STRONG-MOTION RECORDS FROM THE MAMMOTH LAKES EARTHQUAKES OF MAY 1980

1980

CALIFORNIA DIVISION OF MINES AND GEOLOGY

PRELIMINARY REPORT 27

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PRELIMINARY REPORT 27

STRONG-MOTION RECORDS FROM THE MAMMOTH LAKES EARTHQUAKES OF MAY 1980

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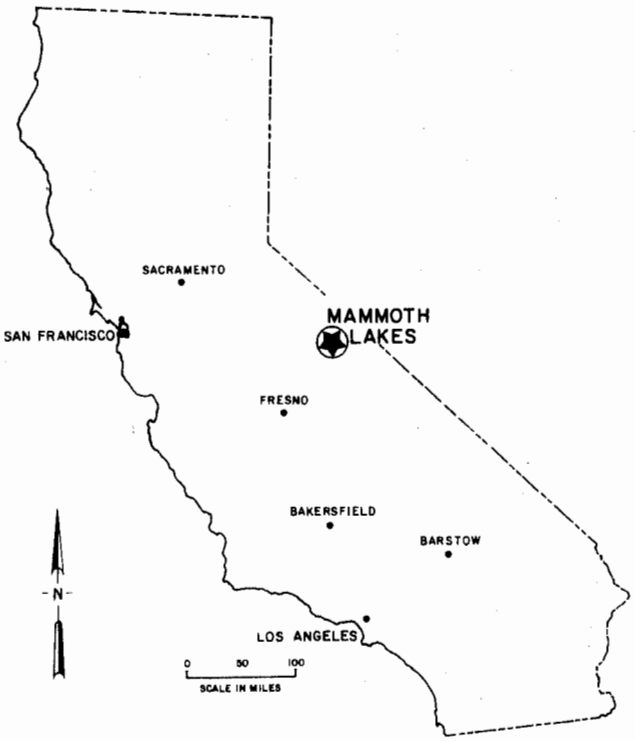

INTRODUCTION

This preliminary report summarizes California Division of Mines and Geology (CDMG), Strong Motion Instrumentation Program (SMIP) accelerograph records recovered from the 25 through 27 May 1980 Mammoth Lakes area earthquake sequence. All CDMG accelerograph stations that were "triggered" (activated) by one or more of the earthquakes are mapped in Figures 1 and 2, and listed in Table 1. These stations, with their respective ground accelerations and other pertinent data, are arranged in Table 2 in order of increasing distance from the epicentral area.

Cautionary Note On Use Of Data

This preliminary data compilation has not been edited or reviewed for conformity with standards and nomenclature of the CDMG. Reasonable precautions have been taken to ensure accuracy of material presented; however, the preliminary nature of the data makes them all subject to change upon further verification. The printed reproductions of the original accelerograms contained herein may have had errors of scale introduced by the printing process. These errors could affect direct scaling and measurement by the user of this report. Accurate photographic copies of the original records may be obtained from: Office of Strong-Motion Studies, California Division of Mines and Geology, 2811 O Street, Sacramento, California 95816.

Acknowledgements

CDMG extends appreciation to those agencies and organizations that have permitted installation of SMIP equipment on their property. Recognition is made to Tom McGrady, CDMG-SMIP Seismological Instrument Technician, for his prompt response and diligent maintenance efforts during the period of these events. Also, sincere appreciation is extended to Jan Parton, of CDMG-SMIP, who developed, processed, and printed all records recovered from this sequence of earthquakes. Her attention to detail is reflected in the outstanding quality and quantity of the reproductions contained herein.

Abbreviations

Organizations

CDMG	California Division of Mines and Geology
OSMS	Office of Strong-Motion Studies
SMIP	Strong Motion Instrumentation Program
CIT	California Institute of Technology

Instruments

CRA-1	Central Recording Accelerograph (Kinemetrics, Inc.)[film]
FBA	Force-Balance Accelerometer (Kinemetrics, Inc.)
RFT-250	Triaxial accelerograph (Teledyne Corporation)[film]
SMA-1T	Triaxial accelerograph with WWVB radio receiver (Kinemetrics, Inc.)[film]

Other

M_L	Local earthquake magnitude as defined by Richter (1958)
PDT	Pacific Daylight Time

Other (cont.)

UTC	Universal Time Coded
WWVB	Call letters for UTC radio station assigned by the Federal Communication Commission

Product Disclaimer

Product trade names or trademarks used in this publication are intended for descriptive purposes only. Such use does not constitute endorsement by the California Division of Mines and Geology.

Instrument Orientations

Direction	- Upward trace movement on film records indicate positive accelerations in the listed azimuth direction.
Stations not in Structures	- Orientation is in degrees azimuth (clockwise from north).
Stations in Structures	- Orientation is in quadrant notation with respect to a reference north.

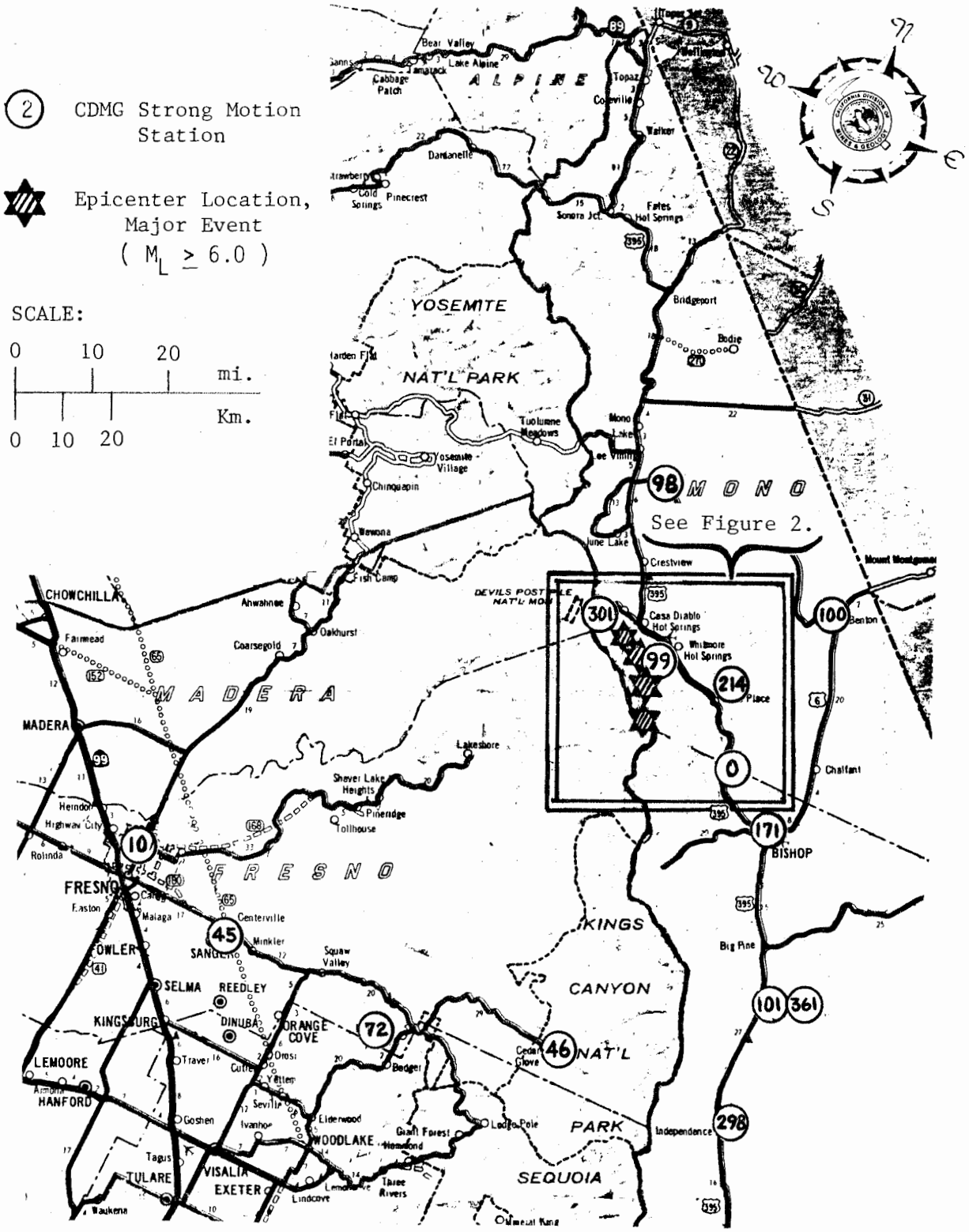

Figure 1.

CDMG Strong-Motion Stations Triggered by the May 1980 Mammoth Lakes Seismic Events.

TABLE 1.

Alphabetical listing of CDMG strong-motion accelerograph stations that triggered and recorded one or more events of the May 1980 Mammoth Lakes earthquake sequence.

No.	Station Name	Coordinates	No. events Recorded	Structure Type/Size	Instrument Location(s)
100	Benton	37.818°N 118.475°W	4	1-story building	ground level
171	Bishop	37.370°N 118.395°W	3	2-story cement bk building	ground level
45	Centerville	36.734°N 119.486°W	3	1-story building	ground level
99	Convict Creek	37.614°N 118.831°W	37	1-story building	ground level
10	Fresno (State University)	36.813°N 119.748°W	3	seismic vault	basement level
298	Independence (L.A. Water & Power Bldg.)	36.800°N 118.199°W	3	1-story concrete building	ground level roof
46	King's Cyn. Nat'l. Park (Cedar Grove)	36.787°N 118.675°W	3	T-hut	ground level
214	Long Valley Dam	37.588°N 118.705°W	17	earth dam	abutment L & R crest
301	Mammoth Lakes (High School Gym.)	37.641°N 118.963°W	47	2-story building	ground level roof
72	Miramonte (Conservation Camp)	36.641°N 119.050°W	1	1-story building	ground level
98	Mono Lake	37.940°N 119.065°W	4	Armco building	ground level
361	Tinnemaha Dam	37.055°N 118.239°W	3	earth dam	abutment L & C crest
101	Tinnemaha (CIT Seismic Vault)	37.055°N 118.239°W	3	seismic vault	ground level
Temporary Stations:					
0	Paradise Lodge	37.481°N 118.602°W	3	1-story building	ground level
*	Mammoth Lakes (Sheriff's Substation)	37.638°N 118.892°W	3	1-story cement bk building	ground level
*	Crowley Lake (Shehorn Residence)	37.561°N 118.743°W	1	1-story building	ground level

* CDMG Temporary stations installed and operational after 27 May 1980.

