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FINAL TECHNICAL REPORT

SEISMIC BASELINE AND INDUCTION STUDIES ROOSEVELT HOT SPRINGS, UTAH AND RAFT RIVER, IDAHO

by

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Schyler Schaff
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May 1982

Work performed under Contract DE-AS07-78ID01821

EARTH SCIENCE LABORATORY
University of Utah Research Institute
Salt Lake City, Utah

Prepared for
U.S. Department of Energy
Division of Geothermal Energy

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ILLUSTRATIONS

ABSTRACT

Local seismic networks were established at the Roosevelt Hot Springs geothermal area, Utah and at Raft River geothermal area, Idaho to monitor the background seismicity prior to initiation of geothermal power production. The Raft River study area is currently seismically quiet down to the level of approximately magnitude one. The Roosevelt Hot Springs area has low-level seismic activity for M_L greater than about two; however, microearthquake ($M_L \leq 2$) swarms appear to be relatively common. One swarm occurred adjacent to the Roosevelt geothermal area during the summer of 1981. From June 27 to August 28, 1044 microearthquakes ($M_L \leq 1.5$) were recorded from which 686 earthquakes were located and analysed. The main cluster of microearthquakes was located about 2 km east of the production field at a depth of about 5 km. A few small events were located in the production field at shallow depths (< 2 km). Three of the four largest earthquakes in the swarm (M_L 1.5-2.0) were located 4-5 km further east along a N-NW trend beneath the flank of the adjacent Mineral Mountains. Focal mechanism solutions indicate primarily normal faulting due to the regional E-W extension which characterizes this portion of the eastern Basin and Range Province. Hence, the Mineral Mountain swarm appears to be a natural release of tectonic stress in this area. Nevertheless, the occurrence of natural earthquake swarms indicates a potential for induced seismicity at Roosevelt Hot Springs after major production operations are initiated.

Final Technical Report on Seismic Baseline and Induction Studies at Roosevelt Hot Springs, Utah and Raft River, Idaho

1.0 INTRODUCTION

Part of the plan for exploitation of geothermal resources involves reinjection of the fluid produced. It has been shown that such downhole fluid injection can trigger earthquakes (Healy et al., 1968); production of fluid may also induce seismicity (Bufe et al., 1981). Thus, induced seismicity is a possible by-product of geothermal power generation.

This report summarizes a study of possible induced seismicity at two Intermountain geothermal areas: Raft River Geothermal Project, Idaho and Roosevelt Hot Springs thermal area, Utah. The work was performed under Department of Energy (DOE) contract number DE-AS07-78ID01821, placed with ESLD/UURI in September 1979. Seismic networks were established in both areas to monitor local seismicity. The Roosevelt array was discontinued in January 1982; however, the Raft River array is still monitoring seismicity unperturbed by production. The main objective is to collect baseline seismicity data against which post-production seismicity can be compared. Roosevelt Hot Springs is planned to begin production in 1983; the schedule for bringing the demonstration plant at Raft River on line currently forecasts full-scale plant operation in April 1982.

After describing the analysis procedure, we discuss the background seismicity of the study areas and then present a detailed description of a major microearthquake swarm which occurred within and adjacent to the Roosevelt Hot Springs thermal area. From June 27 to August 28, 1981, approximately 1044 microearthquakes (local magnitude, $M_L \leq 1.5$) were detected along a narrow, linear band extending from the geothermal production zone eastward about 5 km into the adjacent Mineral Mountains. Although any mechanical relationship between the swarm and the geothermal field is still unclear, the data are relevant for study of the structure and strain release mechanism within the geothermal reservoir. Analyses of the swarm data (Section 4.0) provides, we believe, the most important results of this study. Summaries of array implementation, station locations, station calibrations, analysis procedures, and earthquake hypocenter listings are provided in appendices.

2.0 ANALYSIS PROCEDURES

Earthquakes have been located on a routine basis at Roosevelt Hot Springs since September 1979. No local earthquakes have been detected at the Raft River site to date. The location program HYPOELLIPSE (Lahr, 1979) was used for all hypocenter determinations in this report unless specifically noted otherwise. In the location program, we used a velocity model for the Roosevelt events from Olson and Smith (1976) which was obtained by inversion of local earthquake data recorded near Cove Fort, approximately 28 km northeast of Roosevelt Hot Springs. The model consists of three layers over a half-space with the following parameters:

LAYER	P-VELOCITY (km/sec)	DEPTH TO TOP (km)	THICKNESS (km)
1	3.1	0.0	0.4
2	5.7	0.4	13.9
3	6.4	14.3	11.7
4	7.4	26.0	semi-infinite

Detailed velocity information is available for the Roosevelt Hot Springs area (Gertson and Smith, 1979); however the results are restricted to relatively shallow depths (< 2 km) and indicate considerable lateral heterogeneity. Therefore, we decided to use the more general velocity model for the routine locations. Absolute location errors due to errors in the velocity model are probably less than 1 km in epicenter and 2 km in depth, and the location errors of the hypocenters with respect to each other are much less than the absolute errors. Results of joint hypocenter location attempts on subsets of the data are described in a later section.

Routine magnitude determinations were difficult due to the small magnitudes of the events and the absence of good master events to calibrate a coda-duration scheme. A crude coda-duration scheme calibration was possible only for the Roosevelt swarm data and is described in the section dealing with the swarm activity. Further details of the data acquisition and analysis procedures are given in appendices A and C.

3.0 BACKGROUND SEISMICITY

Both the Raft River and Roosevelt Hot Springs geothermal areas are within the southern Intermountain Seismic Belt (ISB) (Smith and Sbar, 1974) which is an approximately 200 km wide zone of late Quaternary faulting and current seismicity that extends from Yellowstone National Park to southwestern Utah (Figure 1). Historical and current seismicity in the portion of the ISB in Utah have been reviewed recently in a volume published by the Seismograph Station at the University of Utah (Arabasz et al., 1979). Most of the data for the following summaries are from the Utah volume and the follow-up report by Richins et al. (1981).

