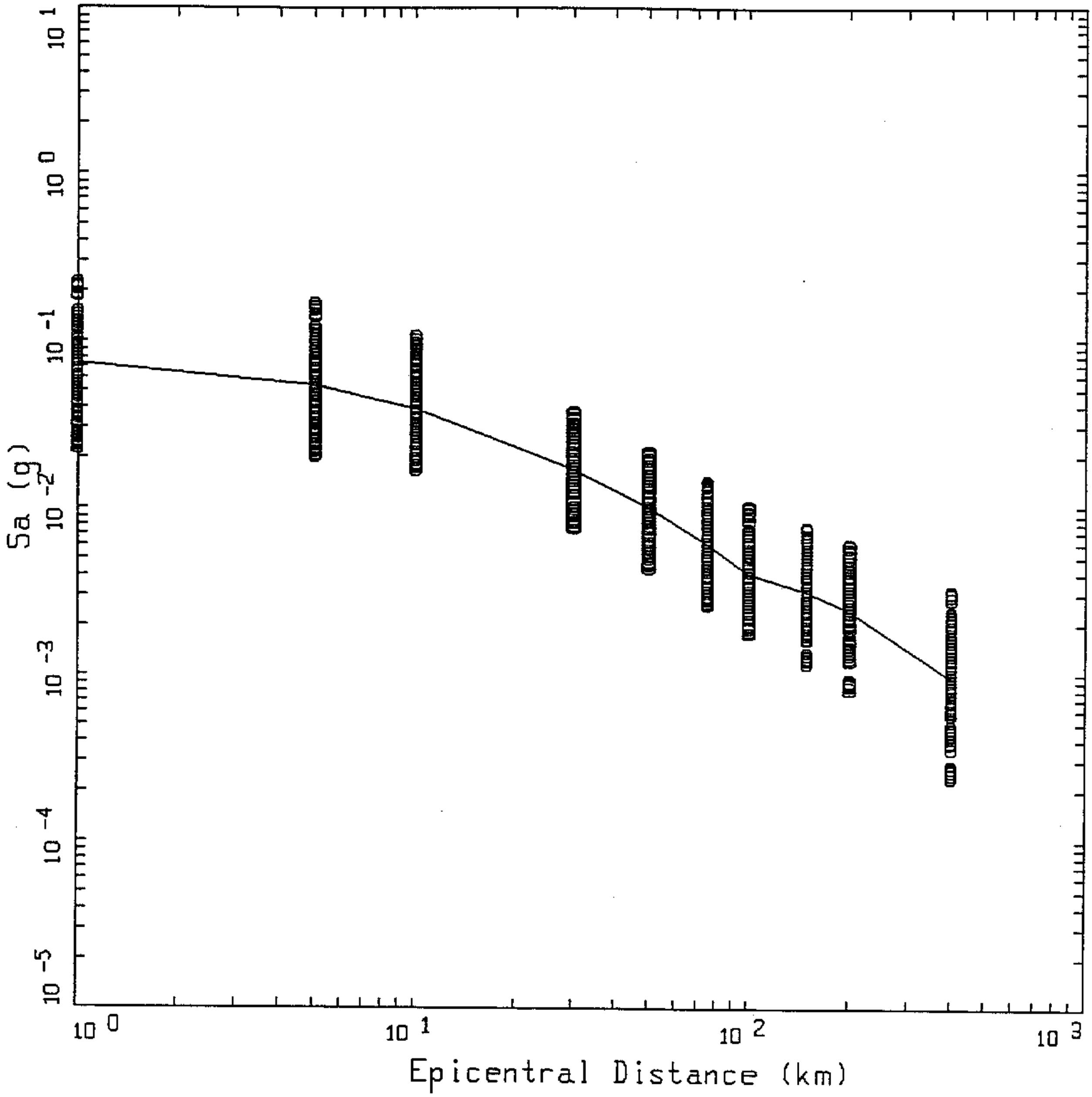
Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 0.50 Hz, CANYON SITES	Figure O-57
Woodward-Clyde Federal Services			

91C0509A-1300/060293



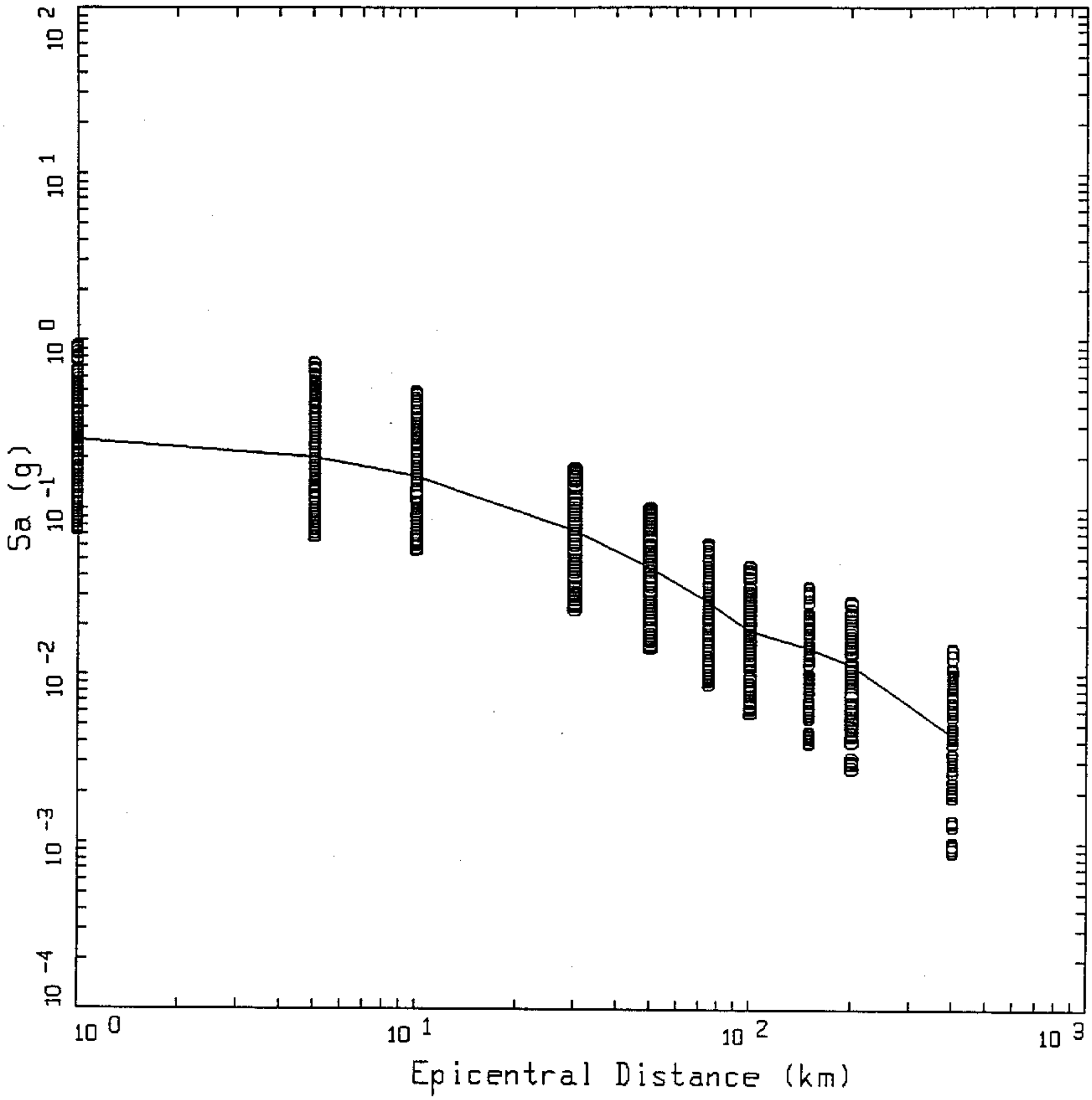
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 0.50 Hz, CANYON SITES	Figure O-58
Woodward-Clyde Federal Services			

91C0509A-1300/060293



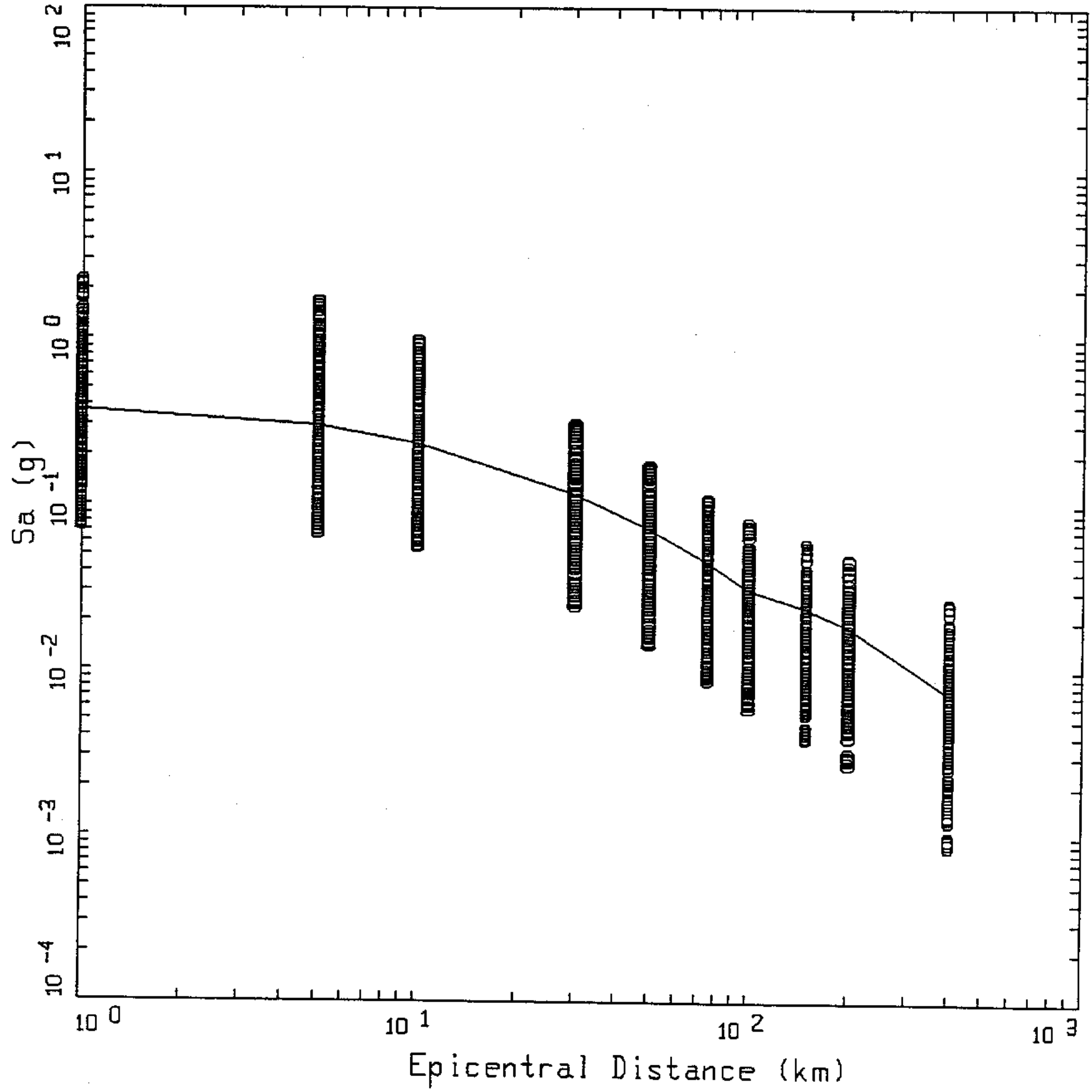
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 0.50 Hz, CANYON SITES	Figure O-59
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