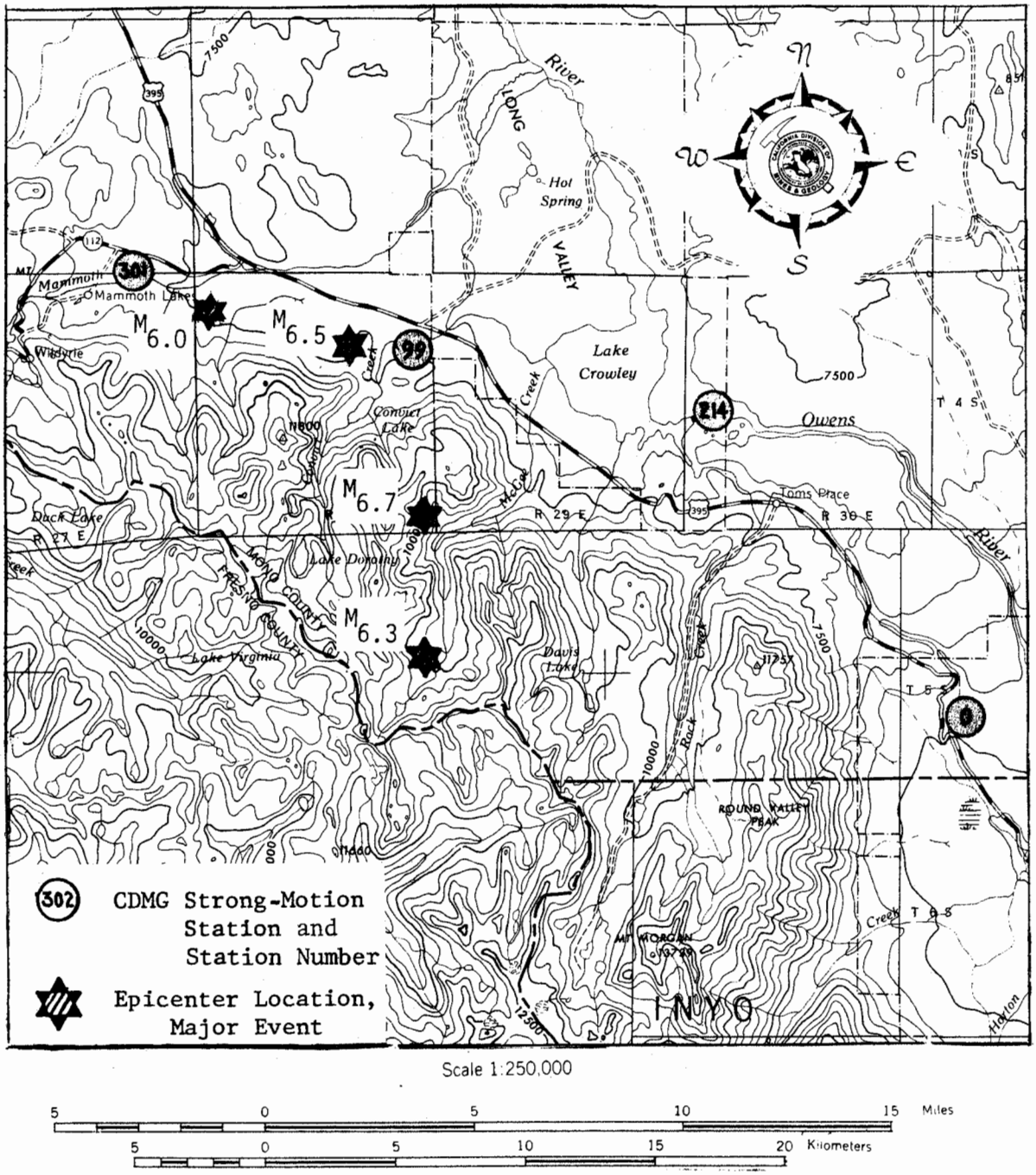

Figure 2.

Epicenter locations and strong-motion stations that recorded peak accelerations of the M 6+ May 1980 Mammoth Lakes events.

STRONG-MOTION DATA

Fourteen accelerograph stations, instrumented by CDMG-SMIP, were triggered by one or more of the $M_{6.0+}$ Mammoth Lakes events; strong motions resulting from these events were monitored and recorded. Ground motions were monitored at freefield installations, and structural responses as well as ground motions were monitored at a gymnasium and a dam. Records from these stations provide acceleration data that can be useful in evaluating energy release, wave propagation, and damage-capable levels of motion.

The fourteen accelerograph stations are listed, alphabetically, in Table 1. All stations that recorded significant accelerations ($\geq$.05 g CDMG) during the largest magnitude events were located within a 50 km radius of the epicenters as determined by CDMG (Cramer and Toppozada, 1980). A total of 1082 data traces were recorded from events beginning with the $M_{6.5}$ (CIT) 0933 hours earthquake on 25 May through the $M_{4.9}$ (CIT) 2216 hours event on 27 May 1980. Preliminary scaling of the strong-motion records indicates that 347 data traces have significant peak accelerations.

The three $M_{6.0+}$ events on 25 May and the $M_{6.3}$ event on 27 May 1980 triggered the greatest number of the stations that are listed in Table 1. Epicentral proximity ($\geq$ 50 km) and significant (>0.05 g) peak accelerations were the criteria used in selecting accelerograms included in this report.

Peak accelerations in the form of a decimal fraction of "g", along with other pertinent data, are summarized in Table 2. Horizontal and vertical peaks are listed for the freefield installations. For the dam and gymnasium installations, peak structural-response accelerations as well as peak ground motion accelerations are listed. These peak

acceleration figures have been added to the traces on the accelerograph records reproduced in this report.

Table 3 is a chronological listing of the earthquake events that triggered CDMG-SMIP stations on 25 May through 27 May 1980. The magnitude (CIT), the date and time, and the CDMG station number(s) of the triggered station(s) are given for each monitored event. We have assumed that stations not synchronized by WWVB time recorded the major events. The assumption was made on the basis of the proximity of these stations to the epicenters, comparisons between magnitude-response trace configurations, interviews with people who live in the area of these stations, and "bracket" time/dates for station visits to install film and recover records.

A brief description of the geology of the Mammoth Lakes High School gymnasium, Convict Creek, and Long Valley Dam SMIP station sites is included in this report on the strong motion record data sheets. This information was provided by R. McJunkin, CDMG-SMIP geologist.

Maximum peak accelerations shown on the accelerograms as a decimal fraction of "g" were calculated using instrument sensitivities derived from static tilt tests. The sensitivities were either supplied by the instrument manufacturer or determined by "in house" tilt tests performed by CDMG prior to installation on site. Post-event tilt tests may be done at a later time to verify the preliminary results reported herein.

TABLE 2.

Partial listing of earthquake ground motion and other pertinent data for CDMG accelerograph stations triggered by the Mammoth Lakes 25-27 May 1980 earthquake sequence. Stations are arranged in order of increasing distance from epicenter(s). Epicenters for events are coded by local date and time.

No.	Station Name	Coordinates	Date	Time	M_L (CIT)	Epicentral[1] Distance (km) [Direction]	Acceleration Azimuth	[2]Max(g)	Ground/ Structure
99	Convict Creek	37.818°N 118.475°W	25th	0933	6.5	1.5 [69°]	180°	0.46	ground
							Up	0.43	"
							90°	0.43	"
			25th	0949	6.0	8.7 [100°]	180°	0.20	"
							Up	0.14	"
							90°	0.17	"
			25th	1245	6.7	6.1 [4°]	180°	0.19	"
							Up	0.20	"
							90°	0.24	"
			27th	0751	6.3	11.9 [353°]	180°	0.33	"
							Up	0.20	"
							90°	0.27	"
301	Mammoth Lakes (High School Gym.)	37.641°N 118.963°W	25th	0933	6.5	10.8 [289°]	254°	0.33	ground
							Up	0.26	"
							344°	0.26	"
							254°	1.07	roof beam
			25th	0949	6.0	3.5 [296°]	254°	0.37	ground
							Up	0.27	"
							344°	0.43	"
							254°	>1.00	roof beam
							344°	>1.00	"

TABLE 2. (cont.)

214	Long Valley Dam	37.588°N 118.705°W	25th	0933	6.5	12.7 [101°]	90° Up 360°	0.28 0.13 0.42	left abutment " "
							90° Up 360°	0.23 0.15 0.42	left crest " "
							90° Up 360°	0.15 0.14 0.20	right crest " "
							90° Up 360°	0.07 0.07 0.11	downstream (bedrock) "
			25th	0949	6.0	20.1 [103°]	90° Up 360°	0.07 0.04 0.19	left abutment " "
							90° Up 360°	0.04 0.05 0.06	left crest " "
							90° Up 360°	0.04 0.04 0.05	right crest " "
							90° Up 360°	0.01 0.02 0.04	downstream (bedrock) "
			25th	1245	6.7	11.9 [75°]	90° Up 360°	0.19 0.12 0.49	left abutment " "

TABLE 2. (cont.)

	Long Valley Dam (cont.)						90°	0.12	left crest
							Up	0.14	"
							360°	0.24	"
							90°	0.06	downstream
							Up	0.07	(bedrock)
							360°	0.11	"
			27th	0751	6.3	14.1 [50°]	90°	0.41	left abutment
							Up	0.32	"
							360°	0.99	"
							90°	0.52	left crest
							Up	0.21	"
							360°	0.30	"
							90°	0.49	right crest
							Up	0.24	"
							360°	0.47	"
							90°	0.17	downstream
							Up	0.09	"
							360°	0.24	"
Ø	Paradise Lodge	37.481°N 118.602°W	27th	0751	6.3	20.6	150°	0.12	ground
							Up	0.09	"
							60°	0.09	"
98	Mono Lake	37.940°N 119.065°W	25th	0933	6.5	39.8	85°	0.06	ground
							Up	0.04	"
							355°	0.08	"
171	Bishop	37.370°N 118.395°W	27th	0751	6.3	41.6	270°	0.04	ground
							Up	0.02	"
							180°	0.08	"

TABLE 2. (cont.)

100	Benton	37.818°N 118.475°W	27th	0751	6.3	46.8	360° Up 270°	0.18 0.07 0.11	ground " "
101 361	Tinemaha (Dam) " (Seismic Vault)	37.055°N 118.239°W	27th	0751	6.3	72.7	less than 0.05 all traces		
46	King's Canyon Nat'l Park (Cedar Grove)	36.787°N 118.675°W	27th	0751	6.3	81.1	less than 0.05 all traces		
298	Independence (L.A. Water & Power Bldg.)	36.800°N 118.199°W	27th	0751	6.3	96.5	less than 0.05 all traces		
45	Centerville	36.734°N 119.486°W	27th	0751	6.3	101.2	less than 0.05 all traces		
10	Fresno (State University)	36.813°N 119.748°W	27th	0751	6.3	112.0	less than 0.05 all traces		
72	Miramonte	36.406°N 119.050°W	27th	0751	6.3	123.7	less than 0.05 all traces		

[1]Distance from epicenters, in kilometers; and in brackets, azimuthal direction (as available) from epicenter to SMIP station for earthquakes' coordinates (as determined by CDMG- Cramer and Toppozada, 1980).

M_L	Date	Origin Time			Latitude	Longitude	Depth
		h	m	s			
6.5	25th	09	33	44.77	37.609°N	118.847°W	8.85km
6.0	25th	09	49	27.04	37.627°N	118.927°W	13.79km
6.7	25th	12	44	51.46	37.559°N	118.835°W	15.93km

TABLE 2. (cont.)

6.3	27th	07	50	57.17	37.506°N	118.826°W	14.15km

Distances for stations farther than 50 km from epicenters were calculated using formulae developed by C.F. Richter (Richter, 1943).