Raft River Geothermal Area - The Raft River study area (approximately 42°N, 113.5°W) in southernmost Idaho is about 80 km west of the seismically active Hansel Valley and Pocatello Valley areas (Figure 2). The nearest large historical earthquake may have been a magnitude 5.4 (Modified Mercalli Intensity 6) event on November 18, 1937 (2350 GMT) at 42°6'N., 113°54'W, about

40 km WNW of Raft River (Arabasz et al., 1979). However, it should be noted that due to the poor instrumental coverage prior to 1962 the quoted location is estimated to have an accuracy of only ± 25 to ± 50 km. Another isolated $M_L > 4$ earthquake occurred about 50 km southwest of Raft River on March 29, 1970 (1240 GMT) with an epicenter at 41°39.7'N, 113°50.4'W and a magnitude of 4.7. Other than these two isolated events, all the significant seismicity occurs along a 120 km long NE-striking trend that starts from the Newfoundland Mountains at the northern end of the Great Salt Lake Desert, extends through the Hogup Mountains, along the Hansel Mountains north of the Great Salt Lake, and terminates in Pocatello Valley west of Malad City, Idaho (Figure 3). Three earthquakes with magnitude $M_L \geq 6.0$ have occurred along this trend since 1909 including two in Hansel Valley: an $M_L = 6$ earthquake on October 5, 1909, and an $M_L = 6.6$ earthquake on March 12, 1934, the largest recorded earthquake in Utah and the only one in the state with confirmed surface faulting. More recently on March 27, 1975, an $M_L = 6.0$ earthquake occurred near the Idaho-Utah border in Pocatello Valley. This earthquake trigged an intense swarm of aftershocks and related activity along the aforementioned NE-striking trend (Arabasz et al., 1981).

No historical earthquakes have been recorded within the Raft River geothermal area. Prior to installation of the local array, smaller earthquakes ($M_L < 3$) may have gone undetected. Since the installation of the three-station array (Appendix A), no microearthquakes have been detected within the Raft River area.

<u>Roosevelt Hot Springs Thermal Area</u> -The largest historical earthquakes in the vicinity of Roosevelt Hot Springs have occurred 50-70 km to the NE in the Sevier Valley between Richfield and Marysvale (Figure 2). One of the largest

historical earthquakes in Utah occurred near Richfield at 38.8°N, 112.1°W on November 13, 1901. Its magnitude of $M_L \geq 6.5$ makes it comparable to the 1934 Hansel Valley earthquake, although no surface faulting was reported. About 20 km south of Richfield, 6 earthquakes occurred in a short period near Elsinore with two of $M_L = 6.3$ on September 29 and October 1, 1921. In more recent years, moderate-sized earthquakes have occurred near Marysvale (October 4, 1967, 38.5°N, 112.2°W, $M_L = 5.2$) and Elsinore (January 3, 1972, 38.7°N, 112.2°W, $M_L = 4.4$).

There are two other nearby areas of intense microearthquake activity: the Cove Fort geothermal area about 35 km to the NE of Roosevelt Hot Springs which is characterized by swarm-like microearthquake activity (Olson and Smith, 1976); and a diffuse zone of activity in the Beaver Valley south of the Mineral Mountains (Figure 3). Prior to the installation of the local array, regional monitoring by the University of Utah indicated that the Roosevelt Hot Springs area had a relatively low level of seismicity. A microearthquake survey in the area by Olson and Smith (1976) located earthquake activity along the western flank of Milford Valley, presumably associated with a graben-bounding fault, and six earthquakes aligned along the west flank of the Mineral Mountains Range (Figure 4). No activity was detected within the geothermal area.

From the startup of the Roosevelt Hot Springs array (Appendix A) in September 1979 until the summer of 1981, seismicity in the immediate vicinity of Roosevelt Hot Springs continued at a low level and with an episodic nature. No earthquakes were detected within the production zone. During the period from startup to summer of 1980, several earthquakes were located on an east-west linear trend across the Mineral Mountains. Unfortunately, the events were outside the array, hence the locations were not well constrained in the direction of the apparent linearity of the epicenters. We will demonstrate later that this apparent trend is indeed real. The data necessary for this confirmation came from a major microearthquake swarm that occurred during the summer of 1981 (Figure 5). Although the most intense cluster of events was located beneath the Mineral Mountains Range just adjacent to the production zone, a small number of events were also located within the production zone for the first time. This swarm is described in greater detail in the next section.

4.0 THE MINERAL MOUNTAINS SWARM

During the period June through August 1981 a swarm of microearthquakes occurred in the Mineral Mountains east of the Roosevelt Hot Springs geothermal area northeast of Milford, Utah (Figures 4 and 5). From June 27 to August 28, approximately 1044 earthquakes were recorded with magnitudes of $M \leq 1.5$ (Figure 6). From these, 686 earthquakes were picked and located; small events with three or fewer readable arrivals were not located. The epicenters were located along a narrow linear band striking about S75°E, extending from the geothermal production zone eastward about 5 km into the Mineral Mountains (Figure 5). The linear trend of the epicenters parallels the nearly east-west Negro Mag Fault but is displaced about 2 km to the south. The majority of the hypocenters are located at depths of 4-5 km; therefore, it is possible that these earthquakes are occurring on a down-dip extension of the Negro Mag Fault. These findings could have important implications concerning the structure of the geothermal reservoir; therefore, we are attempting to extract as much information as possible from these earthquakes.

Hypocenter Locations - A major problem with the data set from these earthquakes is due to the unfortunate circumstance that many of the events are outside of the 6-station array centered on the production zone (Figure 5). This situation makes precise hypocenter location and source mechanism determination much more difficult. For example, the location program ouput indicates that the epicenters are least well-constrained in the azimuth along the observed linear trend of epicenters. Thus, a remote possibility exists that the linear trend is only an artifact of mislocating the earthquakes. Fortunately, some of the larger earthquakes were also recorded at distant regional stations, and some of the smaller events were located within the array which allowed much more accurate locations. A study of these events indicate that the observed linearity is indeed real. Relocations using the JHD (Joint-Hypocenter-Determinations) technique have also confirmed the linear trend of the swarm epicenters. The depths of the earthquakes are predominantly around 4-5 km (below a datum of 1.25 km above sea level), although shallower-depth events ($\leq$ 1.5 km) occur within the production zone.

Precise magnitude determinations are not possible due to the absence of Wood-Anderson records and the very small magnitudes of the majority of the events. However, rough magnitude classifications were made using a duration scheme. Using the best recorded earthquakes of various sizes, we measured both the maximum amplitude and coda duration on seismograms from low-noise stations CVE, MWA, and WLD. These measurements were plotted on a graph (Figure 7) and were somewhat arbitrarily divided into 4 different size classes. Earthquakes with amplitudes less than 500 units generally had durations between 7.5 to 15 seconds. For events with amplitudes between 500 and 1600 units, durations ranged between 15 and 25 seconds, and so on. With this empirical relationship between amplitude and duration, we were able to assign equivalent duration magnitudes to each earthquake (maximum amplitudes were measured for each earthquake during the "picking" procedure). The duration magnitude scale is the one determined for Utah earthquakes by Griscom and Arabasz (1979).

The new map of the epicenters (Plate I) includes these magnitude estimates. The four largest events occurred within the peak of the swarm on July 23, 25, and 27 and are about M_L = 1.5-2.0. With this additional information some new trends are observable. The predominant trend is still the roughly E-W alignment of the smallest events (events having a magnitude less than zero are indicated by Xs in Plate I). However, the larger events (with magnitudes greater than zero and indicated by circles in Plate I) appear to occur on N-S epicenter trends. Also, the four largest events have a more N-S trend than the E-W trend shown by the smallest events.