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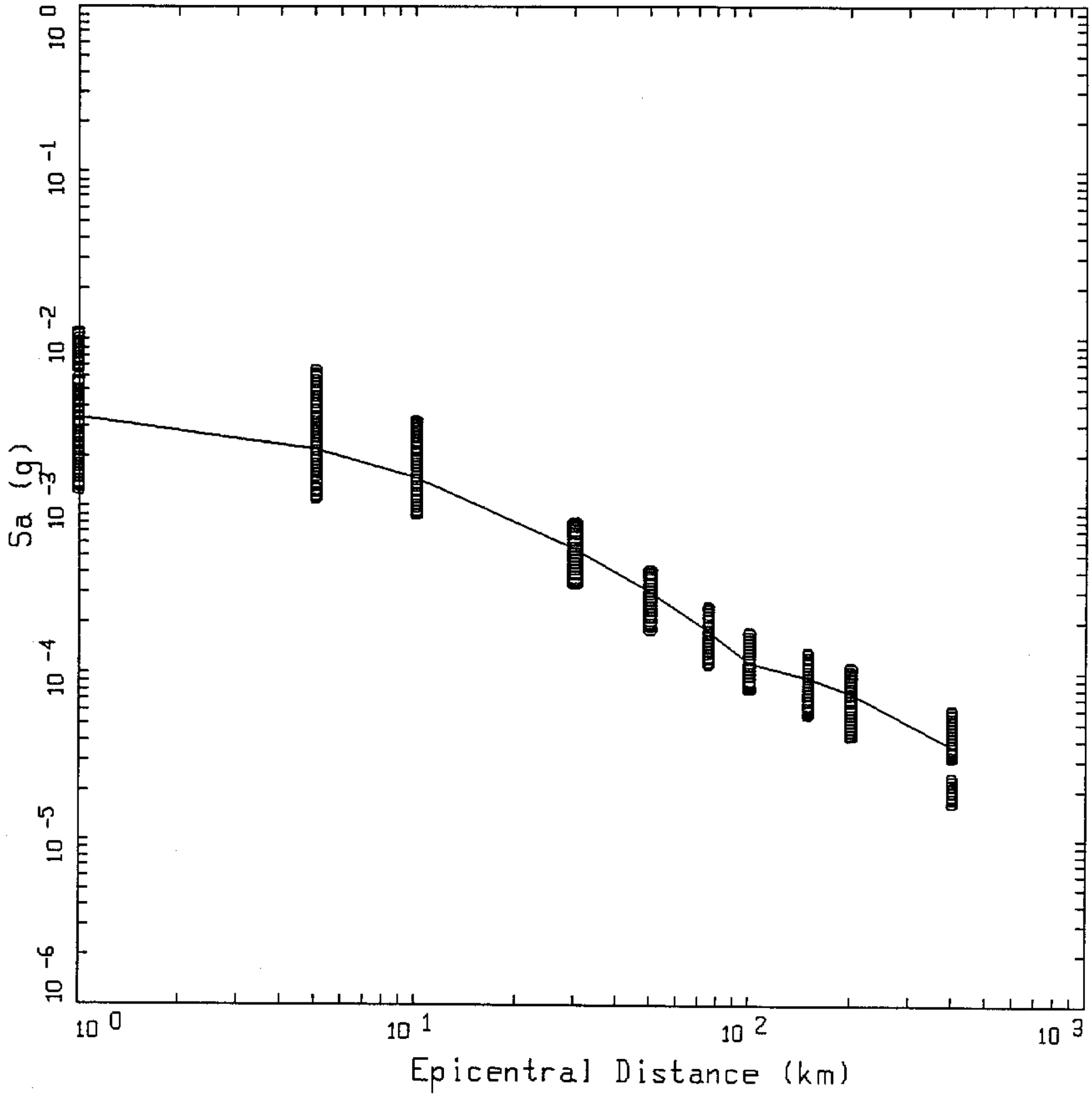
—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 0.50 Hz, CANYON SITES	Figure O-60
Woodward-Clyde Federal Services			

91C0509A-1300/060293



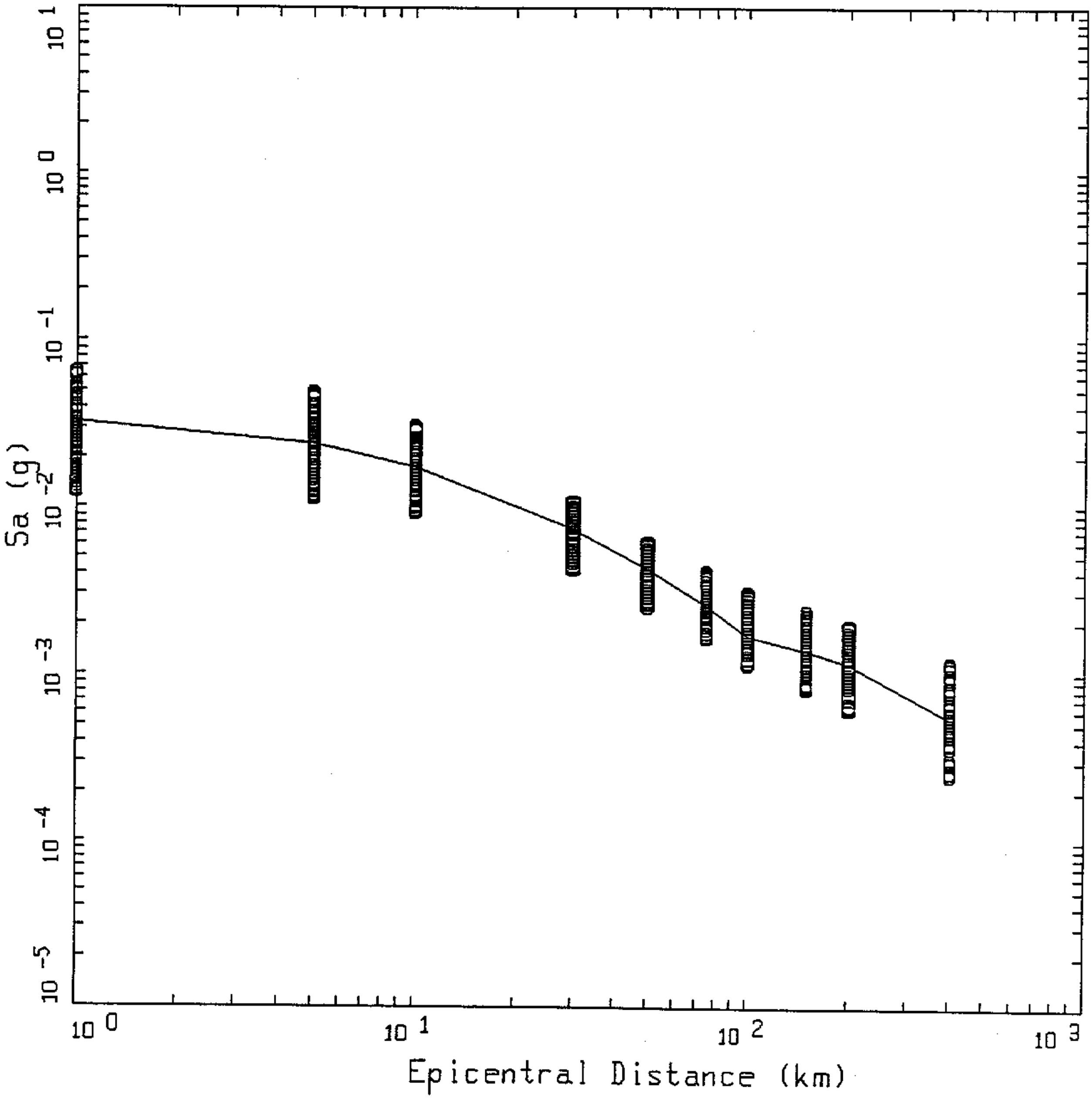
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 5.0 AND 0.25 Hz, CANYON SITES	Figure O-61
Woodward-Clyde Federal Services			