[2]Azimuthal direction of ground acceleration for upward trace deflection on accelerogram (degrees, clockwise from North).

Max(g) is the decimal fraction of acceleration due to gravity; nominal value of one "g" ≃ 9.8 m/sec^2.

TABLE 3.

Chronological listing of earthquake magnitude(CIT), calendar date and local time(PDT- Pacific Daylight Time) with the numbers of corresponding CDMG-SMIP station(s) which recorded the event. Asterisk denotes significant (> 0.05 g) accelerations.

M_L	Date/Time	SMIP Station Numbers
6.5	25th/0933	Ø*,10,45,46,98*,99*,100*,101,171,214*,298,301*,361
5.0	0936	99*,214*,301*
4.0	0940	99
4.2	0942	99*,301
4.0	0945	301
6.0	0949	98,99*,100,214*,301*
4.6	0952	99,214
4.2	0956	99
4.9	1006	99
4.6	1008	99,214
3.9	1017	99*
4.6	1049	99,214
4.5	1241	99
6.7	1245	Ø*,10,45,46,98,99*,100*,101,171,214*,298,361
3.9	1255	99
4.7	1323	99*
5.5	1336	99*,214*
4.3	1339	99*,214*
3.6	1345	99*
4.9	1359	99*,214
4.1	1511	214
4.4	1757	214
4.7	1819	214,301*
3.6	2025	99
4.0	2049	214*
4.0	2137	99*
4.6	2257	99

TABLE 3. (cont.)

M_L	Date/Time	SMIP Station Numbers
4.1	26th/0321	99*,214*
3.8	0340	99
4.0	0404	99,214*
5.2	0524	99*,214*,301
4.1	0604	214
3.8	0657	99
4.5	0920	99
(†)	1130	99
4.9	1158	99,214*,301*
3.8	1304	99
6.3	27th/0751	Ø*,10,45,46,72,98,99*,100*,101,171*,214*,298,361.
3.8	0911	99
5.0	1201	99,214*
3.8	1658	99
3.8	2103	99
4.8	2216	99,301

(†) magnitude not determined.

Note: Earthquake dates and times listed in this table have been converted from WWVB radio time code received by the recording instruments. The following conversion formulas are provided for those persons accustomed to using WWVB time codes:

Calendar date 25 May 1980 = Julian date 146
26 May 1980 = 147
27 May 1980 = 148

Pacific Daylight Time (PDT) = Universal Time Coordinated (UTC) minus (-) 7 hours.

Time of events listed in Table 3 is rounded to the nearest minute from station trigger time in hours and minutes in accordance with a 24 hour clock system.

STRONG-MOTION RECORD DATA: CONVICT CREEK

STATION: Name Convict Creek

Address Sierra Nevada Aquatic Research Laboratory
Convict Creek, CA

County Mono Elevation _____ m

CDMG 99 Latitude 37.614 °N

USGS 1324 Longitude 118.831 °W

INSTRUMENT: Type (Traces)	Serial Number	Date Installed	Date Removed
SMA-1T (3)	2593	8-16-79	

EARTHQUAKE: Name (Region) Mammoth Lakes May 1980

Date (Table 3) (UTC) _____ Epicentral Distance (Table 2) km

SITE GEOLOGY: Site underlain by Quaternary alluvium which overlies glacial morainal debris derived from upper Convict Creek. Clastic debris was shed into the Long Valley collapse caldera the southern boundary of which trends E-W and is adjacent to station.

TRACE EVALUATION

Trace (from top)	Orientation	Sensitivity (mm/g)	Nat Freq (Hz)	Damping (% crit)	Peak Accel (% g)
1	180°	18.1	26.4	.61	see
2	Up	17.8	26.5	.58	accelerograms
3	90°	18.0	26.9	.62	

Structural orientation reference: North = 360 ° East = 90°

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STRONG-MOTION RECORD DATA: CONVICT CREEK (page 2)

Station: Convict Creek
Instrument: SMA-1T Serial No. 2593, 3 Channels, WWVB Radio
Mammoth Lakes Earthquake Sequence, 25-27 May 1980.

M_L[1]	Date	Trigger Time (PDT)	Peak Accelerations[2] - "g" 1 (L)	2 (V)	3 (T)
6.5	25 May	0933:46	0.46	0.43	0.43
5.0		0935:55	0.06	0.04	0.04
4.0		0939:42			
4.2		0941:56			
6.0		0949:28	0.20	0.14	0.17
4.6		0952:29			
4.2		0956:17			
4.9		1006:26			
4.6		1008:32			
3.9		1016:52			
4.6		1048:32			
4.5		1240:34			
6.7		1244:54	0.19	0.20	0.24
3.9		1254:59			
4.7		1323:27			
5.5		1335:49	0.49	0.35	0.38
4.3		1338:41			
3.6		1344:41			
4.9		1359			
3.6		2024:33			
4.0		2136:56			
4.6		2257			
4.1	26 May	0320:33			
3.8		0339:57			
4.0		0404:07			
5.2		0524:27			
3.8		0657:26			
4.5		0920:26			
(not determined)		1129:48			
4.9		1157:58			
3.8		1303:42			
6.3	27 May	0751:01	0.33	0.20	0.27
3.8		0910:40			
5.0		1201:09			
3.8		1657:45			
3.8		2103:00			
4.8		2216:25			

[1] Preliminary local magnitudes from the CIT Seismological Laboratory, Pasadena.

[2] Accelerations less than 0.05 g (horizontal axes) not listed.

STRONG-MOTION RECORD DATA: LONG VALLEY DAM

STATION: Name Long Valley Dam
Address Route 3, Box 42
Bishop, CA 92514

County Mono — Elevation ____ m
CDMG 214 — Latitude 37.588 °N
USGS 1444 — Longitude 118.705 °W

INSTRUMENT: Type (Traces)	Serial Number	Date Installed	Date Removed
CR-1 (13)	190	8-29-79	
SMA-1 (3)	3504	8-29-79	
SMA-1 (3)	3505	8-29-79	
SMA-1 (3)	3506	8-29-79	

EARTHQUAKE: Name (Region) Mammoth Lakes May 1980
Date (Table 3) (UTC) ____ Epicentral Distance (Table 2) km

SITE GEOLOGY: Earthfill dam with rip-rap blocks on upstream face. Founded on layered, blocky rhyolite with flows 2 to 15 ft. thick. At surface 3 ft. of soil, 10 ft. of weathered rhyolite.

TRACE EVALUATION

	Trace (from top)	Orientation	Sensitivity (mm/g)	Nat Freq (Hz)	Damping (% crit)	Peak Accel (% g)
CR-1	1	E	+17.9 -17.0	51.8	.64	see
	2	Up	Avg. 17.5	50.0	.62	accelerograms
	3	N	+18.0 -17.3	51.1	.63	
	4	E	+17.8 -17.1	50.48	.65	
	5	Up	Avg. 17.7	52.0	.64	
	6	E	+16.65 -16.75	51.521	.64	
	7	N	+17.5 -17.1	50.9	.64	
	8	Up	Avg. 17.2	50.7	.63	
	9	E	+17.5 -17.5	51.5	.64	
	10	Up	Avg. 17.3	51.7	.65	
	11	E	+17.0 -17.4	51.5	.64	
	12	N	+17.5 -17.3	51.0	.63	
	13	Up	Avg. 17.4	50.2	.62	

Structural orientation reference: North = 360 ° East = 90°

OSMS Rev 4/9/80

STATION: Name Long Valley Dam (page 2)

Address _____

_____

County _____ Elevation _____ m

CDMG _____ Latitude _____ °N

USGS _____ Longitude _____ °W

INSTRUMENT:

Type (Traces)	Serial Number	Date Installed	Date Removed

EARTHQUAKE: Name (Region) _____

Date _____ (UTC) _____ Epicentral Distance _____ km

SITE GEOLOGY: _____

_____

_____

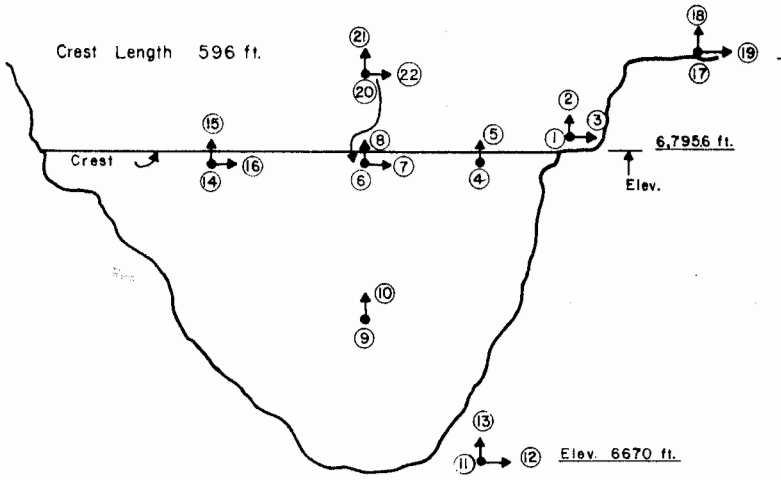
_____

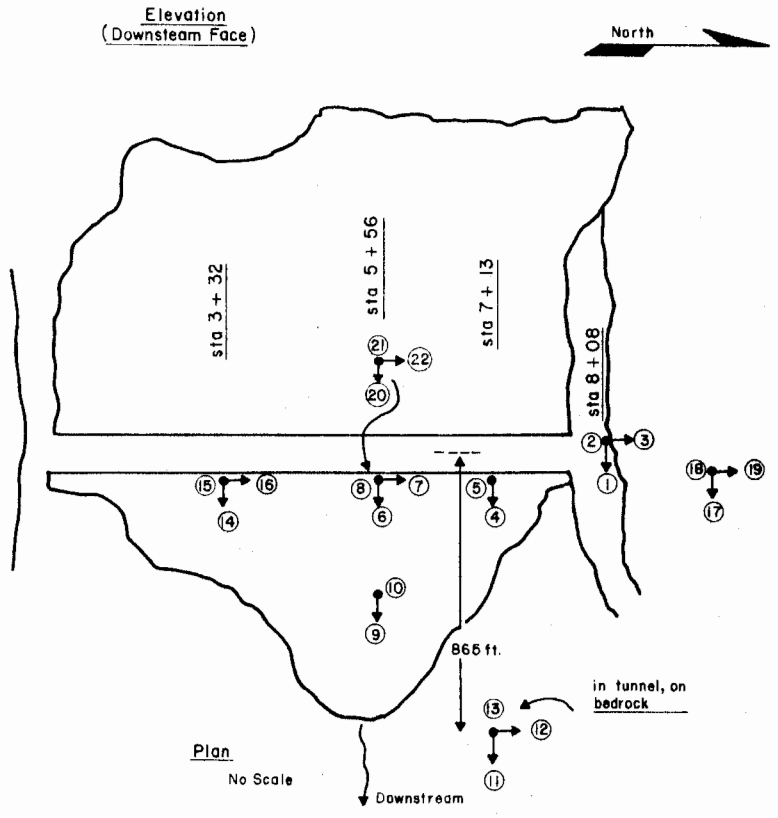
TRACE EVALUATION

	Trace (from top)	Orientation	Sensitivity (mm/g)	Nat Freq (Hz)	Damping (% crit)	Peak Accel (% g)
SMA-1 3504	1	E	17.5	25.9	.57	see accelerograms
	2	Up	18.9	24.8	.61	
	3	N	19.0	24.7	.62	
SMA-1 3505	1	E	18.7	25.1	.57	
	2	Up	18.5	25.6	.64	
	3	N	17.5	25.9	.61	
SMA-1 3506	1	E	18.6	26.1	.56	
	2	Up	17.8	26.4	.62	
	3	N	19.1	25.1	.58	