In cross section, a few more trends become clear. Perpendicular to the trend of the smallest earthquakes (A-A', Plate II), the hypocenters occur in a cluster at a depth of about 5 km. The shallow events within the production zone appear to lie on an E-W linear trend near the production well Roosevelt KGRA 13-10. The events within the production zone are clearly separated from the deeper earthquakes. In a cross section parallel to the major trend of the seismicity (B-B', Plate III), a few other observations are possible. The largest events occur in the easternmost end of the trend at relatively shallow depths (2-3 km). The smallest earthquakes have hypocenters that deepen somewhat to the west and end beneath the production zone at a depth of about 5.5 km. Again the activity within the production zone is very shallow and clearly separated from the main swarm. The production zone activity is also quite restricted in time, almost all of it occurring early in the swarm sequence on two separate days: July 10 and July 15 (see Appendix E).

Focal Mechanisms - Knowledge of the source mechanisms of some of these earthquakes would help greatly in the tectonic interpretation of the swarm. The four largest earthquakes were recorded at enough regional stations to determine a composite focal mechanism (Figure 8). One nodal plane is well-constrained (N8°W, dip = 20°E); the orthogonal plane is not as well constrained although it has a NW strike and a relatively steep dip (70° - 82°). There is the usual ambiguity in choosing the fault plane from the two nodal planes. Nevertheless, the focal mechanism does indicate nearly pure normal faulting with a tension axis striking E-NE.

Source mechanism studies of the smaller earthquakes are hindered by the small number of stations (≤ 6) which recorded their signals and by the fact that most of them were outside the local array. We were able to obtain a focal mechanism of a small earthquake within the production zone by matching observed SV/P amplitude ratios with theoretical ratios using the method of Kisslinger et al. (1981). The result is shown in Figure 9 which shows normal faulting with a component of right-lateral strike-slip motion. It exhibits a roughly E-W tension axis, similar to the composite focal mechanism of the largest events. Attempts to use this method for other small earthquakes produced results which we considered unreliable.

Geological Interpretation - The Roosevelt Hot Springs thermal area is a hot water-dominated system in fractured bedrock on the western margin of the Mineral Mountains Range which is composed mainly of a Tertiary intrusive complex (Figure 4). The crest and western flank of the range have an irregular cover of rhyolitic tuffs, flows, and domes (see Figure 5) produced during a period of rhyolitic volcanism which occurred between 0.8 and 0.5 m.y.

ago. The proposed production zone is located beneath a relatively thin veneer of alluvium that covers the western flank of the range. A concise summary of the geology, geochemistry, and geophysics of the Roosevelt Hot Springs thermal area is available in Ward et al. (1978).

The occurrence and nature of the Mineral Mountains swarm may be relevant to studies of the structure of the geothermal reservoir. The reservoir system is controlled by faults and fractures cutting crystalline rocks. There are three major fault systems in the Mineral Mountains Range. The Basin and Range structure trends locally in a north-northeast direction and one system of faults follow this trend. The Opal Mound Fault forms the western boundary of a small graben striking north-northeast and appears to form the western boundary of the geothermal field (Yusas, 1979). A series of east-west high-angle faults cuts across the northern part of the range. One such fault is the Negro Mag Fault that cuts through the center of the geothermal field at Negro Mag Wash (Nielson et al., 1978). A set of northwest-trending low-angle faults and associated high-angle faulting and fracturing, mapped in the western flanks of the Mineral Mountains (Nielson et al., 1978), comprises the third major fault system.

The hypocenters and focal mechanisms of the swarm earthquakes appear to have a close association to these major fault structures. First, the hypocenters are bounded on the west, north, and east by the Opal Mound Fault, the Negro Mag Fault, and the NW-trending high-angle faults, respectively (see Plates I, II, and III). In fact, the focal mechanism of the production zone earthquake (Figure 9) has a nodal plane (N30°E, dip = 68°E) which would be consistent with normal faulting on the Opal Mound Fault. The composite focal mechanism of the four largest events (Figure 8) has a nodal plane (NW strike, high-angle dip to the west) which would be consistent with normal faulting on one of the NW-trending faults mapped by Nielson et al. (1978). The alignment of three of the four "large" earthquakes (Plate I) is also consistent with the choice of the NW nodal plane as the fault plane. The significance of the main cluster of earthquakes is still ambiguous because we were not able to determine a reliable focal mechanism for these events. There are at least two possible hypotheses. It is apparent from Plate II that the main cluster may be associated with the down-dip extension of the Negro Mag Fault; however, this idea is not consistent with either the faulting mechanism of the larger earthquakes (Figure 8) or the east-west orientation of the present stress field which would favor faulting on N-S-trending structures. The other possibility is that the cluster is associated with earthquakes on the down-dip extension of a listric normal fault similar to those which outcrop within the Mineral Mountains as the northwest-trending high-angle fault mapped by Nielson et al. (1978). In our extrapolation, this westward-dipping, high-angle fault has increasingly shallower dip with depth until it becomes subhorizontal at a depth of about 5 km. Then the clustering of events near 5 km depth is consistent with high-angle normal faulting further east at shallower depths (see Plate III). Obviously, this idea is very speculative without focal mechanism information from the main cluster. However, it is consistent with listric normal faulting at shallower depths as proposed by Nielson et al. (1978), and with the mechanics of low-angle faulting as first proposed by Nielson et al. (1978) and subsequently discussed by Bruhn et al. (1982). The paper by Nielson et al. (1978) suggested that low-angle denudation faults dipping between 5° and 35° to the west form an important component of the Roosevelt Hot Springs reservoir structure. Calculations on the mechanics of such faulting (Bruhn et al., 1982) indicate that the average coefficient of sliding friction along such faults ranged between 0.15 and 0.4, and that the maximum depth for the formation of denudation faults is about 5 km. High crustal temperatures (Ward et al., 1978) and low values for the coefficient of friction on low-angle faults may allow relatively aseismic displacement on the fault surface except where asperities produce localized zones of high stress concentrations. The sporadic and clustered nature of the swarm may be due to this style of deformation.

5.0 CONCLUSIONS

The major conclusions from the work performed during the course of this contract are:

1) The Raft River geothermal area, Idaho is currently seismically quiet down to the microearthquake level (about local magnitude one). Smaller microearthquakes could be occurring undetected. Also, because of its proximity to an active seismic belt, future earthquake activity cannot be ruled out.

2) The Roosevelt Hot Springs thermal area, Utah is situated in an area characterized by few earthquakes of magnitude greater than about 2 (based on historical seismicity data). However, microearthquake ($M_L \leq 2$) swarms appear to be relatively common within the adjacent Mineral Mountains.

3) A major microearthquake swarm occurred adjacent to the Roosevelt Hot Springs geothermal area during the summer of 1981. Approximately 1044 microearthquakes ($M_L \leq 1.5$) were detected and a large subset of these was located and analyzed (see Section 4).