91C0509A-1300/060293



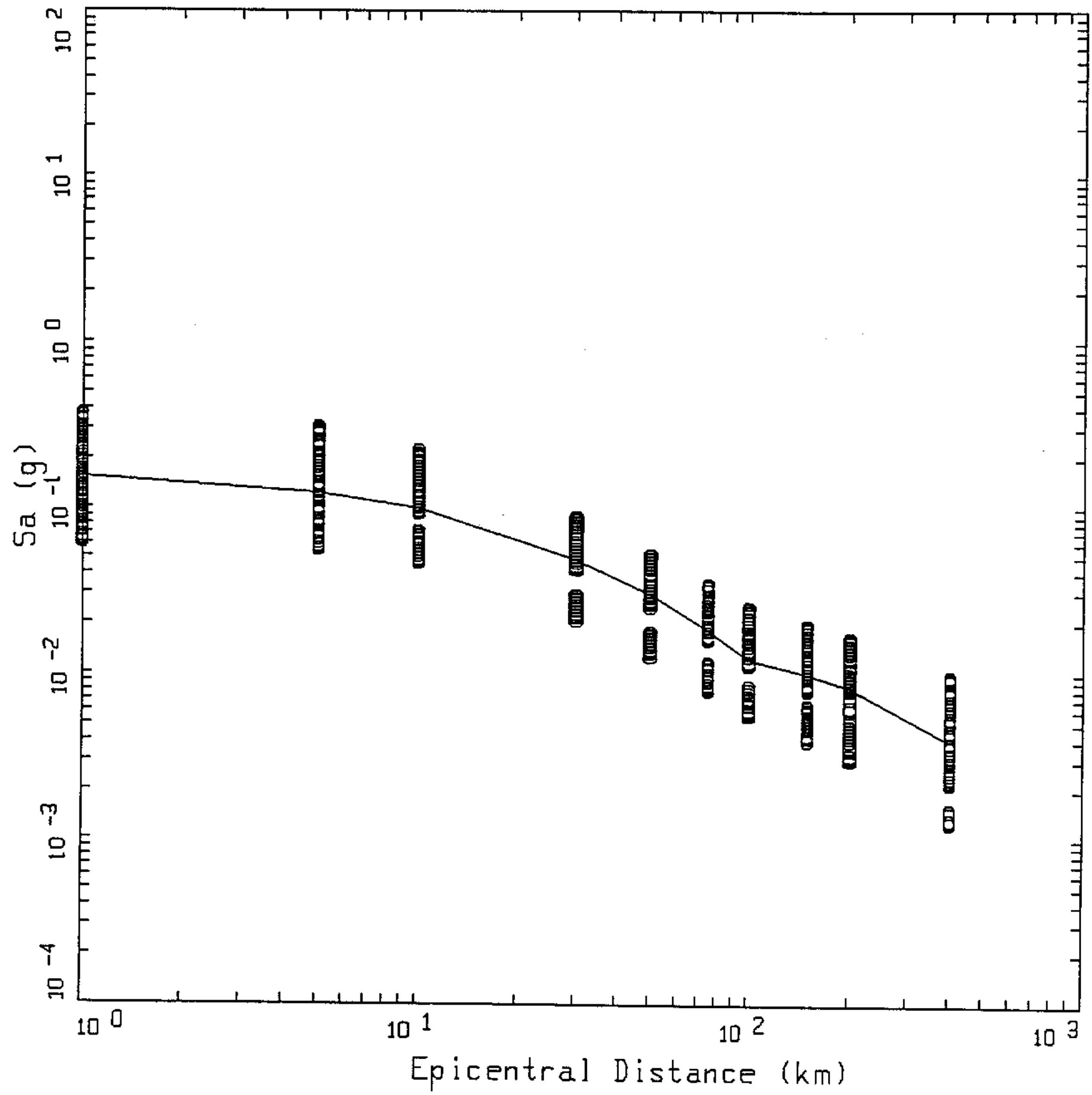
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 6.0 AND 0.25 Hz, CANYON SITES	Figure O-62
Woodward-Clyde Federal Services			

91C0509A-1300/060293



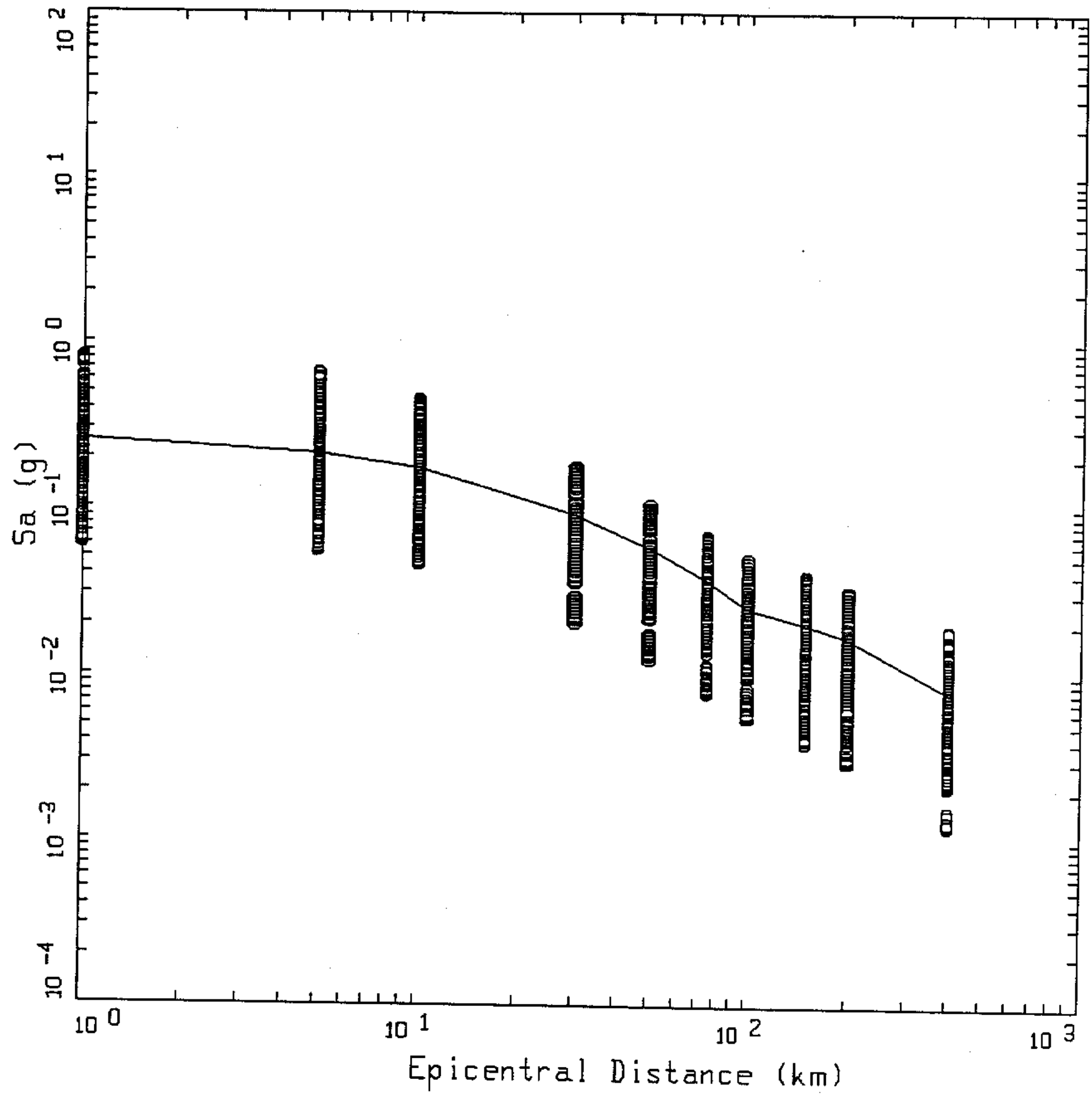
LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.0 AND 0.25 Hz, CANYON SITES	Figure O-63
Woodward-Clyde Federal Services			

91C0509A-1300/060293



LEGEND

o Data

—— Regression of Data

Project No. 91C0509	Los Alamos Seismic Hazards	STOCHASTIC ATTENUATION RELATIONSHIP FOR M 7.5 AND 0.25 Hz, CANYON SITES	Figure O-64
Woodward-Clyde Federal Services			

91C0509A-1300/060293

APPENDIX P
EVALUATION OF SITE EFFECTS AT THE NEVADA TEST SITE

APPENDIX P
EVALUATION OF SITE EFFECTS AT THE NEVADA TEST SITE

INTRODUCTION

Site response is considered to be an important factor in defining the spectral characteristics of strong ground motion. Frequency-dependent site response is a function of impedance contrasts, attenuation characteristics, and thickness of the geologic materials below the site and the spectral content of the input motion (Trifunac, 1990). In the bandwidth of interest for engineering design, the impedance contrast (the ratio of the products of seismic velocity and material density across an interface) and anelastic attenuation compete in their effects on the spectral shape and amplitudes of ground motion. Soil sites show higher amplification than rock sites by a factor of 2 to 3 for frequencies lower than about 5 Hz and less amplification than rock sites for frequencies greater than about 5 Hz (Aki, 1988). At lower frequencies, amplification is observed because of the generally strong impedance contrast between the rock and the overlying soil. However, motions in the soil are damped at higher frequencies because of the frequency dependent nature of anelastic attenuation (Trifunac, 1990). Site effects are also observed at sites located on rock (Hough and Anderson, 1988; Hough et al., 1988; Humphrey and Anderson, 1992). A study in Guerrero, Mexico, using recordings from a strong motion array located on a variety of plutonic and volcanic lithologies, found significant frequency-dependent site amplification and deamplification of ground motion (Humphrey and Anderson, 1992). Similar effects have been observed in volcanic terrain in the western United States, Hawaii, and Italy. This appendix will review in some detail observations of underground nuclear explosions (UNE) recorded at seismograph sites located on Tertiary volcanic tuff at the NTS in southern Nevada.

NEVADA TEST SITE DATA

Surface and downhole seismic monitoring of nuclear explosions and earthquakes has been underway for several years at the NTS, with intensive investigations focusing on Yucca Mountain, the location of a proposed underground high-level nuclear waste repository. The Yucca Mountain area is underlain by silicic volcanic rocks, including ashflow tuffs that are similar in many respects to the layered tuff units comprising the Pajarito Plateau near Los

Alamos. This appendix reviews investigations of the variations in spectral response recorded between the surface and subsurface seismometers. The objective is to assess the effects of impedance contrasts on ground motions at NTS.

Seismograph stations of the Weapons Test Seismic Investigations program (WTSI) were installed to record the ground motions produced by UNEs at the level of the proposed repository. The WTSI network consists of 30 triaxial accelerometers placed in pre-existing boreholes and tunnels scattered throughout the NTS. Because of the opportunistic nature of the sensor placement, the holes were not logged in a manner which would allow modeling of the site response of rock units based on their material properties. Unfortunately, only the most cursory information is available for the majority of the holes. This information was used to identify trends in site response which are relevant to LANL.

Two studies describe the early phase of investigation for the WTSI program, specifically the results of a program to monitor UNEs from Pahute Mesa and Yucca Flat at various locations using sensors in surface/downhole pairs (Vortman and Long, 1982a; 1982b). The UNEs are used as seismic sources to identify the maximum detonation permissible in the future should a repository be built and nuclear testing continue and also as analogues for ground motion produced by tectonic earthquakes. Ground motion from 28 different UNEs at Yucca Flat and 10 tests originating in Pahute Mesa were recorded at seven locations. Each station recorded vertical, radial, and tangential components of acceleration at the surface and at depths ranging from 61 to 762 m. These data were used to determine the peak vector amplitudes of acceleration, velocity, and displacement, and vector pseudo-relative velocity (PSRV) spectra. Ratios of the PSRV data were used to examine the effects of variation in geology on wave transmission between the downhole and surface accelerometers.

The locations of the WTSI stations used in this early phase are shown in Figure P-1 and listed in Table P-1 in addition to the geology and elevation of the sensors. Of the seven surface/downhole pairs of sensors, only W9 (Rainier Mesa) and W13 (Area 18) are located in tuff units which are relevant to the LANL study. The accelerometers at W9 are separated by 432 m of "a series of tuff strata" (Vortman and Long, 1982b), most likely interbedded welded and nonwelded silicic ashflow tuff overlain by rhyolitic flows and shallow intrusive rocks. The surface and downhole sensors at W13 are separated by 762 m consisting of "nine units of ash-flow and bedded tuffs and one each rhyolite lava and gravel and tuffaceous sediments" (Vortman and Long, 1982b).