Structural orientation reference: North = 360 ° East = 90°

OSMS Rev 4/9/80





Recorder trace order:

CR-1 #190	Accelerometer		1
	Fixed trace		---
	Accelerometer		2
	Accelerometer		3
	Fixed Trace		---
	Accelerometer		4
	Accelerometer		5
	Fixed trace		---
	Accelerometer		6
	Accelerometer		7
	Fixed trace		---
	Accelerometer		8
	Accelerometer		9
	Fixed trace		---
	Accelerometer		10
	Accelerometer		11
	Fixed trace		---
	Accelerometer		12
	Accelerometer		13
	Fixed trace		---
SMA-1 #3506	Accelerometer	1	14
	Fixed trace	---	
	Accelerometer	2	15
	Fixed trace	---	
	Accelerometer	3	16
SMA-1 #3505	Accelerometer	1	17
	Fixed trace	---	
	Accelerometer	2	18
	Fixed trace	---	
	Accelerometer	3	19
SMA-1 #3504	Accelerometer	1	20
	Fixed trace	---	
	Accelerometer	2	21
	Fixed trace	---	
	Accelerometer	3	22

Note: All instruments tied together with common start and WWVB Radio Time.

Figure 3 - Long Valley Dam, strong-motion instrumentation scheme.

STRONG-MOTION RECORD DATA: MAMMOTH HIGH SCHOOL GYMNASIUM

STATION: Name Mammoth High School (Gym.)

Address Sierra Park Rd. & Meridian Blvd.

Box 1320, Mammoth Lakes, CA 93546

County Mono Elevation ____ m

CDMG 301 Latitude ____ °N

USGS 1490 Longitude ____ °W

INSTRUMENT: Type (Traces)	Serial Number	Date Installed	Date Removed
CR-1 (10)	135	2-4-77	

EARTHQUAKE: Name (Region) Mammoth Lakes May 1980

Date (Table 3)(UTC) ____ Epicentral Distance (Table 2) km

SITE GEOLOGY: Site underlain by Pleistocene glacial debris ∿ 50 m - 100 m thick. Late Cenozoic volcanic rocks exposed in local hills probably underlies glacial debris. Basement rocks could be Mesozoic granitic rocks or pendants of Late Paleozoic metamorphic rocks.

TRACE EVALUATION

Trace (from top)	Orientation	Sensitivity (mm/g)	Nat Freq (Hz)	Damping (% crit)	Peak Accel (% g)
1	W	18.6	54.2	.63	
2	Up	19.5	53.8	.62	
3	N	17.7	53.7	.62	
4	N	18.7	54.1	.65	
5	N	18.4	54.2	.64	
6	N	17.8	54.0	.66	
7	W	17.7	54.5	.67	
8	N	17.8	54.2	.64	
9	W	17.6	54.4	.62	
10	W	18.2	54.5	.65	

Structural orientation reference: North = 344 ° ; West 245°

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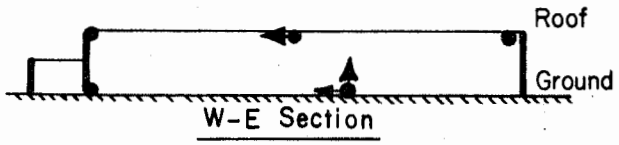
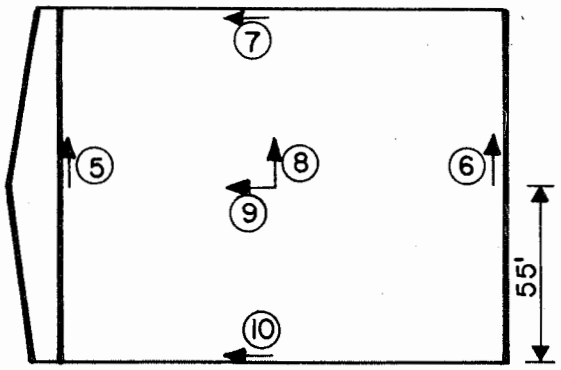
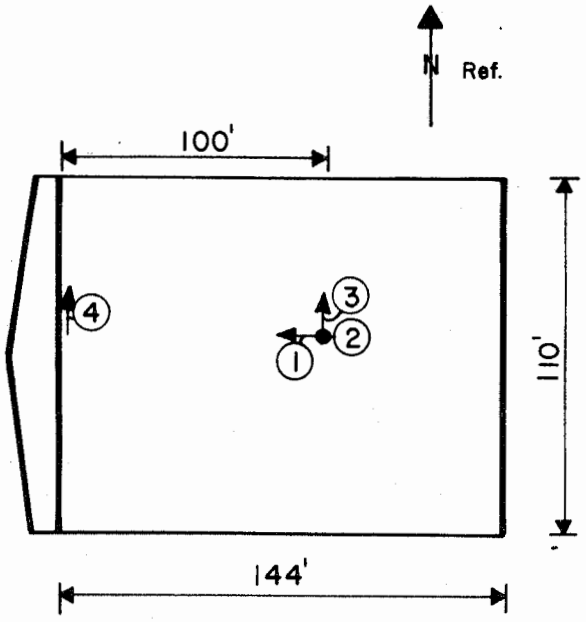


W-E Section



Roof Plan



Ground Floor Plan

Installation Notes:

Accelerometers 1,2,3 and 4 are installed on the ground floor slab.

Accelerometers 5,8 and 9 are attached to the roof trusses at the bottom chord level.

Accelerometers 6,7 and 10 are attached to the roof trusses at the top chord level.

Recorder trace order:

Accelerometer	1
Fixed trace	-
Accelerometer	2
" "	3
Fixed trace	-
Accelerometer	4
" "	5
Fixed trace	-
Accelerometer	6
" "	7
Fixed trace	-
Accelerometer	8
" "	9
Fixed trace	-
Accelerometer	10

Lateral Force resisting system:

Horizontal steel bracing in plane of lower chord of roof trusses; vertical steel bracing encased in reinforced concrete exterior walls.

Figure 4 - Mammoth High School Gymnasium, strong-motion instrumentation scheme.

ACCELEROGRAMS

The accelerograms reproduced on the following pages record strong motions that occurred during three distinct events--one on 25 May 1980 at 0933 hours ($M_{6.5}$), one on 25 May at 1245 hours ($M_{6.7}$), and one on 27 May at 0751 hours ($M_{6.3}$). These three events produced the highest peak accelerations recorded on CDMG-SMIP instruments during the entire earthquake sequence with the one exception of the Convict Creek instrument. The $M_{5.5}$ event on 25 May at 1336 hours generated a peak acceleration of 0.49 "g" on the horizontal accelerometer oriented at 180° azimuthal.

The accelerograms contained in this report are presented in three sections, with one section for each event. Each accelerogram is labeled with station number, station name, date and time (PDT) along with trace azimuth orientation and decimal fraction of "g" (circled, on accelerometer trace).

M. 6.5 25 May 1980 - 0933 hours (PDT)

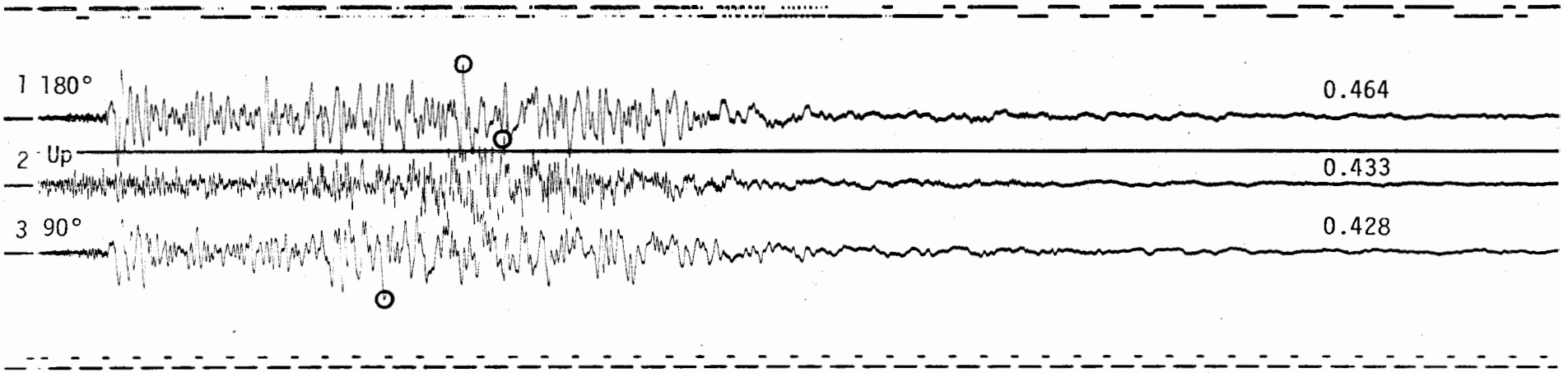
Accelerograms

The accelerograms in this section record significant (> 0.05 g) accelerations that occurred at four CDMG-SMIP instrumented stations during the 25 May 1980 - 0933 hours (PDT) earthquake.