4) The Mineral Mountains microearthquake swarm appears to be a natural release of tectonic stress in this region and is not closely related to pumping activities in the geothermal field. However, a small subset of the earthquakes were located at shallow depths within the production zone

and may have been induced.

5) The occurrence of natural earthquake swarms near the Roosevelt Hot Springs geothermal area indicates a potential for induced seismicity after major pumping operations are initiated.

6) Due to the small magnitudes of the earthquakes in the swarm, the activity is relieving only a miniscule amount of the tectonic stress that may be accumulating in the region. Therefore, the occurrence of the swarm is not a safety valve and the potential for large earthquakes in the area still exists.

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FIGURE CAPTIONS

Fig. 1.--Index map of Intermountain seismic belt. Epicenters of historical mainshocks ($M \geq 6.0$) shown as large circles, NOAA epicenters through 1974 as dots (from Arabasz and Smith, 1981). Raft River and Roosevelt Hot Springs geothermal areas shown by squares.

Fig. 2.--Epicenter map of the largest historical earthquakes in the Utah region, 1850-1978. For coincident epicenters, only the largest event is shown. Earthquakes of magnitude 5-1/2 or greater are dated by year (from Arabasz et al., 1979). Locations of Raft River and Roosevelt Hot Springs geothermal areas indicated by squares.

Fig. 3.--Utah earthquakes for the period July through December, 1980 (from Richins et al., 1981). Locations of Raft River and Roosevelt Hot Springs geothermal areas indicated by squares.

Fig. 4.--Microearthquakes located in the Roosevelt Hot Springs area during 20-30 day surveys in 1974 and 1975 (from Olson and Smith, 1976).

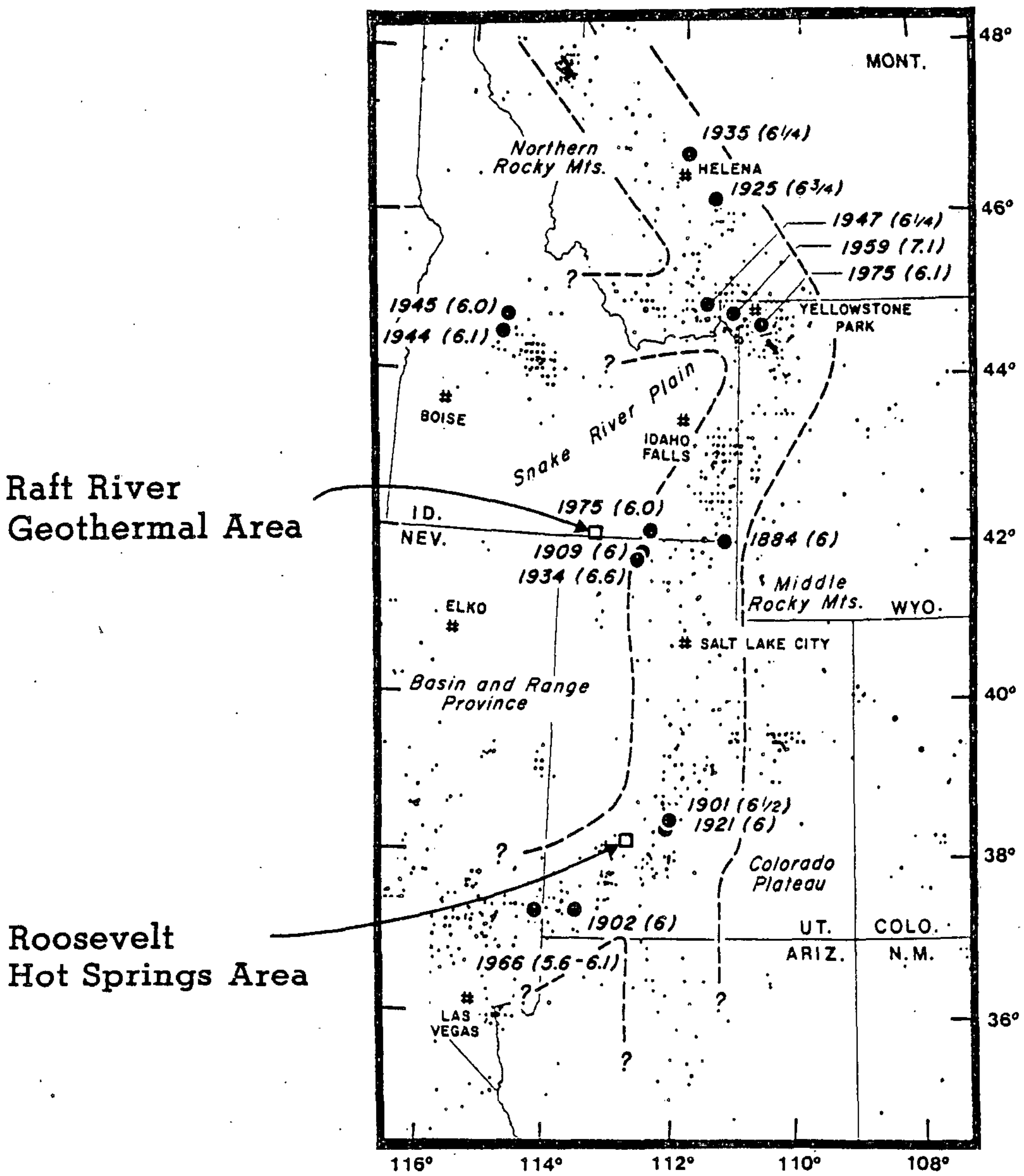
Fig. 5.--Locations of 6 close-in seismograph stations of the Roosevelt Hot Springs seismic array. The general geology of the area and the approximate location of the Mineral Mountains swarm are also shown. Base map from Ward et al., 1978.

Fig. 6.--Histogram for the occurrence of earthquakes during the Mineral Mountains swarm.

Fig. 7.--Amplitude versus duration relationship for some of the best recorded earthquakes in the Mineral Mountains swarm. Only data from low-noise stations CVE, MWA, and WLD were used. An arbitrary but consistent amplitude scale was used because magnitudes were determined from durations (in seconds). The lined areas indicate a somewhat arbitrary division into four earthquake sizes that were used in the magnitude determination.