There were some difficulties in interpreting the data from these sites. At W9, on Rainier Mesa, topographic effects are thought to play a significant role in amplifying the downhole motions (Vortman and Long, 1982a; 1982b). Azimuthal effects impact interpretation of results at W13, the closest station to the Pahute Mesa testing area (Vortman and Long, 1982a). In spite of these complicating factors, the following observations could be made from the two studies (Phillips, 1991a).

- A large variability was observed in the ratios between the surface and downhole pairs, indicating sensitivity to source and path effects. [Because of the shallow depth of detonation in the tests, this is not an unexpected result.]

- Local station geology played a major role in the observed variability in the ground motions at depth.

- The variability of the surface/downhole ratios appeared to be independent of UNE yield. [This implies the results are independent of strain amplitude over the given range of yields.]

The significant result here is that differences in site lithology are a primary cause of variability in PSRV ratios between stations.

A later phase of the WTSI program focused specifically on the variations in ground motion between the surface and depths likely to be considered as repository horizons (Phillips, 1991a). Four surface/downhole stations are located in the vicinity of Yucca Mountain (W25, W28, W29, and W30; Figure P-2). The downhole accelerometer at W29 is located at a shallow depth to provide data to support the design of surface facilities.

Ground motion from a total of 11 Pahute Mesa UNEs have been recorded at these stations. Station W28 is the closest of the group at an average distance of 42 km away from the testing area. The downhole accelerometer is located at a depth of 368 m. W25 is located 45 km from Pahute Mesa, with the downhole sensor located 358 m below the surface. W29 is 47 km from the test area and the downhole sensors are 82 m below the surface. W30 is located 50 km from Pahute Mesa with the downhole unit located at a depth of 352 m.

The seismometers of these four stations are located in units of the Paintbrush Tuff, a mid-Tertiary silicic volcanic sequence. The Paintbrush Tuff consists of four ash-flow cooling units: the Tonopah Springs, Pah Canyon, Yucca Mountain, and Tiva Canyon Members (in ascending order). The Pah Canyon and Yucca Mountain Members are relatively small cooling units which thin out south of station W29. Bedded and non-welded ash-flow tuffs, lava, and interbedded volcanic breccia are locally present between members of the Paintbrush Tuff at Yucca Mountain (Broxton et al., 1989). The individual units hosting the seismometers are described below:

U0 - An informal classification for late Tertiary and Quaternary surficial sedimentary deposits consisting of colluvium and fan alluvium, plus nonwelded, vitric ashflow tuff of the Tiva Canyon Member and any other tuff units that stratigraphically overlie the welded, devitrified Tiva Canyon Member (Ortiz et al., 1985; Phillips, 1991a). The surface accelerometer at W25 is located on alluvium in this unit (Figure P-3). The downhole sensor is located at the interface between the alluvium and the tuff (Phillips, 1991a).

TCw - The Tiva Canyon Member is the uppermost unit of the Paintbrush Tuff. It is a multiple flow, compound cooling unit made up of ash flows erupted from a caldera north of Yucca Mountain and consists of a moderately to densely welded devitrified central portion underlain by a less densely welded vitric zone. The surface seismometers for stations W28 (Figure P-3) and W30 (Figure P-4) are located in this member.

TSw1 - This is a subunit of the Tonopah Spring Member of the Paintbrush Tuff. The Tonopah Spring Member is a multiple flow, compound cooling unit consisting of nonwelded to densely welded ashflows. TSw1 represents the upper lithophysal zone which contains more than 10 percent lithophysal cavities (by volume) in a moderately to densely welded, devitrified ashflow. The downhole unit at station W28 is located in TSw1.

TSw2 - This subunit represents the lower lithophysal zone of the Tonopah Spring Member and is similar in composition to TSw1. It has less than 10 percent lithophysal cavities. The downhole sensors for stations W25 and 30 are located in this subunit.

Data from UNEs were used in the Phillips (1991b) study and analyzed in the same manner as Vortman and Long (1982a; 1982b) except that component PSRV spectra were calculated for these stations as opposed to the vector PSRV determined from the earlier studies. An average PSRV ratio of the surface/downhole motions was determined from all the events (six to nine UNEs) recorded at a station. Figures P-5 to P-8 show the average spectral ratios and the $\pm 1\sigma$ bounds for each of the stations. The average surface/downhole ratios for each station reflect the station-to-station variability which exists in the data, i.e., the variation due to differences in geology at each site (Figure P-9).

Based on his analysis, Phillips (1991a) makes the following general observations:

- The amplitude of downhole motions is generally less than the amplitude of the surface motions.

- The frequency content of the surface recordings are similar to the downhole recordings, but varies from component to component and from station to station.

- The radial and transverse components have larger surface/downhole ratios than the vertical component.

For stations located in similar geologic materials, at distances equidistant from the source, the spectral ratios between the surface and downhole sensors would be expected to be similar. This is not the case for the deep stations at Yucca Mountain (W28, W25, and W30) despite the fact that only 8 km separates the closest and farthest stations and all stations are supposedly founded on tuff (Figure P-9). In particular, W25 (located between W28 and W30) has consistently larger spectral ratios than the other stations. Phillips (1991a) proposed that the differences in the site amplification effects are due to variations in material properties of the various tuff units. He argues that the more consolidated tuff in TCw, which hosts the surface accelerometers of W28 and W30, is stiffer (higher bulk density and seismic velocity) than the relatively unconsolidated tuff of U0 at W25. Note that Phillips' analysis here is qualitative; although the boreholes have been logged these data were not used. This difference in seismic impedance results in higher amplifications for W25. In general, the impedance contrasts of the formations between the surface and downhole sensors are responsible for the amplification of downhole motions at the surface.

The average surface/downhole PSRV ratio at station W28 (Figure P-9) suggests that deamplification of shear waves is occurring at high frequencies. This effect is maximized in the radial components of the W28 recording of event Tierra, the easternmost UNE at Pahute Mesa (Figure P-10). Phillips (1991a; 1991b) suggests that the cause of the higher motions at the base of W28 may due to amplification of particle motion by waves crossing from the stiffer TSw2 into the softer TSw1 in which the downhole sensor is located. Figure P-11 shows the lithology of drillhole USW G-2 and the location of the downhole unit of W28 near some brecciated zones. In contrast, the two other deep stations (W25 and W30) are founded in TSw2 and are underlain by softer material (Phillips, 1991a). Their downhole motions are lower in amplitude than the surface motions.

Phillips (1991a) concludes that the variation in the inter-station surface/downhole behavior at Yucca Mountain can be explained by the differences in material properties of the geologic column at these stations.

TABLE P-1

SEISMIC MEASUREMENTS FOR A TERMINAL WASTE STORAGE PROGRAM

Station	Location	Hole No.	Coordinates North	Coordinates East	Elevation (ft)	Medium	Date Installed
1	Area 16	None	840,515	634,760	Surf. ~5325	Eleana Shale	8/77 (Removed 11/77)
2	Syncline Ridge	None	~843,250	~646,250	Surf. ~4785	Limestone over Eleana	8/77 (Removed 6/78)
3	Piledriver	Ue-15.01	901,147	677,016	Surf. 5036	Alluvium over Granite	9/77
					Tun. 3669 (1367)	Granite	9/77
4	Area 6	Ue-6b	810,000	678,450	Surf. 3933	Alluvium	4/77
					Hole 3505 (428)	Alluvium	4/77 (Removed 5/78)
5	Skull Mountain	None	743,978	643,233	Surf. ~4565	Tuff	10/77
			~742,100	~650,600	Surf. ~	Tuff	Moved 5/81
6	ETS-2	None	758,073	604,467	Surf. ~3810	Alluvium	10/77
7	Calico Hills	None	768,209	608,655	Surf. ~4337	Eleana Shale	10/77
8	Yacht Hole	Ue-1L	837,000	654,001	Surf. 4465	Alluvium over Eleana	11/77 (Removed 8/78)
					Hole 2237, 2595(a) (2228)(1870)	Eleana Shale	3/78 (Removed 8/78)
9	Rainier Mesa	U-12g.08 CH No. 1	882,173	633,268	Surf. 7602.2	Tuff	12/77
					Tun. 6186.15 (1416)	Tuff	12/77
10	Well J-11	J-11	~740,806	~611,832	Surf. 3445	Alluvium	3/78
			740,968	611,764	Hole 2276(b), 2321 (1169)(b)(1124)	Tuff	4/78
10	200	J-11'	~740,896	~611,828	Hole 3245 (200)	Alluvium	3/78
11	Area 4	Ue-4aa	854,145	666,794	Surf. 4210	Alluvium	3/78
					Hole 3076 (1134)	Limestone	3/78

(a) After Reblochon Event

(b) Before Farm Event

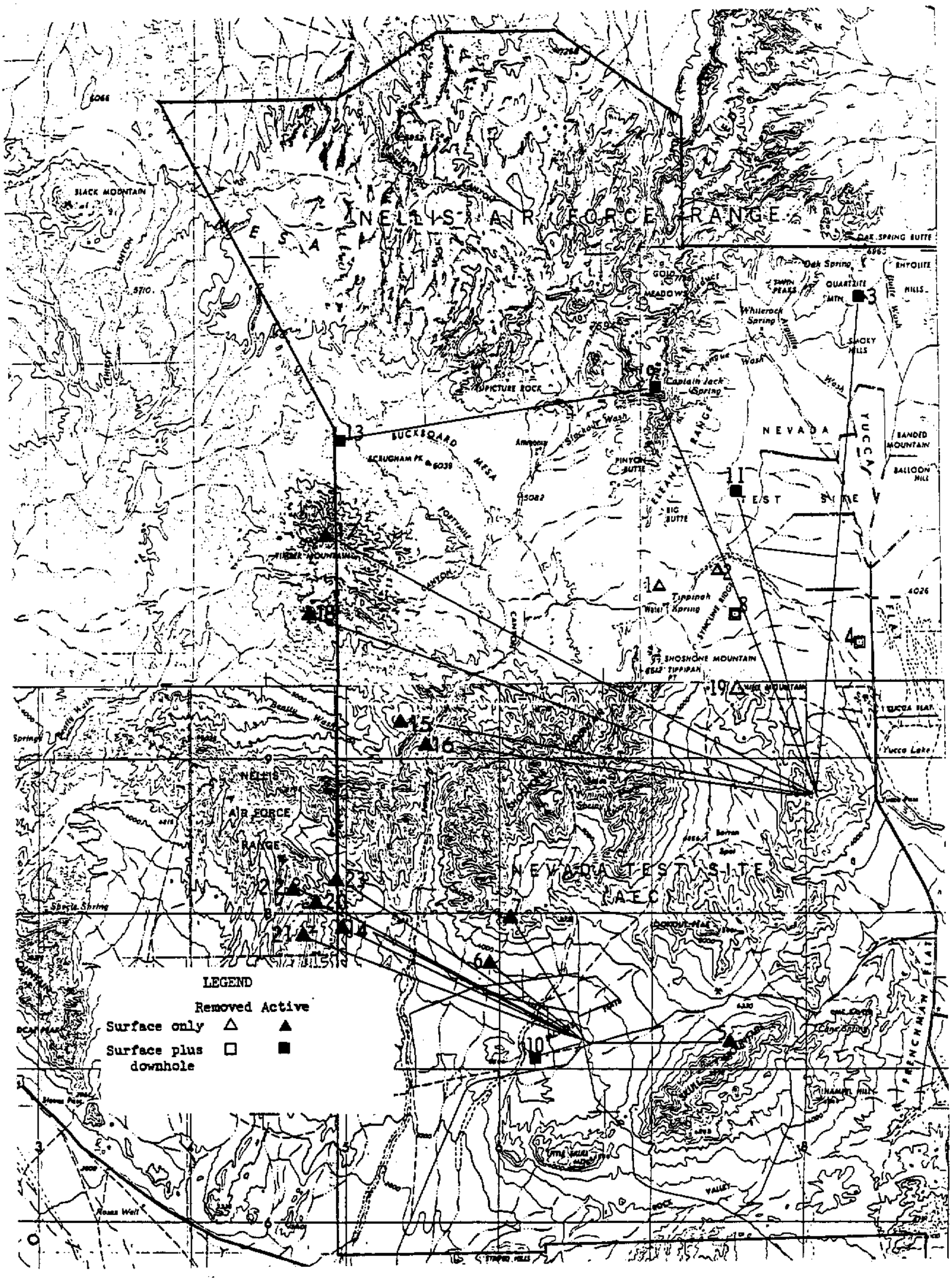
TABLE P-1 (continued)