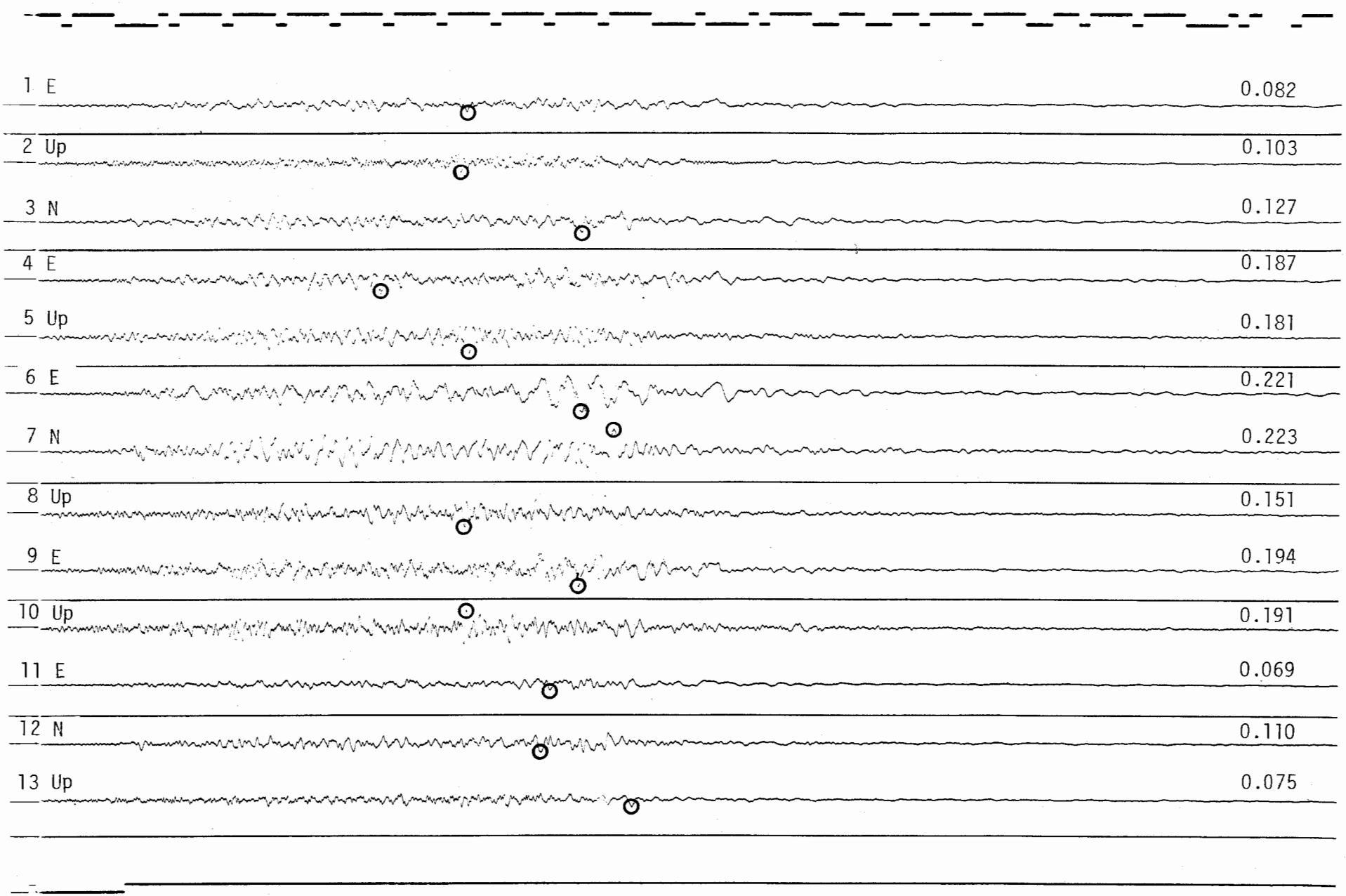
The first accelerogram, from the Convict Creek station instrument shows more high frequency content than the other accelerograms recorded during this event. The duration of significant accelerations was approximately 10 seconds. The Mammoth Lakes High School Gym accelerogram recorded similar frequencies but the duration of significant accelerations was half that of Convict Creek. Frequency content in the four Long Valley Dam accelerograms appears to be lower than either the Convict Creek or Mammoth Lakes High School Gym records; however, the duration of strong-motion lasted about 13 seconds.

The last accelerogram in this section is from the Mono Lake station which was the furthermost SMIP station recording significant accelerations during this event.

CDMG No. 99 Convict Creek - Sierra Nevada Aquatic Research Lab M 6.5 25 May 1980 (0933)

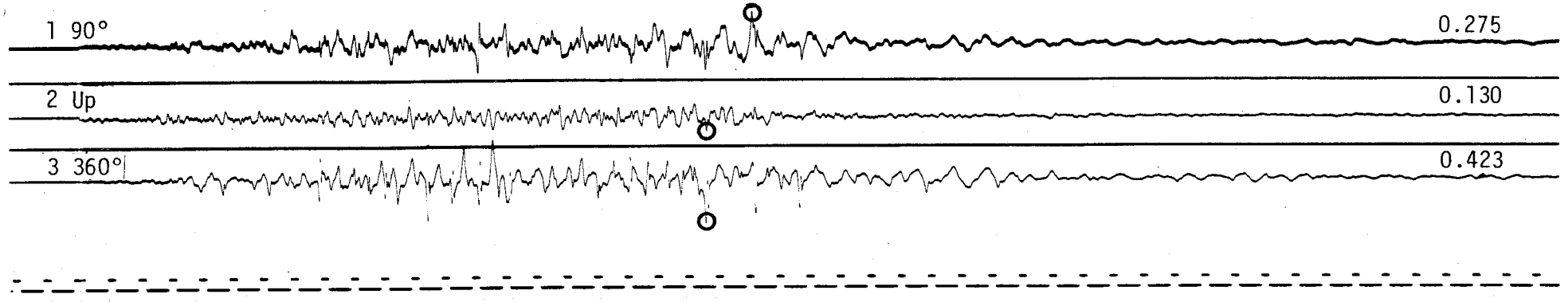


CDMG No. 214 Long Valley Dam (CR-1) M 6.5 25 May 1980 (0933)



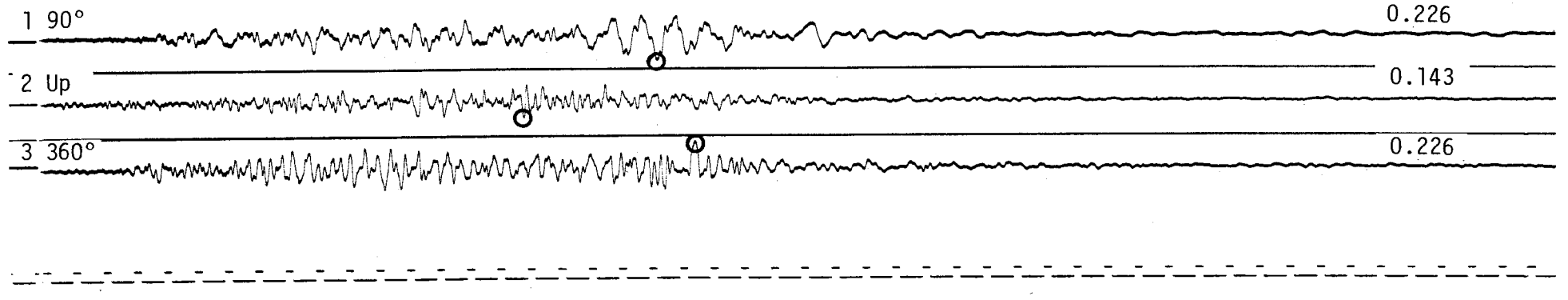
Reference Orientation
N=360° E=90°

CDMG No. 214 Long Valley Dam (L.abutment) M 6.5 25 May 1980 (0933)



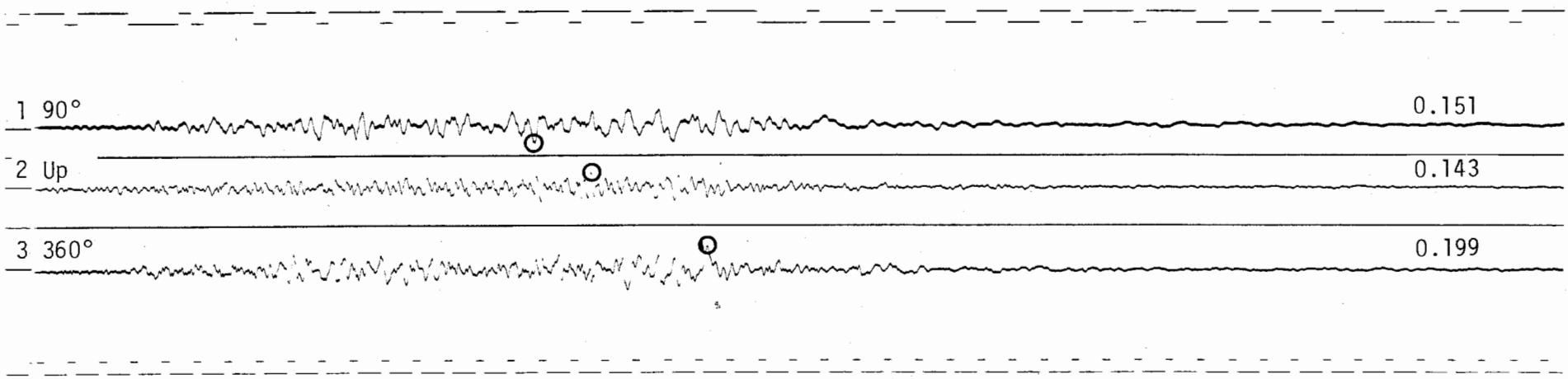
SMA-1 No. 3505

CDMG No. 214 Long Valley Dam (L.crest) M 6.5 25 May 1980 (0933)