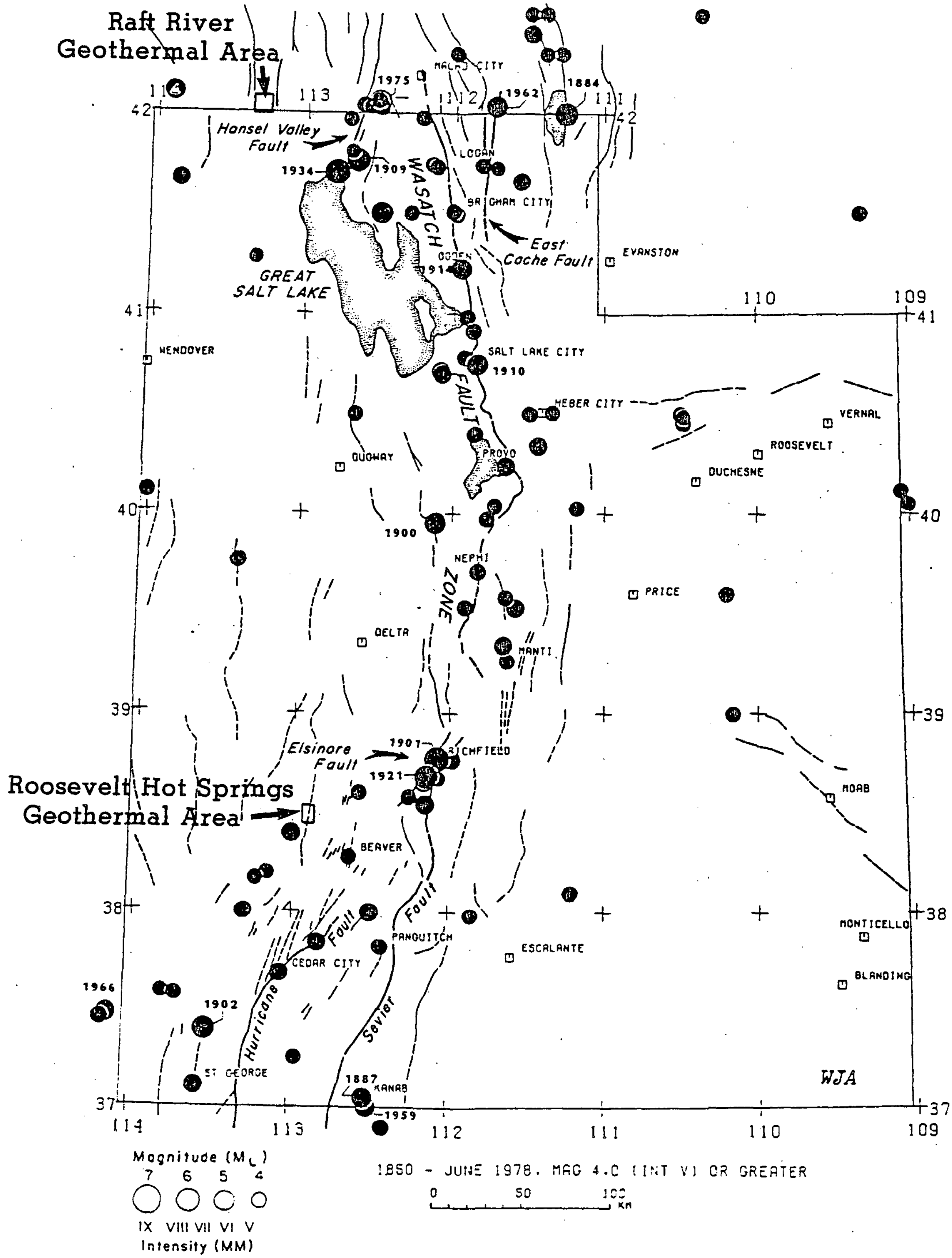
Fig. 8.--A composite focal mechanism for the four largest earthquakes in the Mineral Mountains swarm. A lower hemisphere projection was used and D = dilatation and C = compression. Dashed curves indicate the range of uncertainty for the NW-striking nodal plane.

Fig. 9.--A focal mechanism solution for a small production zone earthquake. Due to sparcity of data, the solution was obtained by inversion of SV/P amplitude ratios. The numbers above the polarity indicators are the predicted values of log (SV/P) for the solution shown, and the numbers below are the observed values corrected for the free-surface effect.



Raft River Geothermal Area
Roosevelt Hot Springs Area
MONT.
Northern Rocky Mts.
HELENA
1935 (6¼)
1925 (6¾)
1947 (6¼)
1959 (7.1)
1975 (6.1)
YELLOWSTONE PARK
1945 (6.0)
1944 (6.1)
BOISE
Snake River Plain
IDAHO FALLS
1975 (6.0)
ID.
NEV.
1909 (6)
1934 (6.6)
1884 (6)
Middle Rocky Mts.
WYO.
ELKO
SALT LAKE CITY
Basin and Range Province
1901 (6½)
1921 (6)
Colorado Plateau
1902 (6)
UT.
COLO.
ARIZ.
N.M.
1966 (5.6-6.1)
LAS VEGAS
48°
46°
44°
42°
40°
38°
36°
116°
114°
112°
110°
108°

Figure - 1



Raft River
Geothermal Area
Honsel Valley
Fault
1975
1962
1884
1934
1909
WASATCH
LOGAN
BRIGHAM CITY
East
Cache Fault
EVANSTON
GREAT
SALT LAKE
SALT LAKE CITY
1910
FAULT
HEBER CITY
VERNAL
ROOSEVELT
DUCHESNE
WENDOVER
PROVO
1900
NEPHI
ZONE
PRICE
DELTA
MANTI
Elsinore
Fault
1901
RICHFIELD
1921
Roosevelt Hot Springs
Geothermal Area
BEAVER
MOAB
Fault
Fault
PANGUITCH
ESCALANTE
MONTICELLO
BLANDING
CEDAR CITY
1966
1902
Hurricane
Sevier
ST GEORGE
1887
KANAB
1959
WJA
114
113
112
111
110
109
42
41
40
39
38
37
Magnitude (M_L)
7 6 5 4
IX VIII VII VI V
Intensity (MM)
1850 - JUNE 1978, MAG 4.0 (INT V) OR GREATER
0 50 100 KM