Station	Location	Hole No.	Coordinates North	Coordinates East	Elevation (ft)	Medium	Date Installed
12*							
13	Area 18	Ue-18r	868,100	564,700	Surf. 5538	Tuff	6/78
					Hole 3038 (2500)	Welded Tuff	8/78
14	Yucca Mountain	None	767,171	566,735	Surf. 4119	Tuff	10/78 (Moved to YM H-1 9/81)
15	Dome Mountain	None	813,801	579,396	Surf. 6193	Lava	10/78
16	Forty-Mile Canyon	None	812,025	586,261	Surf. 4289	Rhyolite	10/78
17	North Timber Mountain	None	~850,300	~562,300	Surf. 7448	Tuff	7/78
18	South Timber Mountain	None	~834,000	~557,800	Surf. 7239	Tuff	7/78
19	Mine Mountain	None	815,533	651,950	Surf. 5226	Limestone	2/79
20	Yucca Mountain G-1	None	772,262	560,566	Surf. 4798	Tuff	7/80
21	Yucca Mountain SW	None	763,987	558,892	Surf. 4863	Tuff	7/80
22	Yucca Mountain NW	None	773,114	554,093	Surf. 5183	Tuff	7/80
23	Yucca Mountain NE	None	777,073	565,125	Surf. 4748	Tuff	7/80

*Reserved for an unspecified future installation.

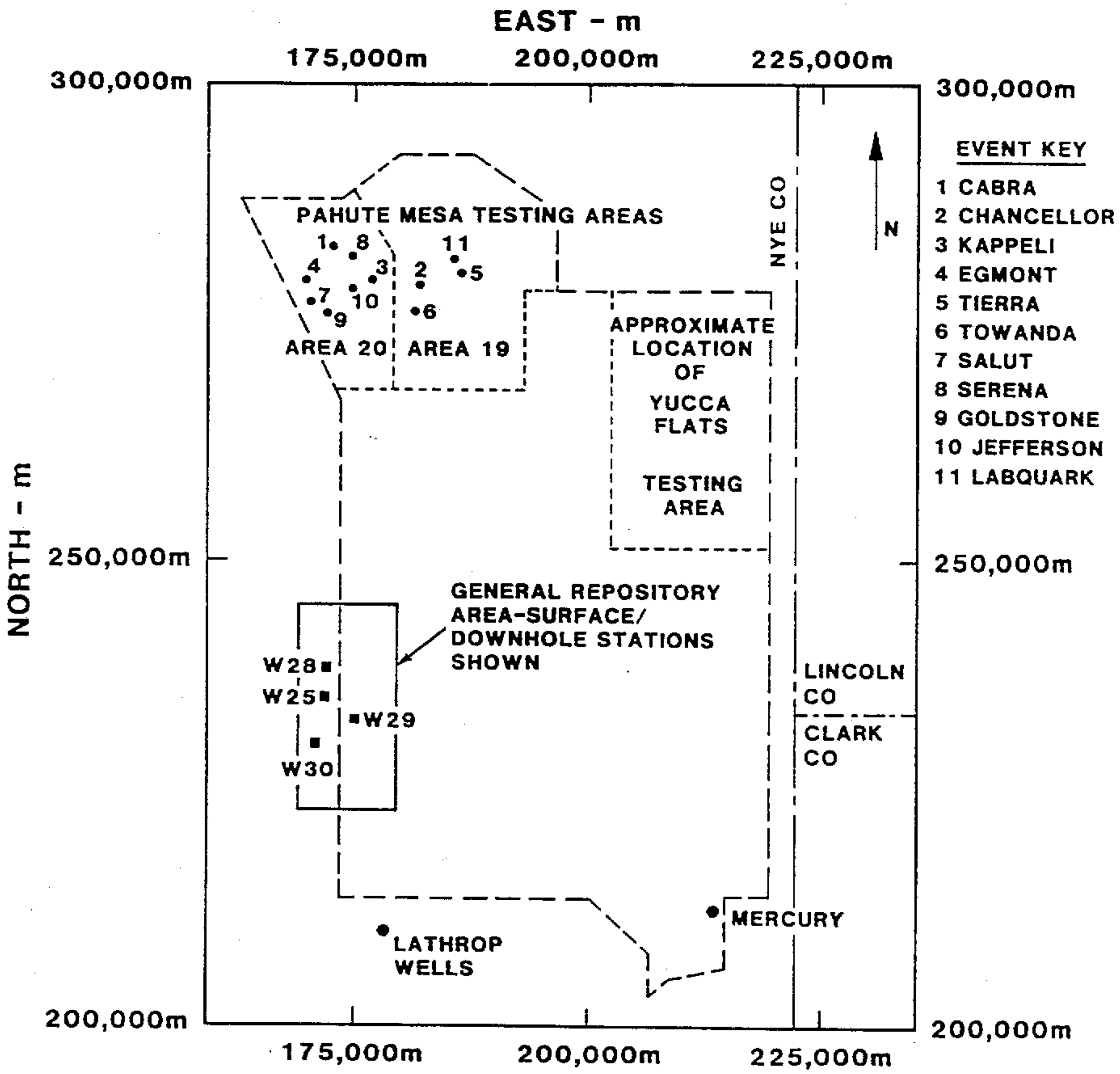
Note: Numbers in ( ) are differences in elevation

Source: Ortiz et al., 1985



Source: Ortiz et al., 1985

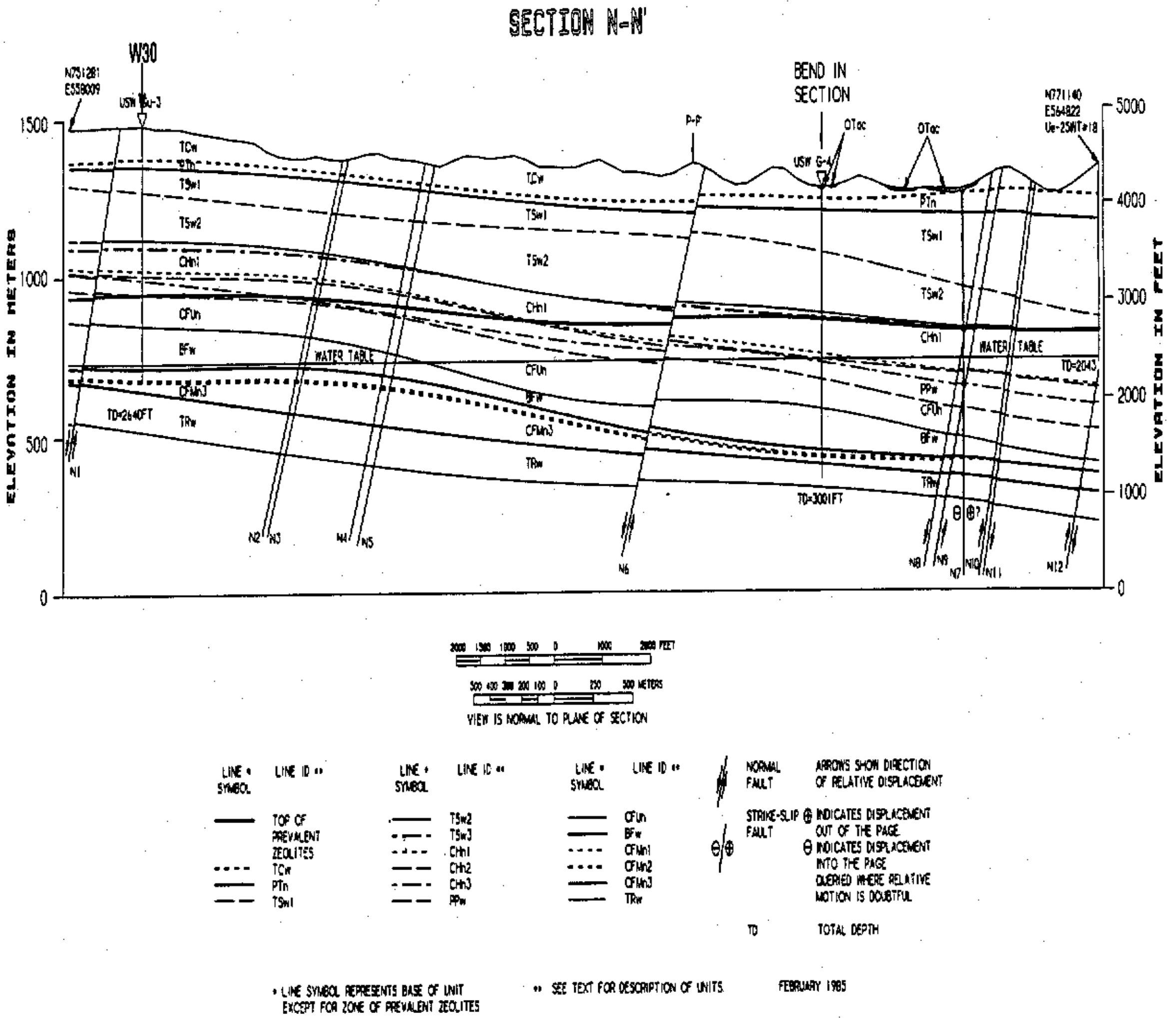
Project No. 91C0509	Los Alamos Seismic Hazards	MAP OF STATION LOCATIONS	Figure P-1
Woodward-Clyde Federal Services			