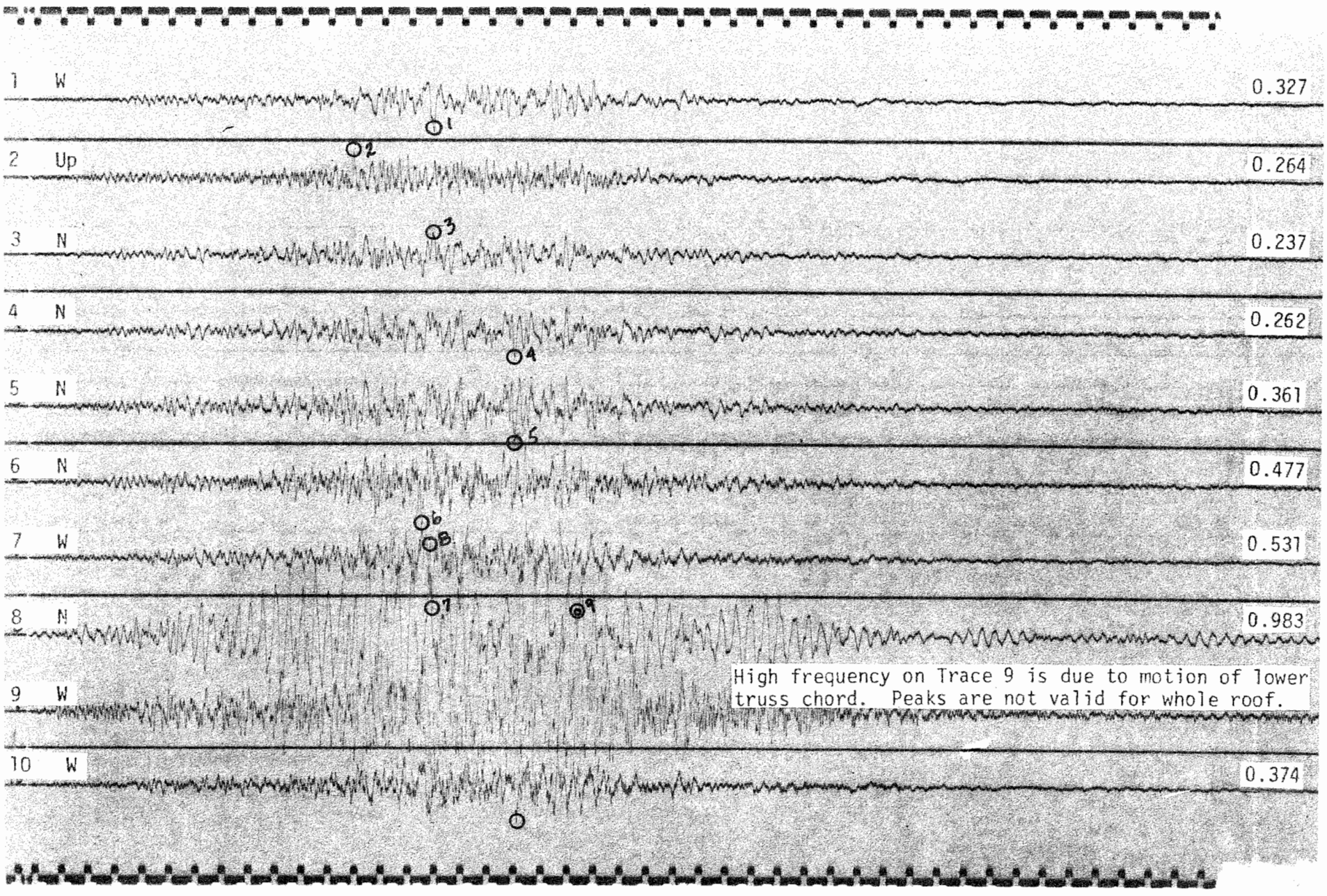
SMA-1 No.3504

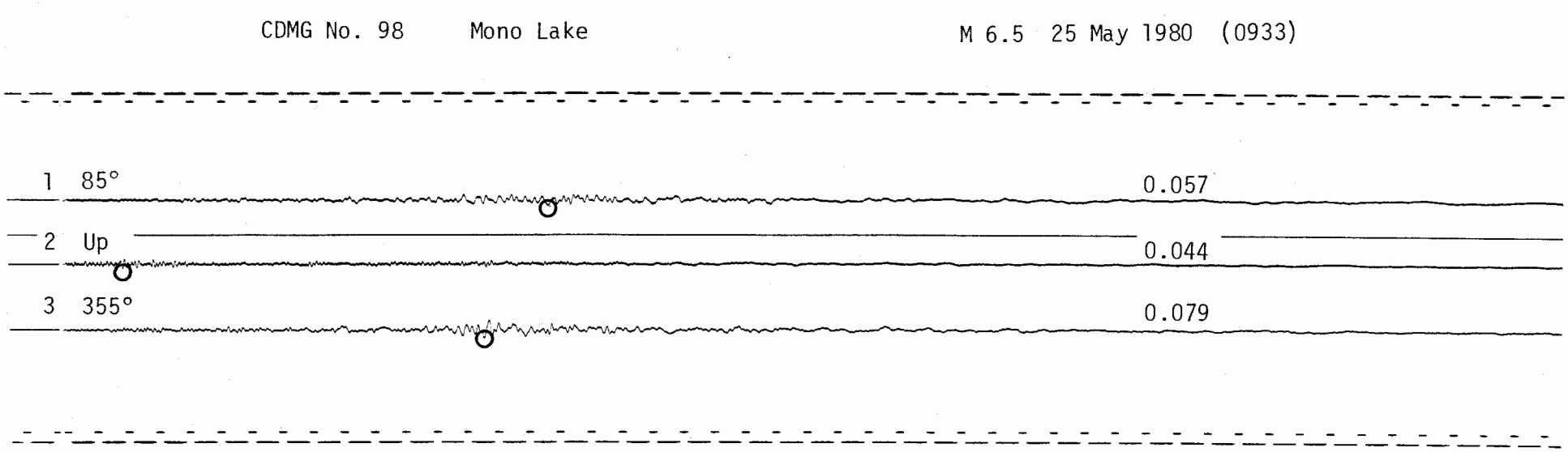
CDMG No. 214 Long Valley Dam (R.crest) M 6.5 25 May 1980 (0933)



SMA-1 No. 3506

CDMG No. 301 Mammoth High School (Gym.) M 6.5 25 May 1980 (0933)




CDMG No. 98 Mono Lake
M 6.5 25 May 1980 (0933)
1 85°
0.057
2 Up
0.044
3 355°
0.079

M 6.7 25 May 1980 - 1245 hours (PDT)

Accelerograms

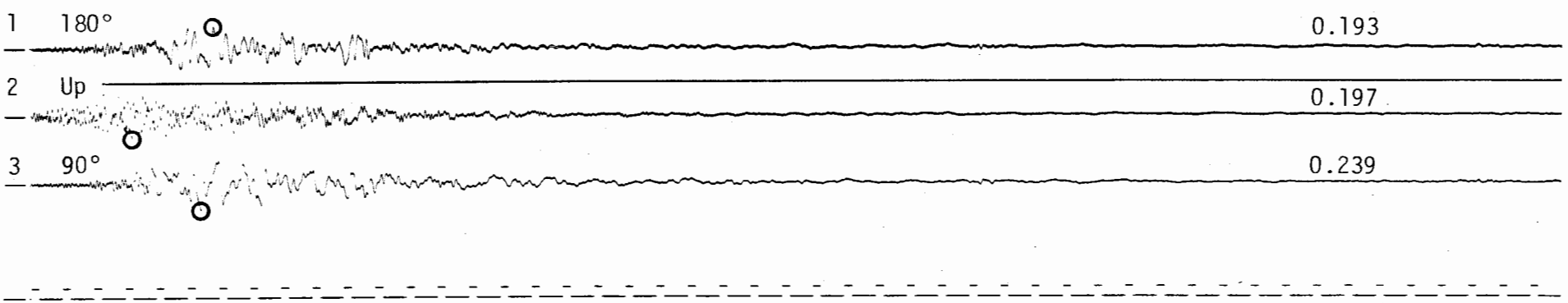
The accelerograms in this section record significant (> 0.05 g) accelerations that occurred at two CDMG-SMIP instrumented stations during the 25 May 1980 - 1245 hours (PDT) earthquake.

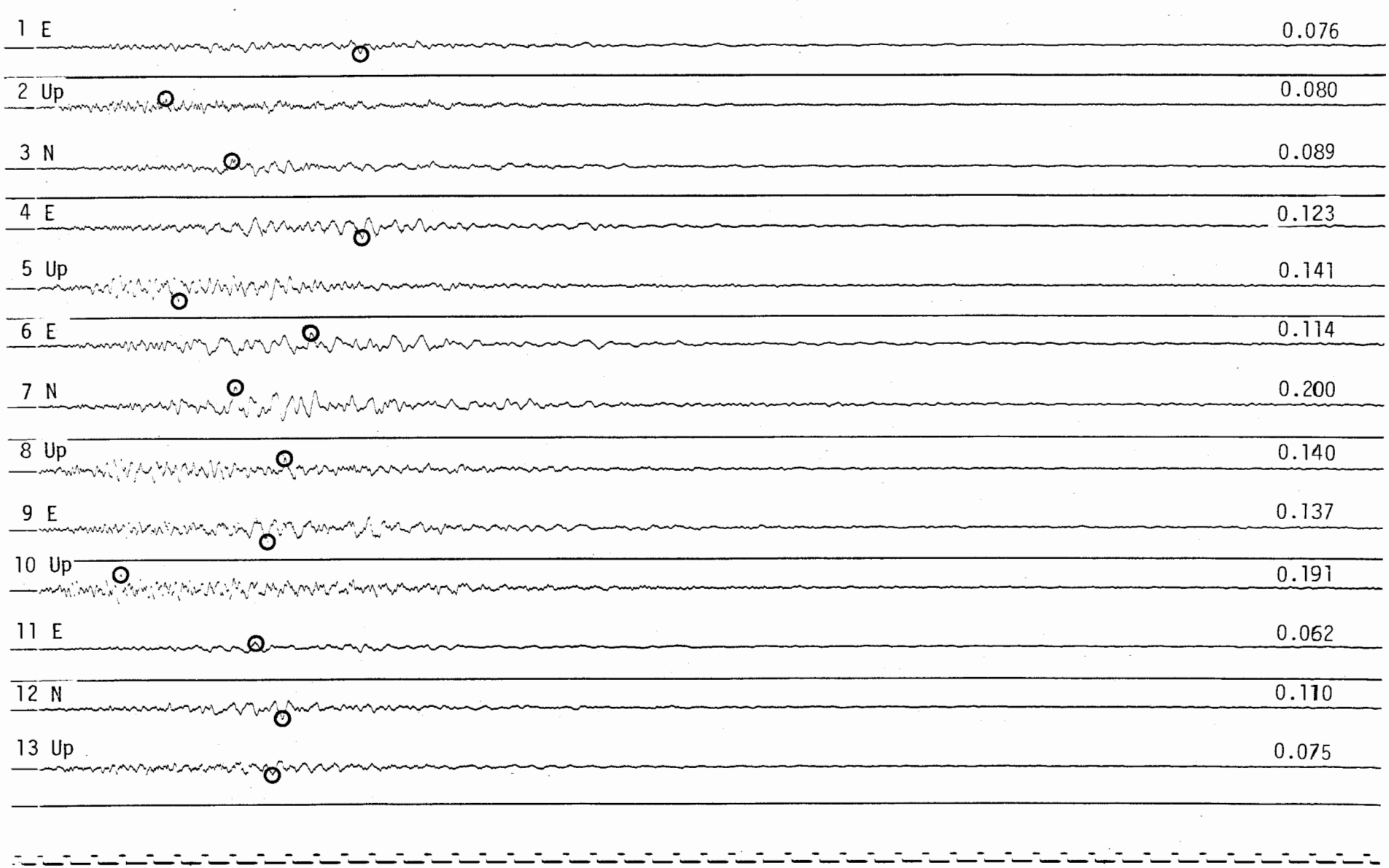
This $M_{6.7}$ (CIT) event was the largest magnitude earthquake occurring between 25-27 May 1980 in the Mammoth Lakes sequence. Accelerograms from the Convict Creek and Long Valley Dam SMIP stations recorded lower peak accelerations, lower frequencies, and shorter durations of significant acceleration than those accelerograms recorded earlier during the $M_{6.5}$ event at 0933 hours (PDT).

The Long Valley Dam and the Convict Creek instruments produced records of similar characteristics, but at Convict Creek, peak accelerations from this event ($M_{6.5}$) have almost one-half the amplitude of those of the earlier ($M_{6.5}$) event.

The comparatively lower values of frequency, peak acceleration, and time duration of strong ground shaking may perhaps be attributed to the greater depth of the 1245 hours event (almost twice that of the $M_{6.5}$ 0933 hours earthquake).