Figure - 2

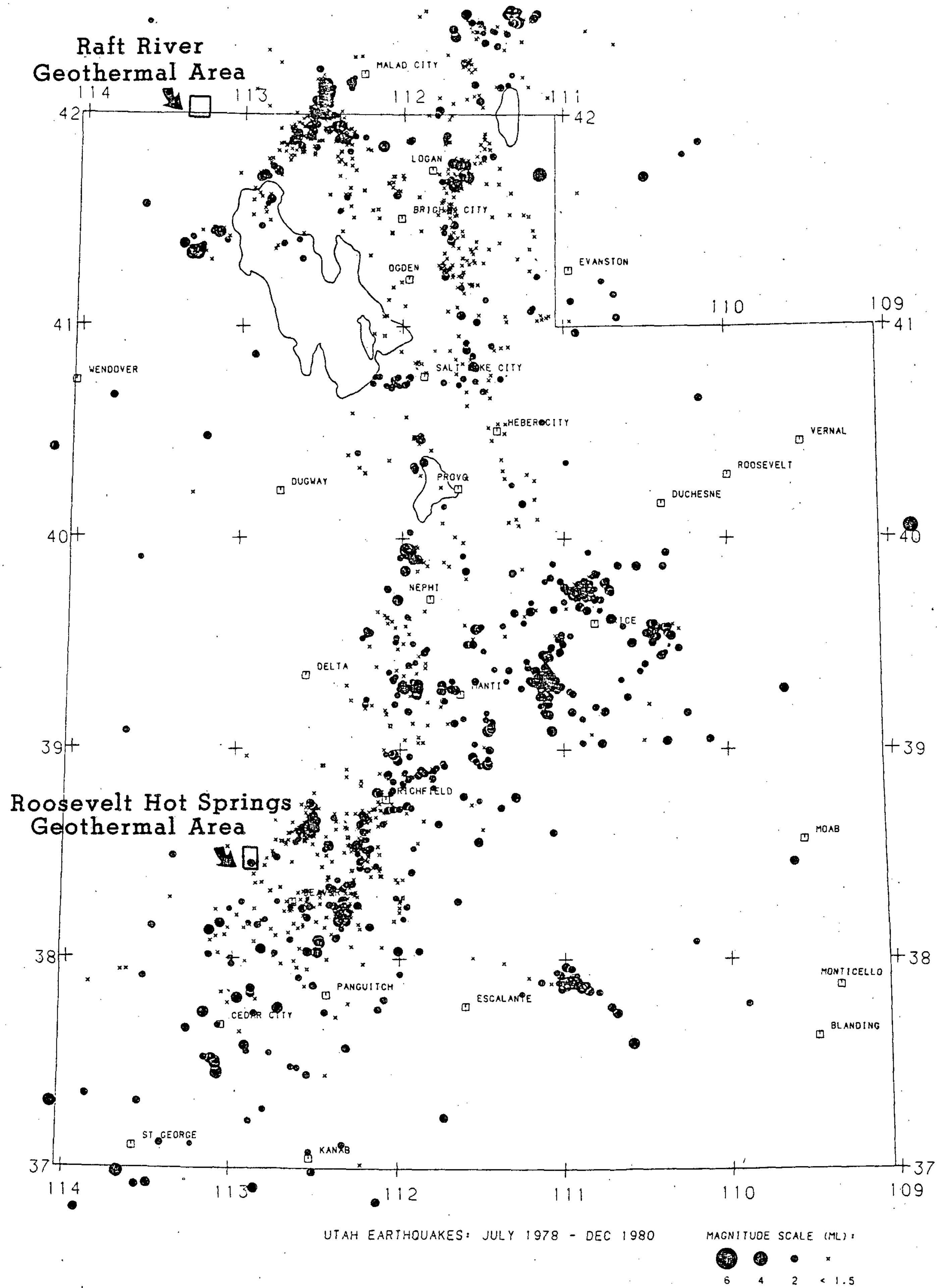

Raft River
Geothermal Area
Roosevelt Hot Springs
Geothermal Area
MALAD CITY
LOGAN
BRIGHAM CITY
OGDEN
EVANSTON
WENDOVER
SALT LAKE CITY
HEBER CITY
VERNAL
ROOSEVELT
DUCHESNE
DUGWAY
PROVO
NEPHI
DELTA
MANTI
RICHFIELD
MOAB
BEAVER
MONTICELLO
PANGUITCH
ESCALANTE
CEDAR CITY
BLANDING
ST GEORGE
KANAB
114
113
112
111
110
109
42
41
40
39
38
37
UTAH EARTHQUAKES: JULY 1978 - DEC 1980
MAGNITUDE SCALE (ML):
6
4
2
< 1.5
0
50
100
KM

Figure - 3

EPICENTER MAP AND GENERAL GEOLOGY OF THE ROOSEVELT HOT SPRINGS AREA

GEOLOGY FROM HINTZE (1963) AND PETERSEN (1975)