NOTE: COORDINATES SHOWN ARE CENTRAL NEVADA GRID

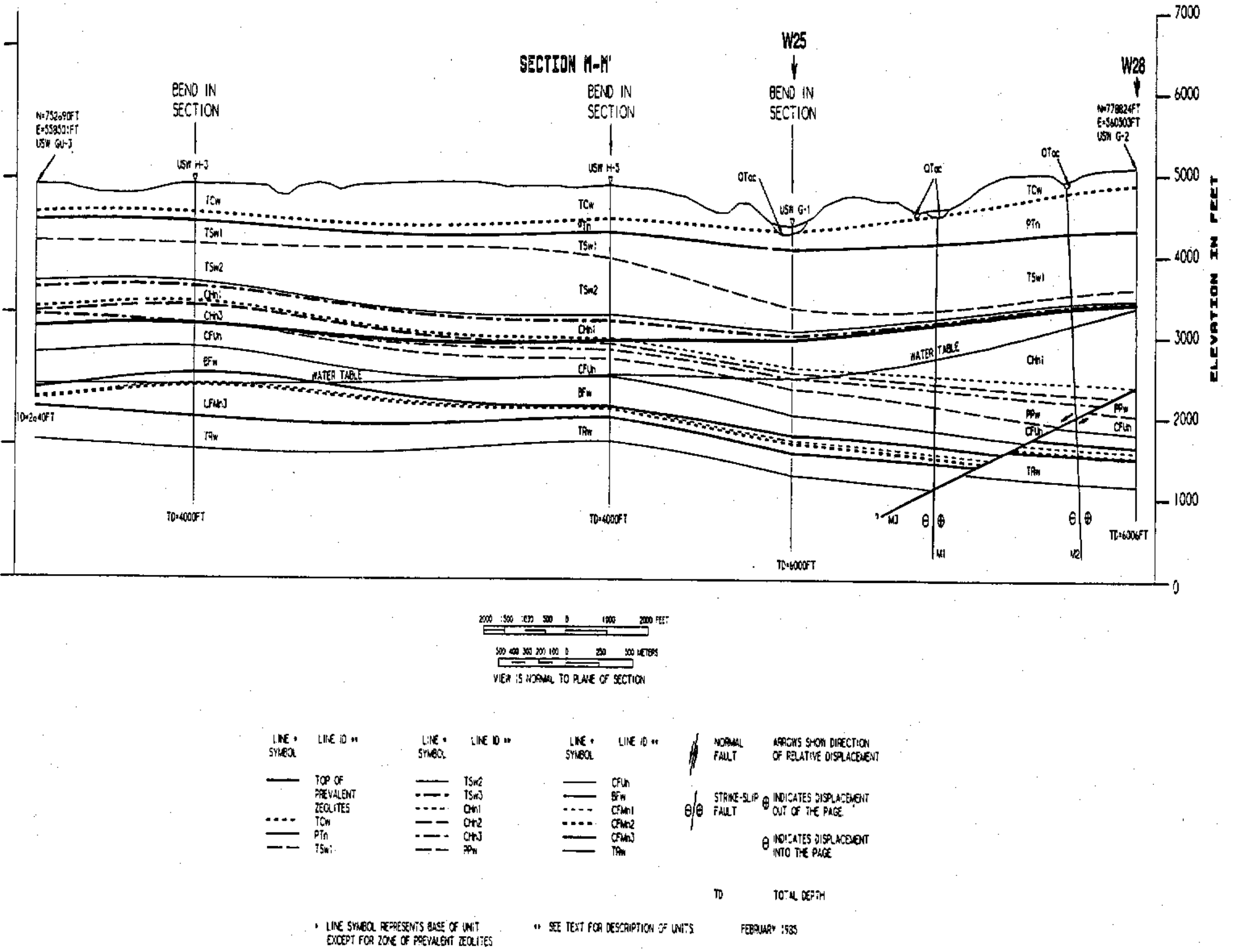
Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	LOCATIONS OF THE UNEs AT THE NTS	Figure P-2
Woodward-Clyde Federal Services			



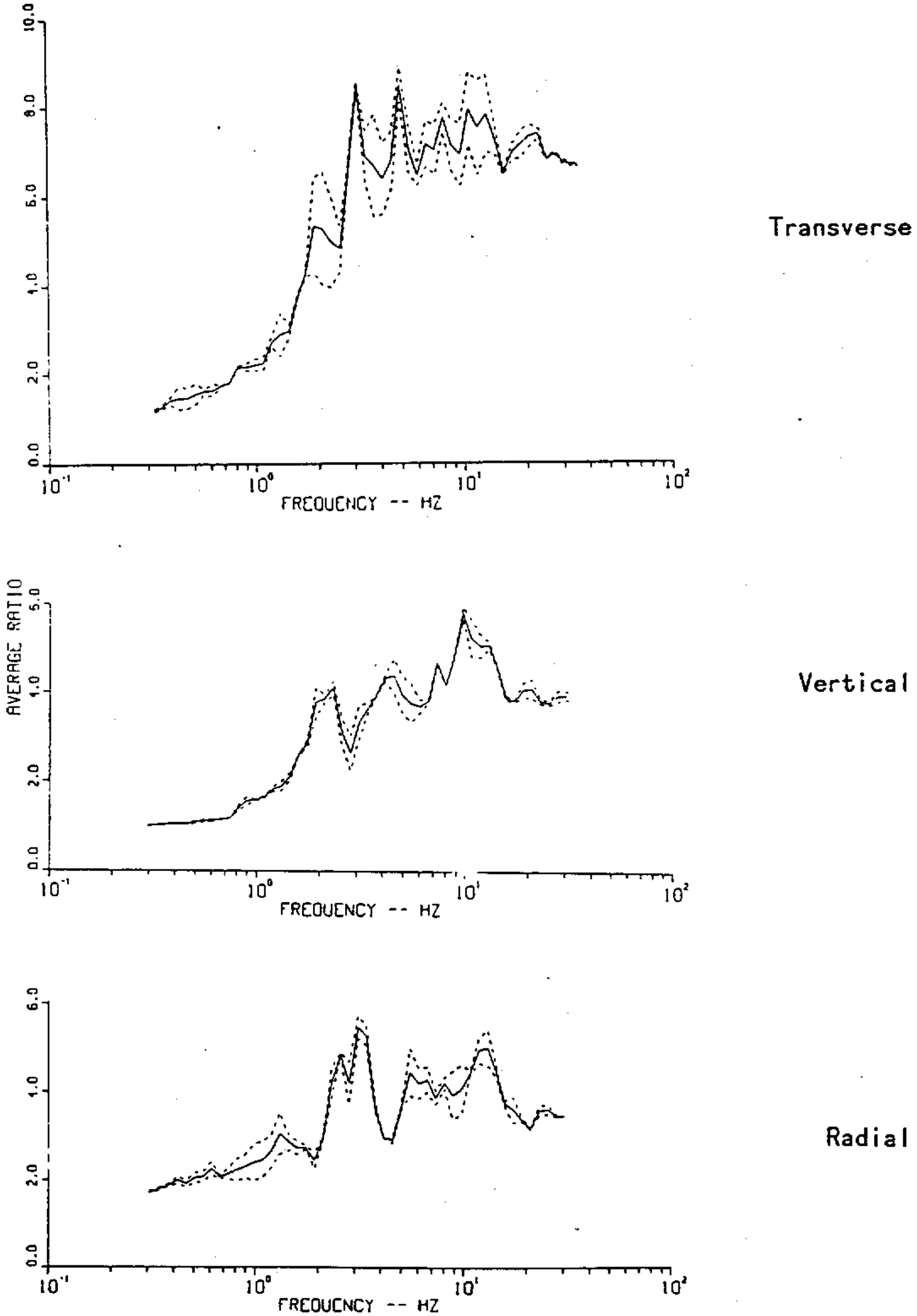
Source: Ortiz et al., 1985

Project No. 91C0509	Los Alamos Seismic Hazards	CROSS-SECTION THROUGH BOREHOLE W30	Figure P-4
Woodward-Clyde Federal Services			



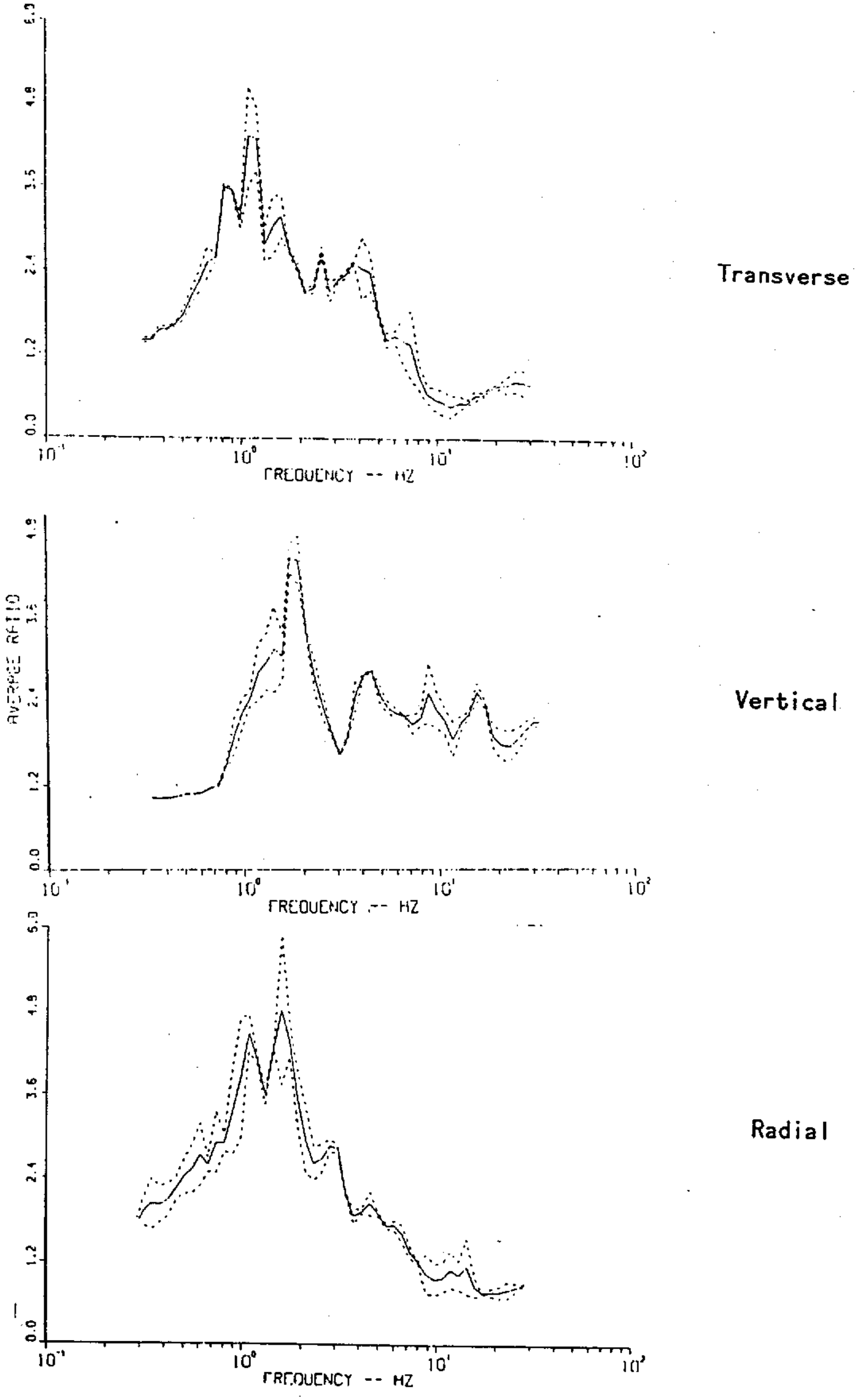
Source: Ortiz et al., 1985

Project No. 91C0509	Los Alamos Seismic Hazards	CROSS-SECTIONS THROUGH BOREHOLES W25 AND W28	Figure P-3
Woodward-Clyde Federal Services			