CDMG No. 99 Convict Creek - Sierra Nevada Aquatic Research Lab M 6.7 25 May 1980 (1245)

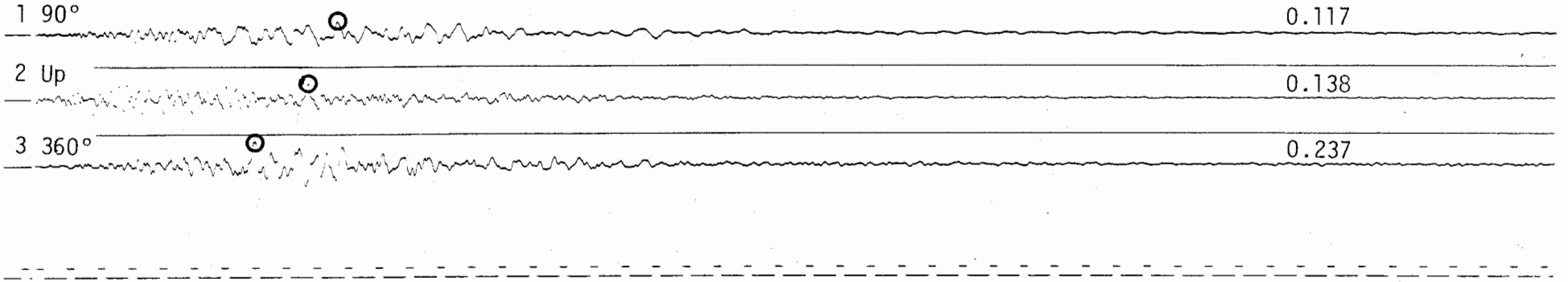




Reference Orientation

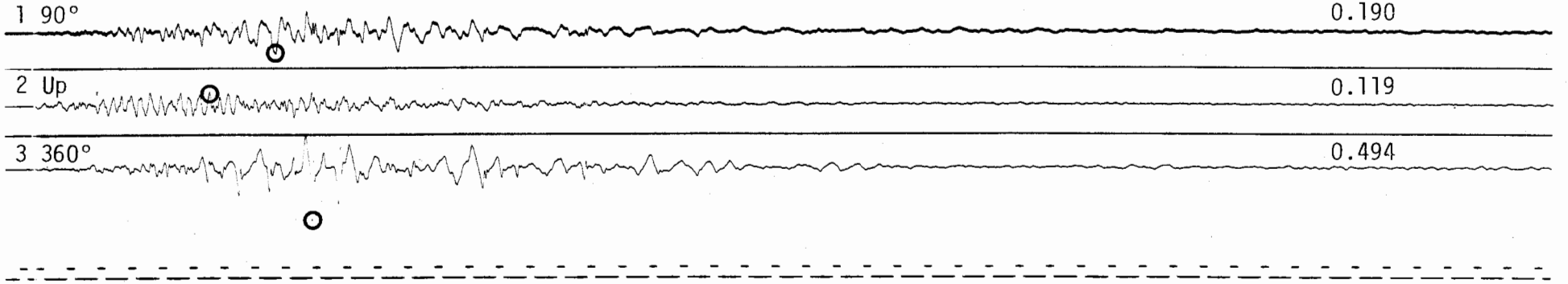
N=360° E=90°

CDMG No. 214 Long Valley Dam (c.crest) M 6.7 25 May 1980 (1245)



SMA-1 No. 3504

CDMG No. 214 Long Valley Dam (L.abutment) M 6.7 25 May 1980 (1245)



SMA-1 No. 3505

M 6.3 27 May 1980 - 0751 hours (PDT)

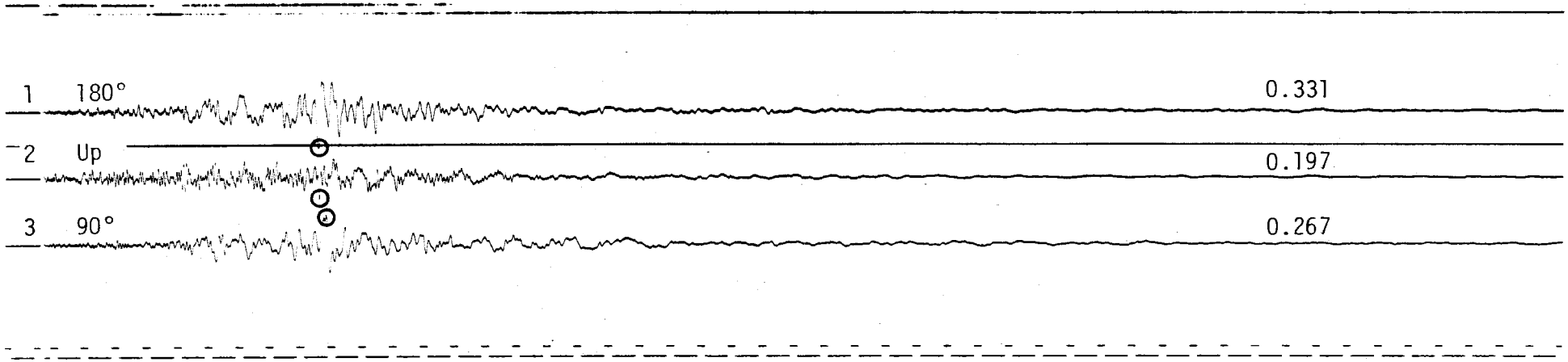
Accelerograms

The accelerograms in this section record significant (> 0.05 g) accelerations that occurred at five CDMG-SMIP instrumented stations during the 27 May 1980 - 0751 hours (PDT) earthquake.

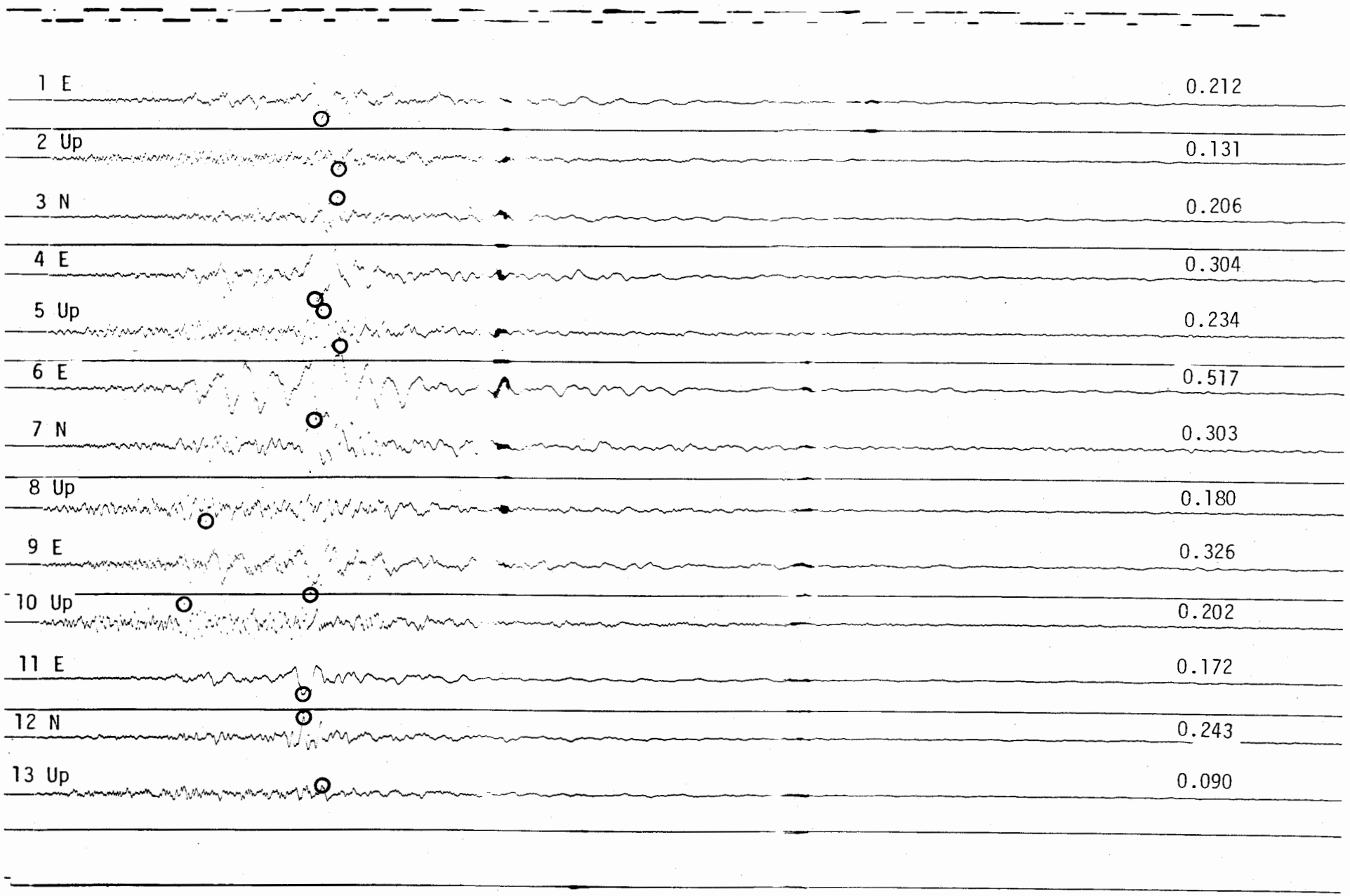
Accelerograms presented in this section are similar to those from the 25 May $M_{6.7}$ earthquake for most SMIP stations. Accelerograms from the Long Valley Dam station instruments differ from the rest in the peak acceleration values. Specifically, the left abutment instrument at Long Valley Dam recorded one high frequency spike of almost one "g", ground motion in the horizontal plane. The accelerogram shows other similar spikes, but they have much less amplitude. This phenomenon may indicate geological changes in the immediate area of the recording instrument. Accelerograms from other instruments at this station show significant accelerations from both structural response on the dam's crest and ground motion at the downstream bedrock site (CR-1 accelerogram, trace numbers 11, 12, and 13).

The accelerograms from the Paradise Lodge and Benton SMIP stations exhibit distinct shear wave arrivals after triggering; however, the Bishop station apparently triggered on the shear wave arrival. Other SMIP stations which recorded this event and were more distant from the epicenter than the Bishop station also triggered on the shear wave.

CDMG No. 99 Convict Creek - Sierra Nevada Aquatic Research Lab M 6.3 27 May 1980 (0751)