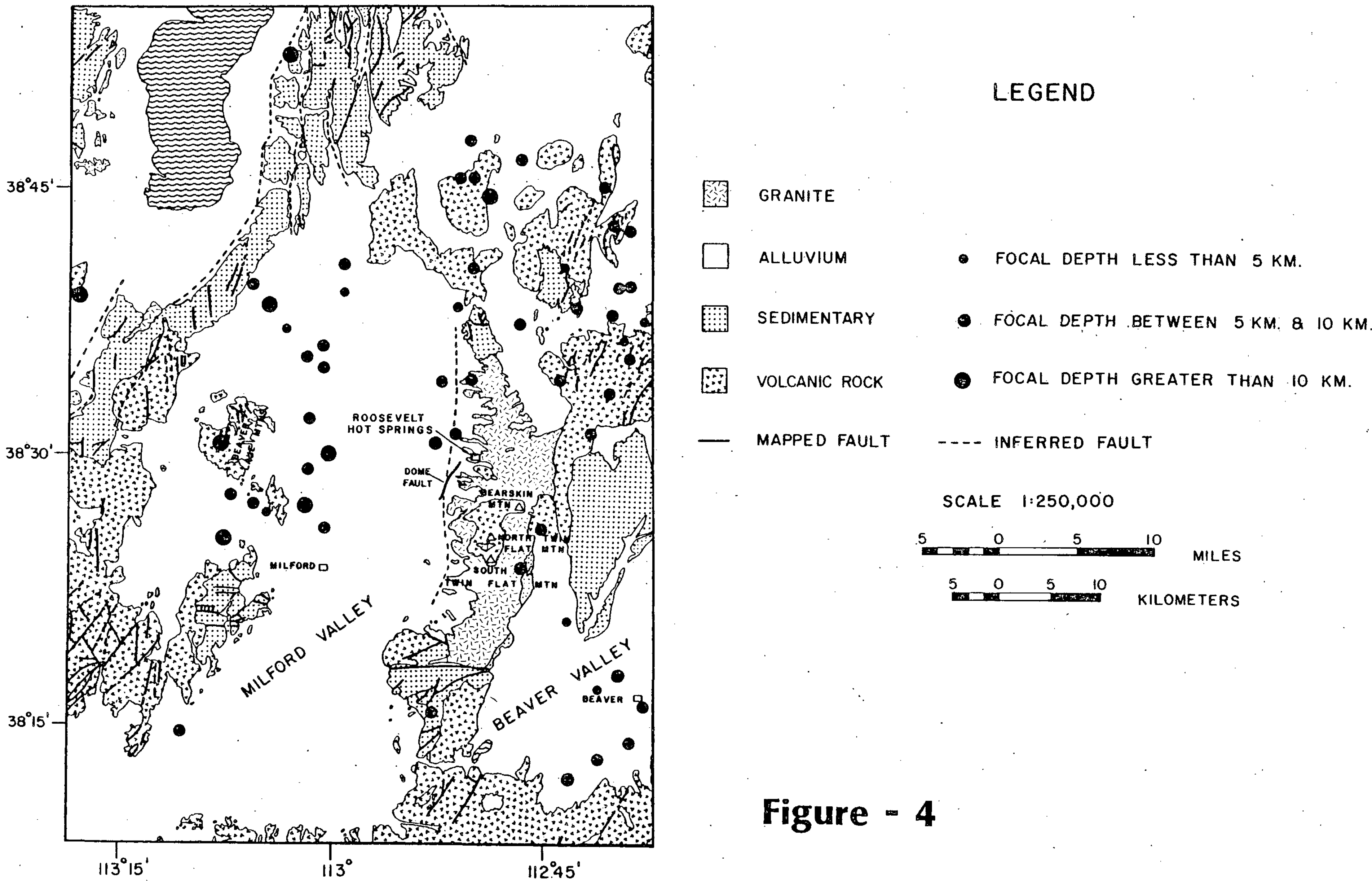


Figure - 4

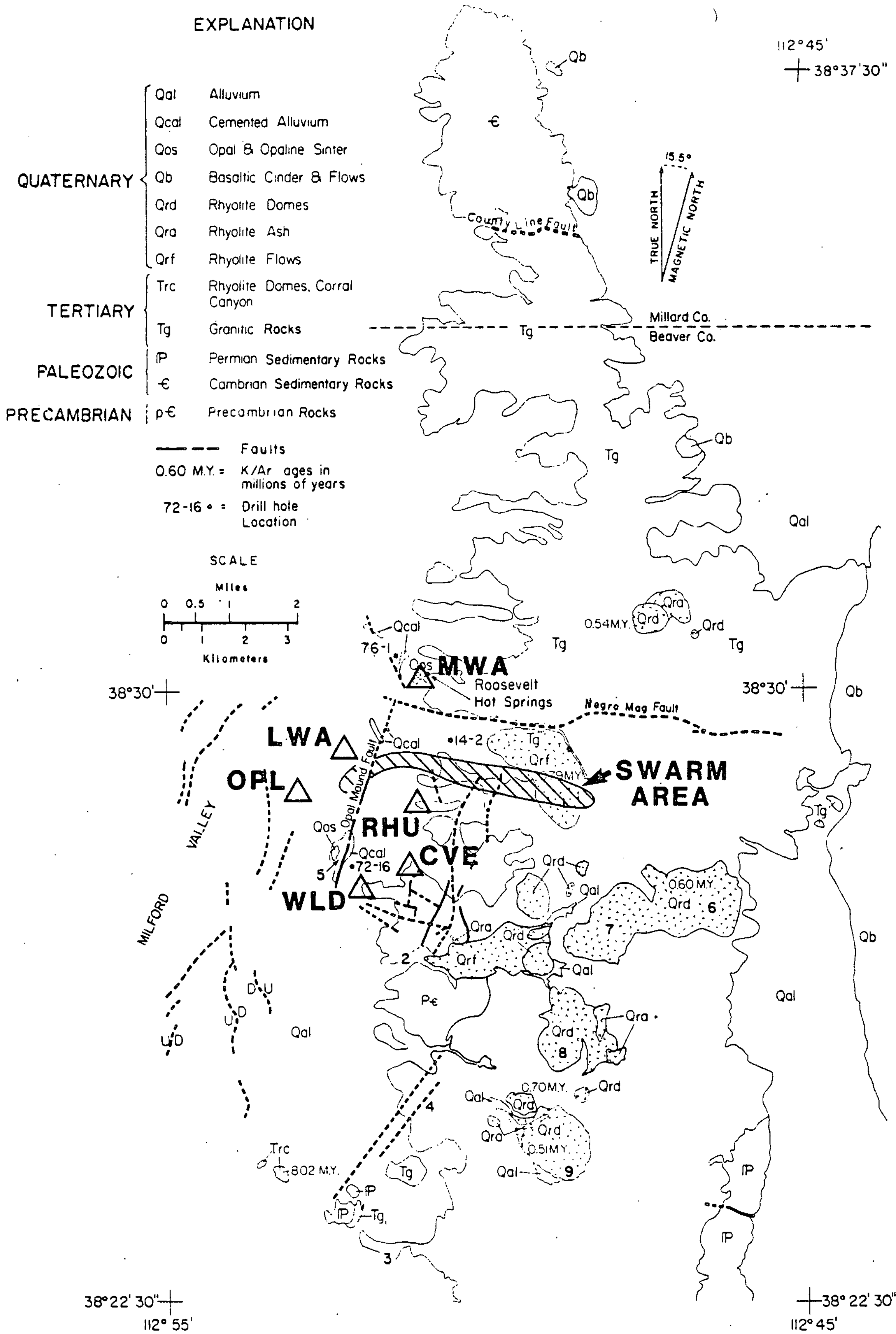

EXPLANATION
QUATERNARY
Qal Alluvium
Qcal Cemented Alluvium
Qos Opal & Opaline Sinter
Qb Basaltic Cinder & Flows
Qrd Rhyolite Domes
Qra Rhyolite Ash
Qrf Rhyolite Flows
TERTIARY
Trc Rhyolite Domes, Corral Canyon
Tg Granitic Rocks
PALEOZOIC
IP Permian Sedimentary Rocks
-€ Cambrian Sedimentary Rocks
PRECAMBRIAN
p€ Precambrian Rocks
Faults
0.60 M.Y. = K/Ar ages in millions of years
72-16 • = Drill hole Location
SCALE
Miles
0 0.5 1 2
0 1 2 3
Kilometers
112°45'
38°37'30"
15.5°
TRUE NORTH
MAGNETIC NORTH
County Line Fault
Millard Co.
Beaver Co.
MWA
Roosevelt Hot Springs
Negro Mag Fault
LWA
OPL
RHU
CVE
WLD
SWARM AREA
Opal Mound Fault
MILFORD VALLEY
0.54 M.Y.
0.60 M.Y.
0.70 M.Y.
0.51 M.Y.
8.02 M.Y.
76-1
14-2
72-16
38°30'
38°30'
38°22'30"
112°55'
38°22'30"
112°45'