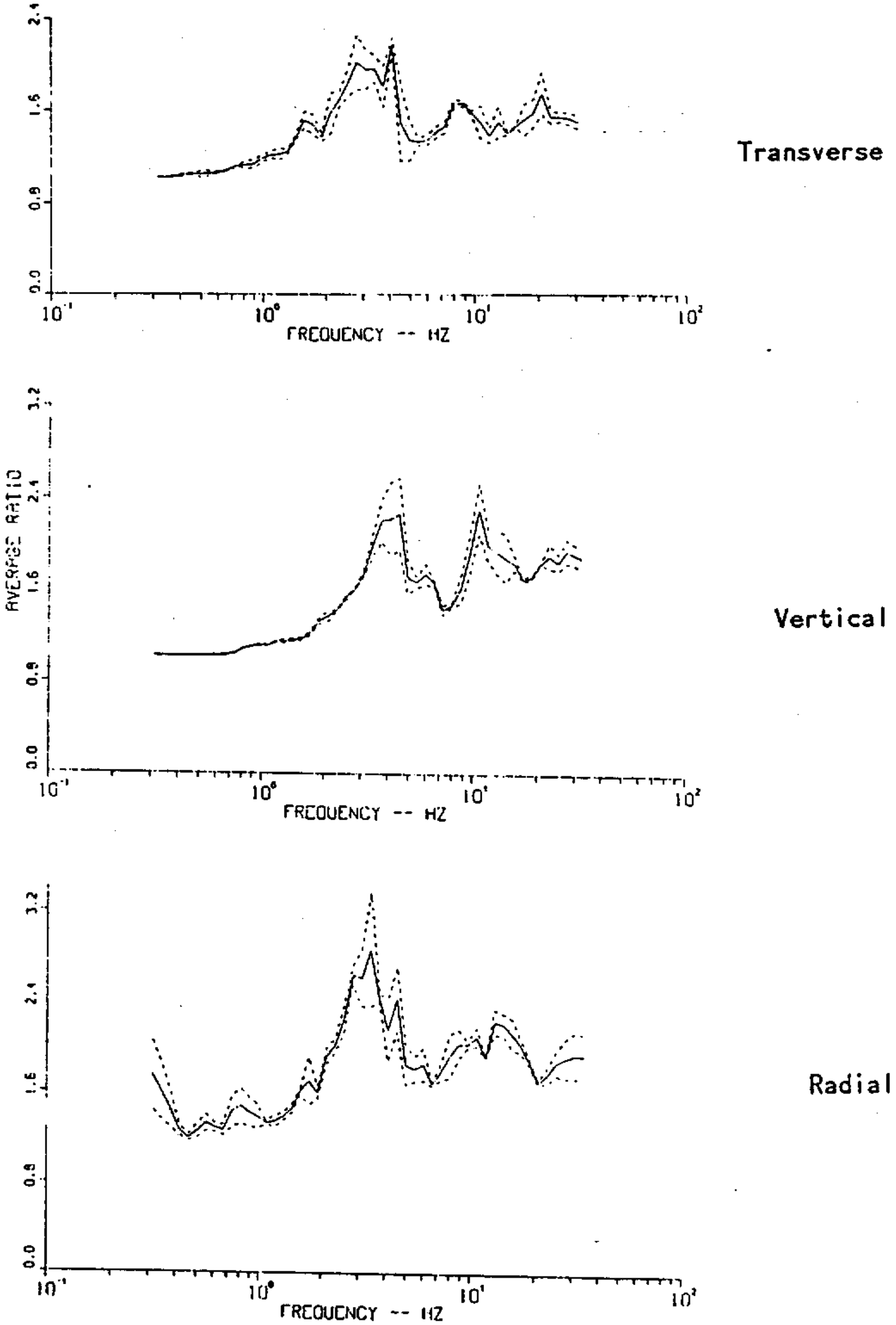
Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	AVERAGE RATIOS OF SURFACE / DOWNHOLE PSRVs CALCULATED FOR STATION W25	Figure P-5
Woodward-Clyde Federal Services			



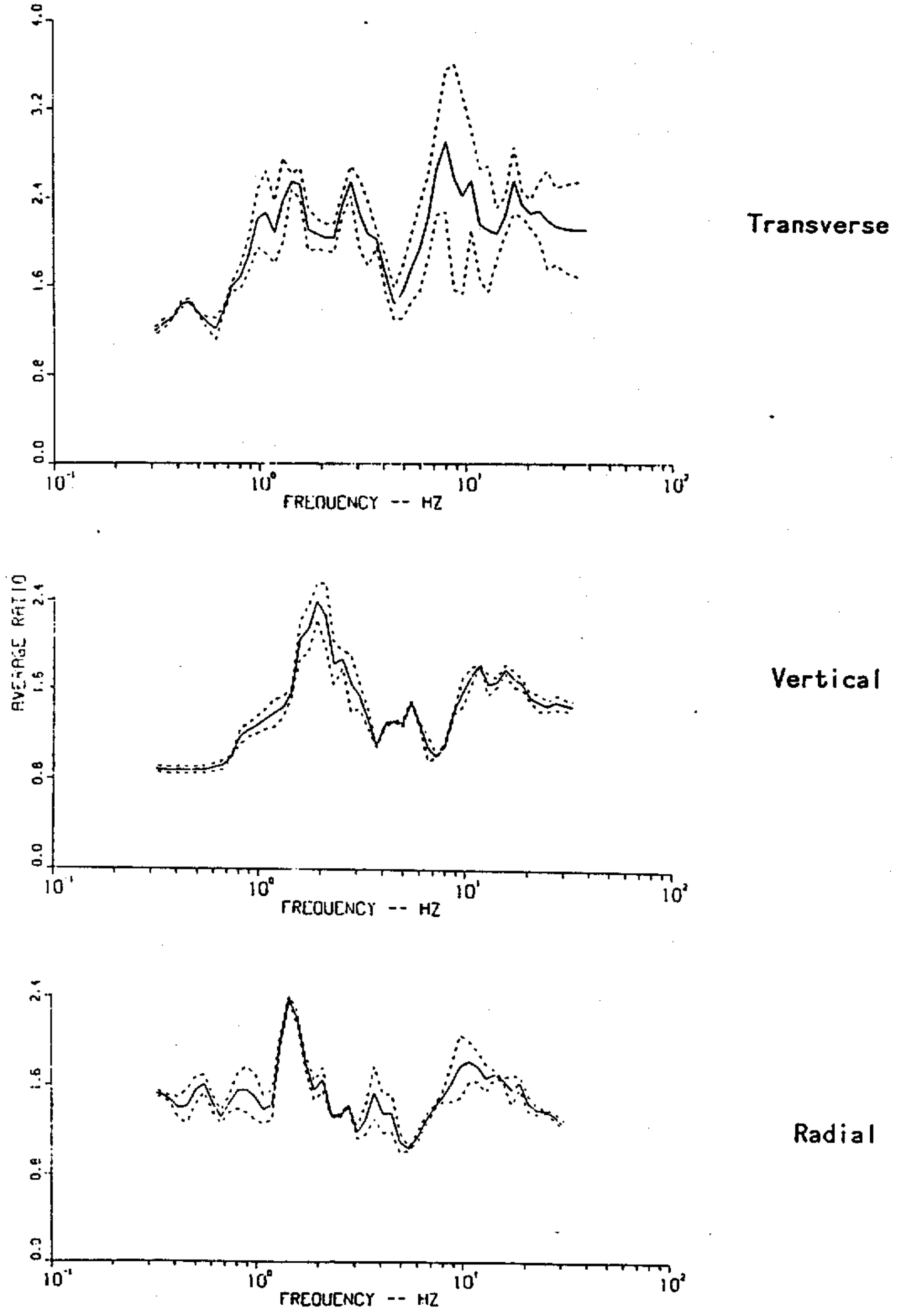
Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	AVERAGE RATIOS OF SURFACE / DOWNHOLE PSRVs CALCULATED FOR STATION W28	Figure P-6
Woodward-Clyde Federal Services			