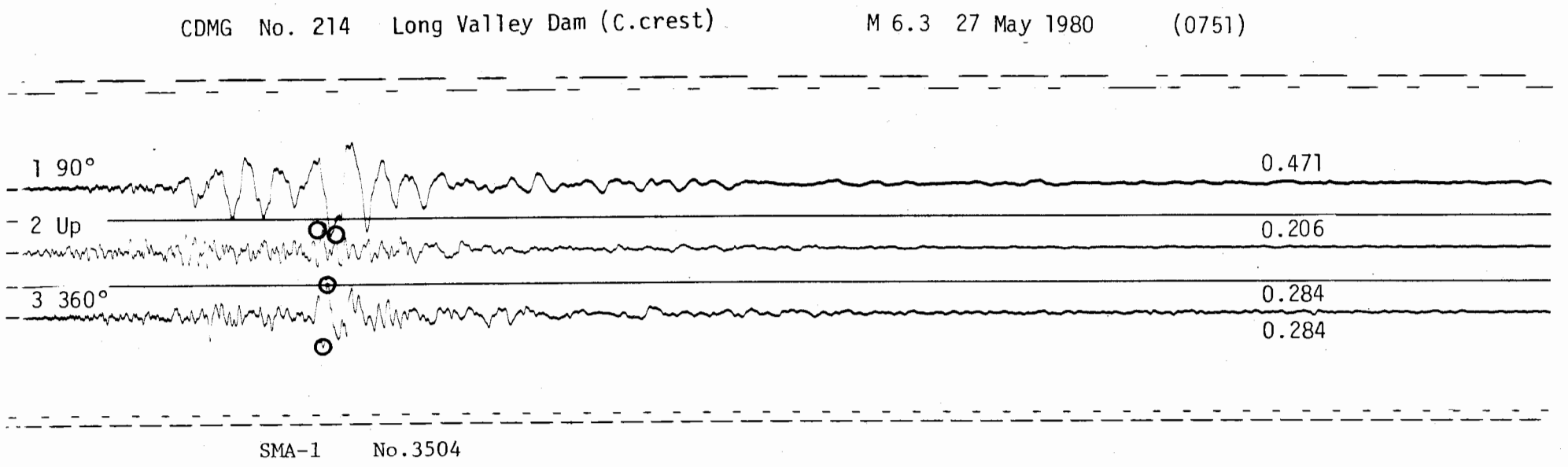


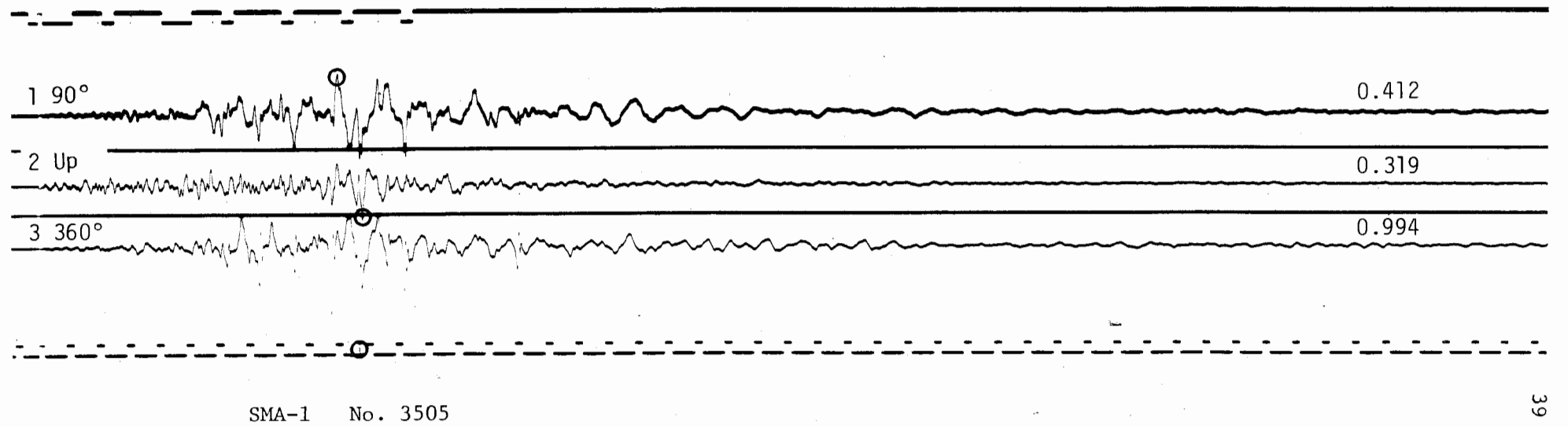
CDMG No. 214 Long Valley Dam (CR-1) M 6.3 27 May 1980 (0751)



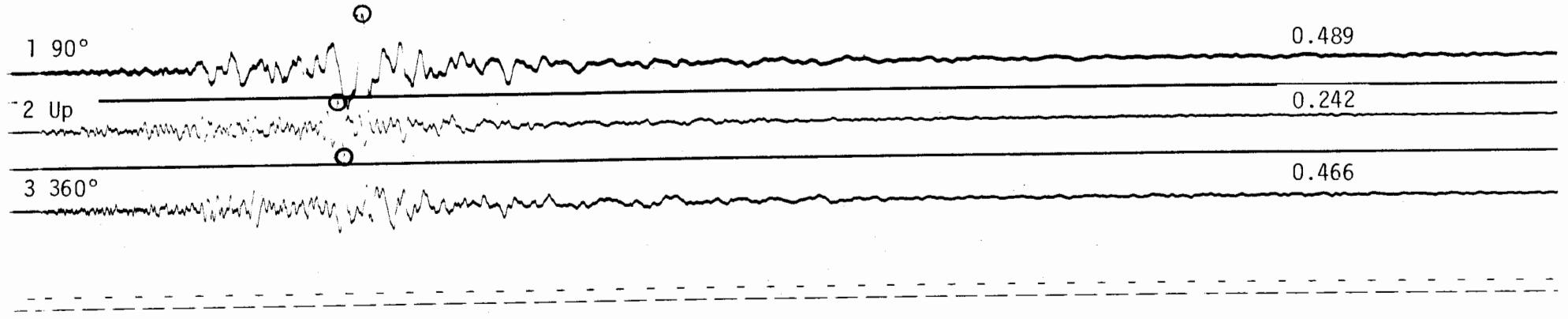
Reference Orientation

N=360° E=90°


CDMG No. 214 Long Valley Dam (C.crest)
M 6.3 27 May 1980 (0751)
1 90°
0.471
2 Up
0.206
3 360°
0.284
0.284
SMA-1 No.3504

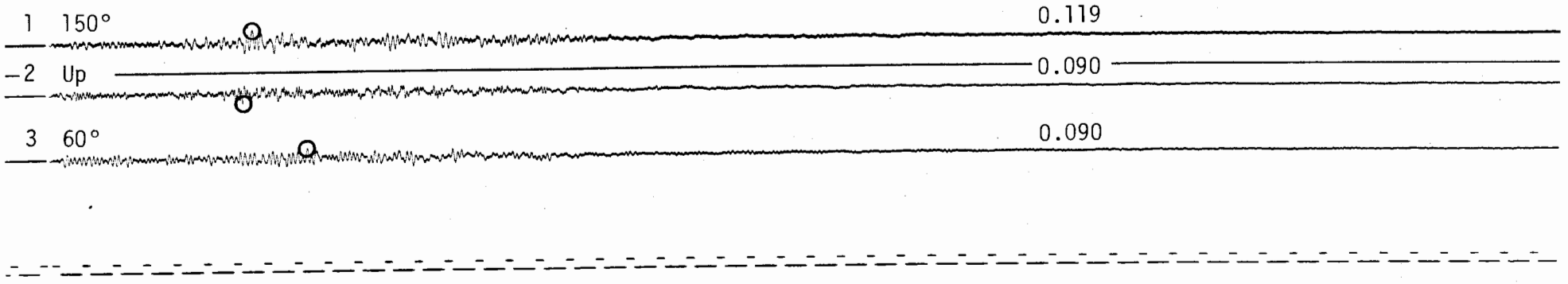

CDMG No. 214 Long Valley Dam (L.abutment)
M 6.3 27 May 1980 (0751)
1 90°
0.412
2 Up
0.319
3 360°
0.994
SMA-1 No. 3505

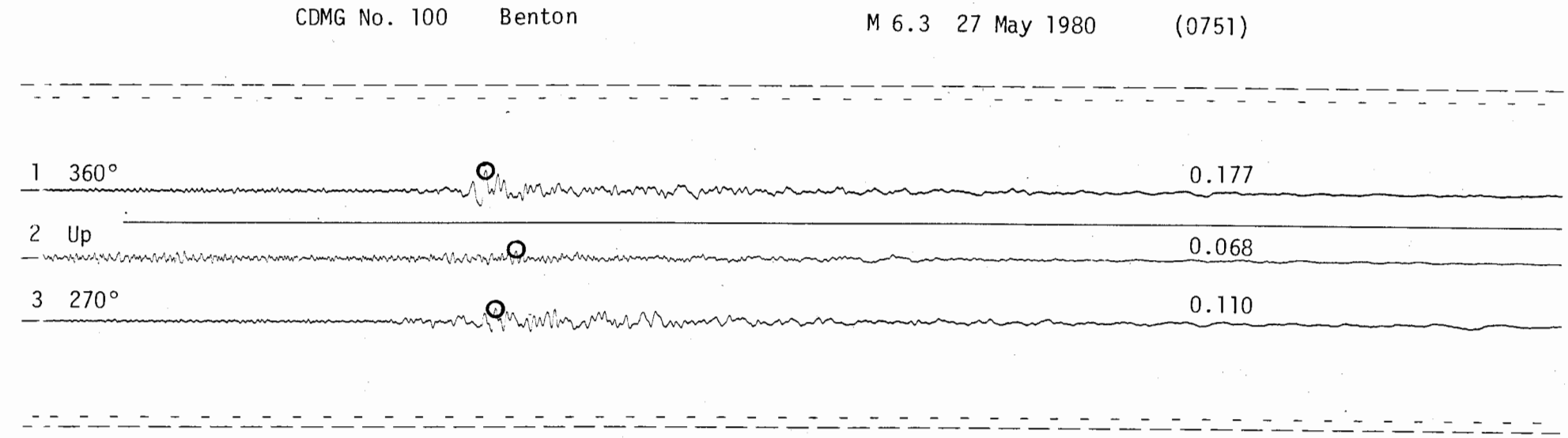
CDMG No. 214 Long Valley Dam (R.crest) M 6.3 27 May 1980 (0751)

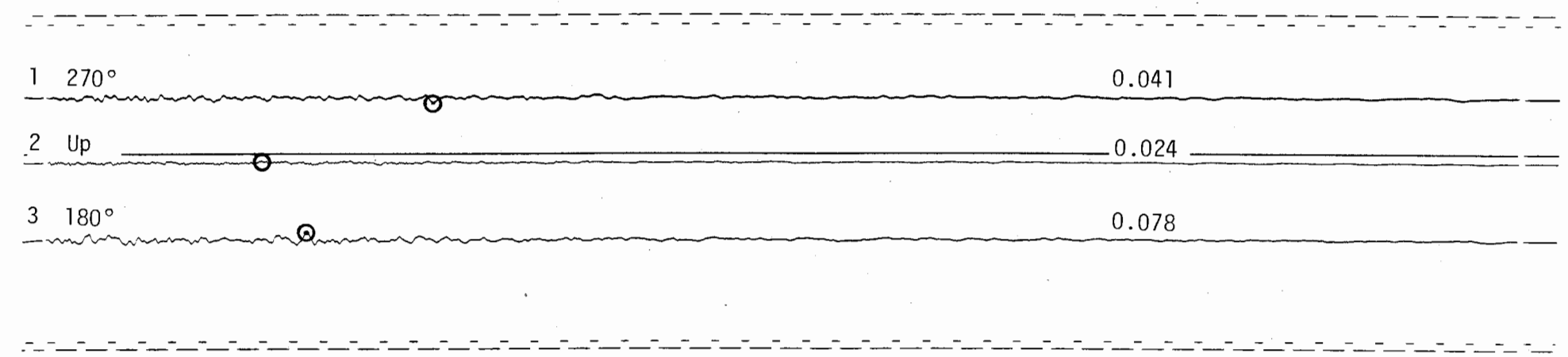


SMA-1 No. 3506

CDMG No. (Temp) Bishop-Paradise Lodge M 6.3 27 May 1980 (0751)




CDMG No. 100 Benton
M 6.3 27 May 1980 (0751)
1 360°
0.177
2 Up
0.068
3 270°
0.110


CDMG No. 171 Bishop
M 6.3 27 May 1980 (0751)
1 270°
0.041
2 Up
0.024
3 180°
0.078

REFERENCES CITED

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