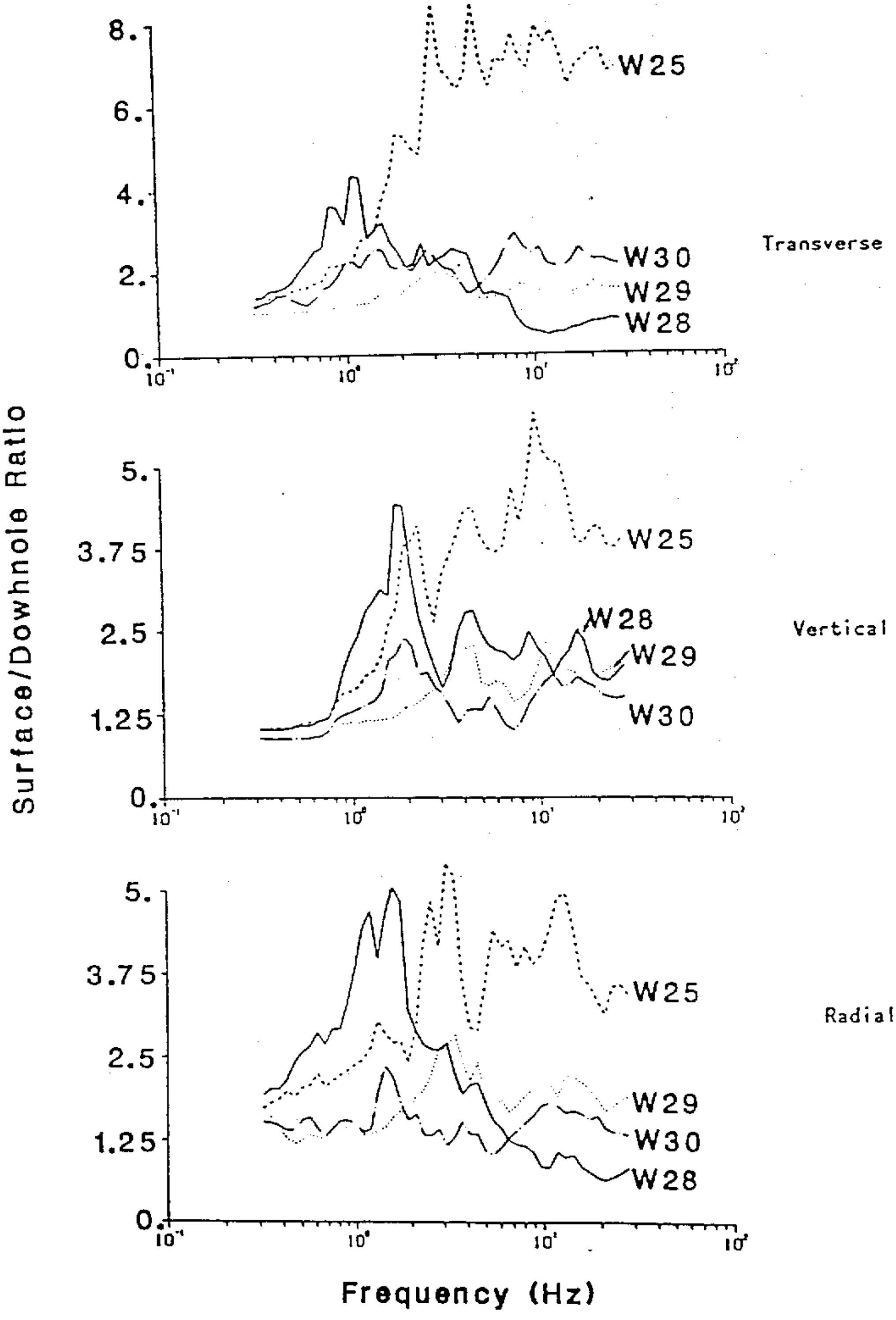
Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	AVERAGE RATIOS OF SURFACE / DOWNHOLE PSRVs CALCULATED FOR STATION W29	Figure P-7
Woodward-Clyde Federal Services			



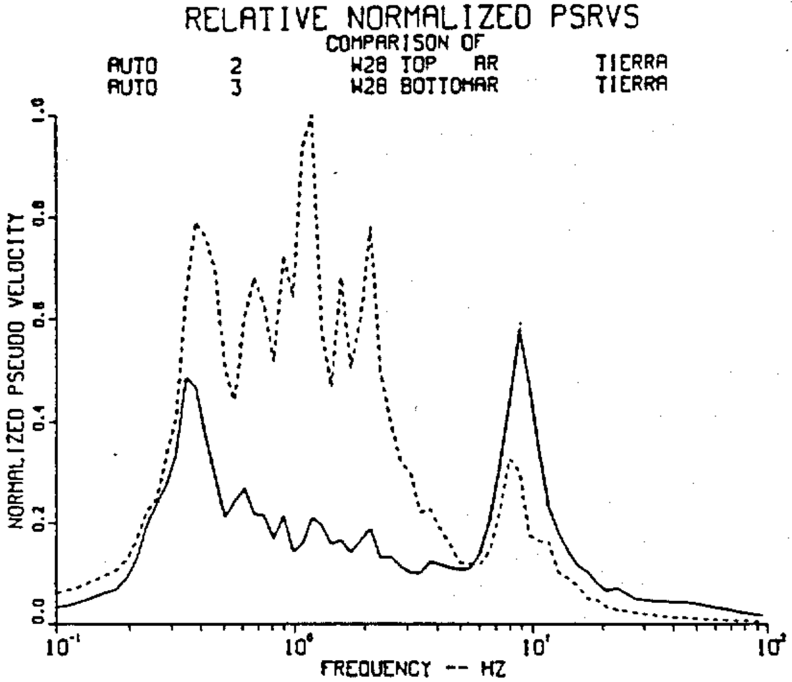
Source: Phillips, 1991a

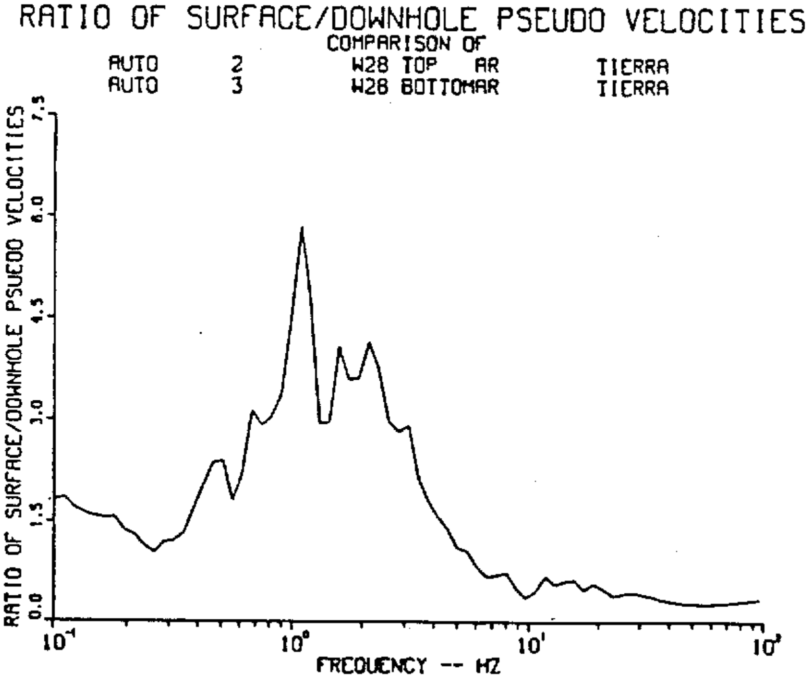
Project No. 91C0509	Los Alamos Seismic Hazards	AVERAGE RATIOS OF SURFACE / DOWNHOLE PSRVs CALCULATED FOR STATION W30	Figure P-8
Woodward-Clyde Federal Services			



Source: Phillips, 1991a

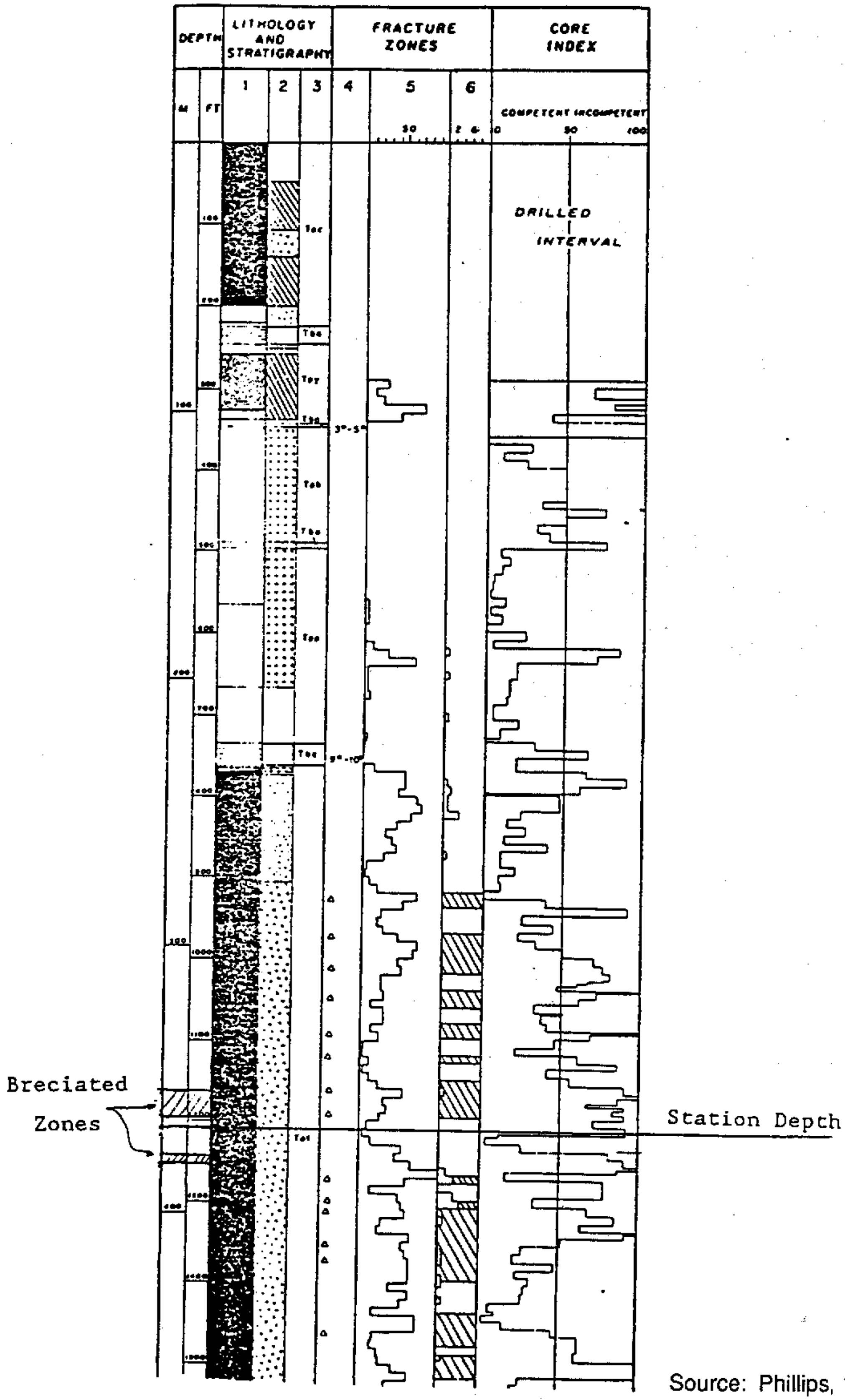
Project No. 91C0509	Los Alamos Seismic Hazards	COMPARISON OF AVERAGE SURFACE / DOWNHOLE PSRV RATIOS AT THE YUCCA MOUNTAIN STATIONS	Figure P-9
Woodward-Clyde Federal Services			





Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	RELATIVE NORMALIZED PSRVs AND RATIOS OF SURFACE/DOWNHOLE PSRVs FOR RADIAL MOTIONS, STATION W28, EVENT TIERRA	Figure P-10
Woodward-Clyde Federal Services			



Source: Phillips, 1991a

Project No. 91C0509	Los Alamos Seismic Hazards	DRILLING LOG OF HOLE USW G-2	Figure P-11
Woodward-Clyde Federal Services			