Figure - 5

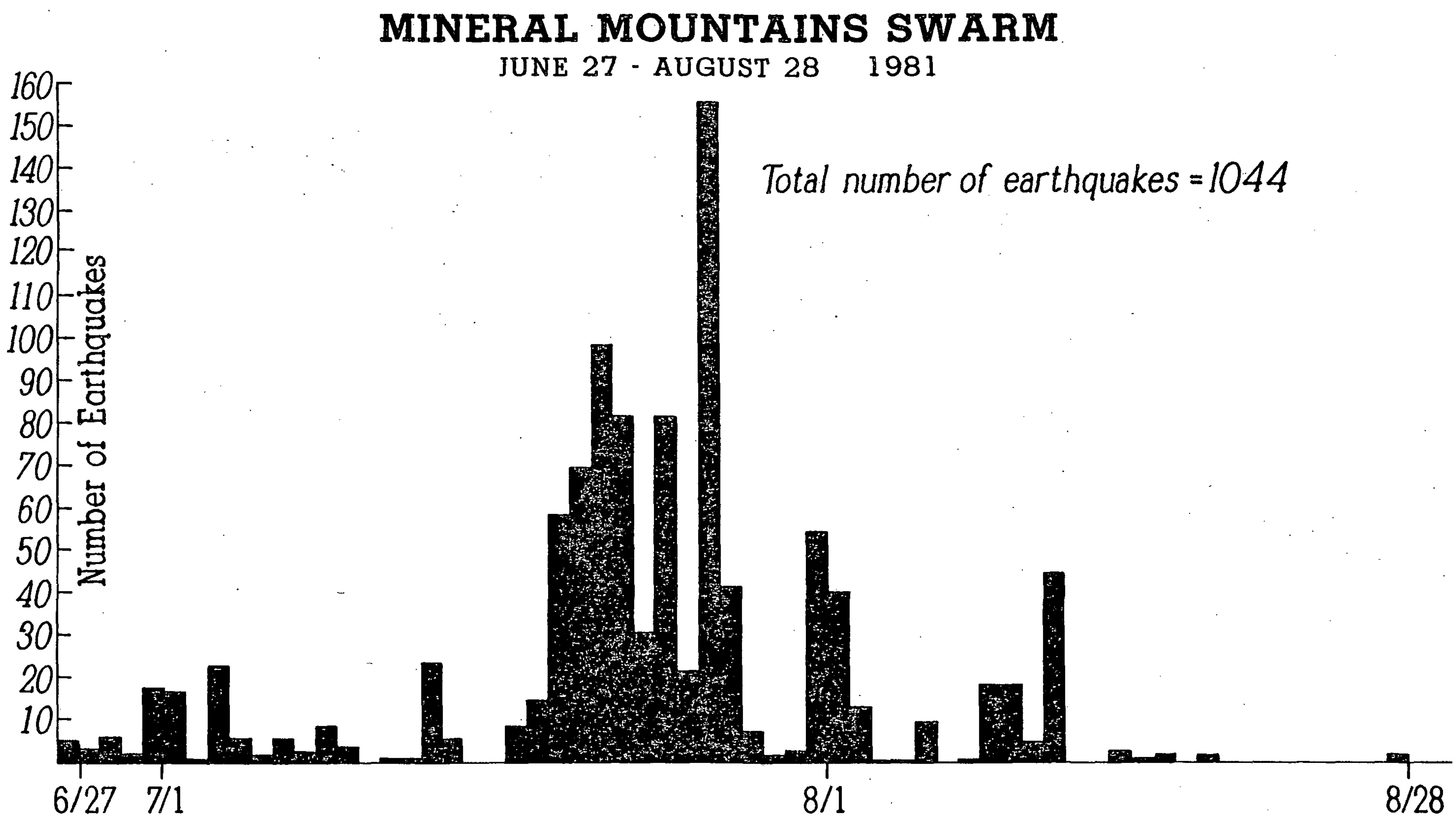
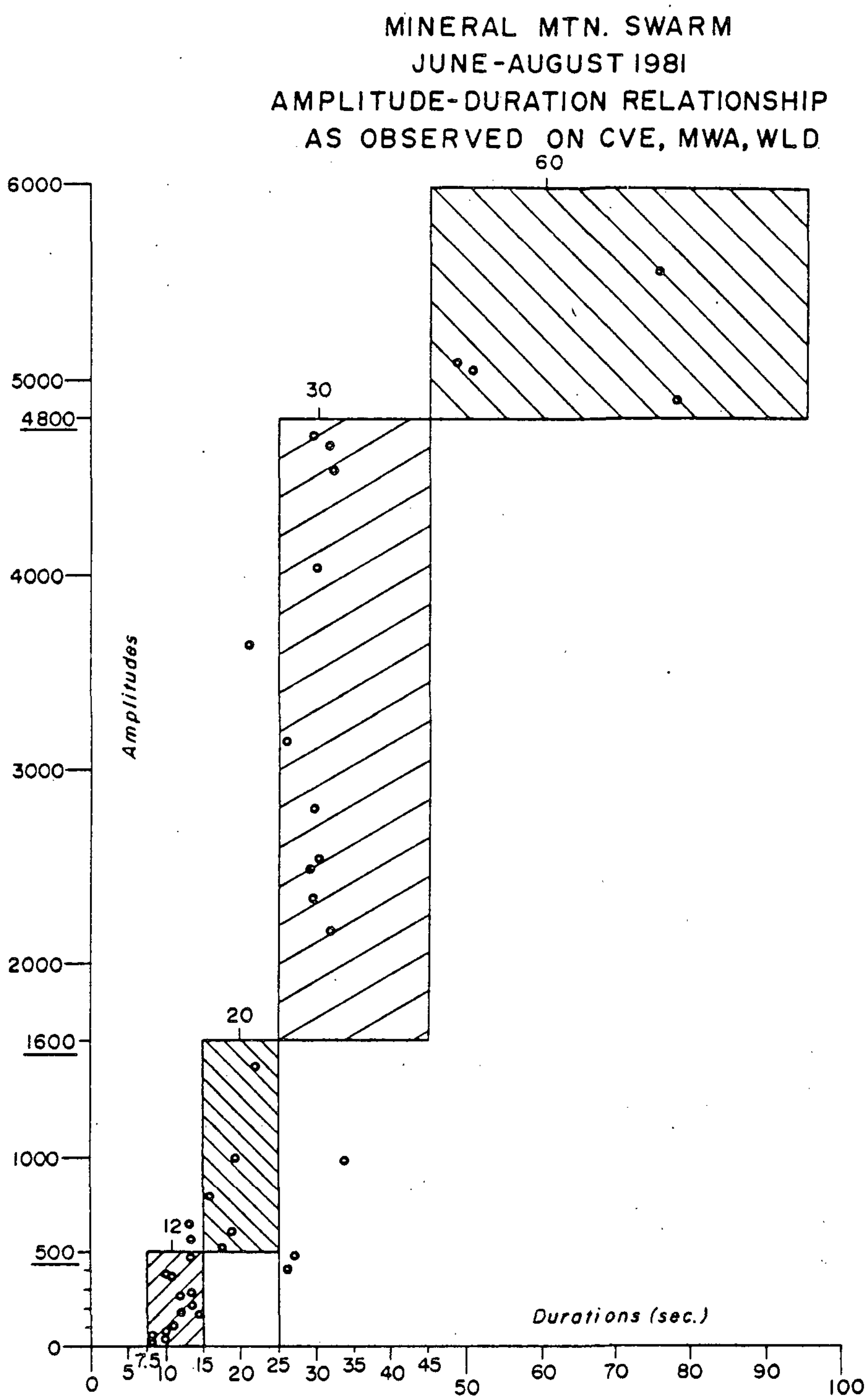
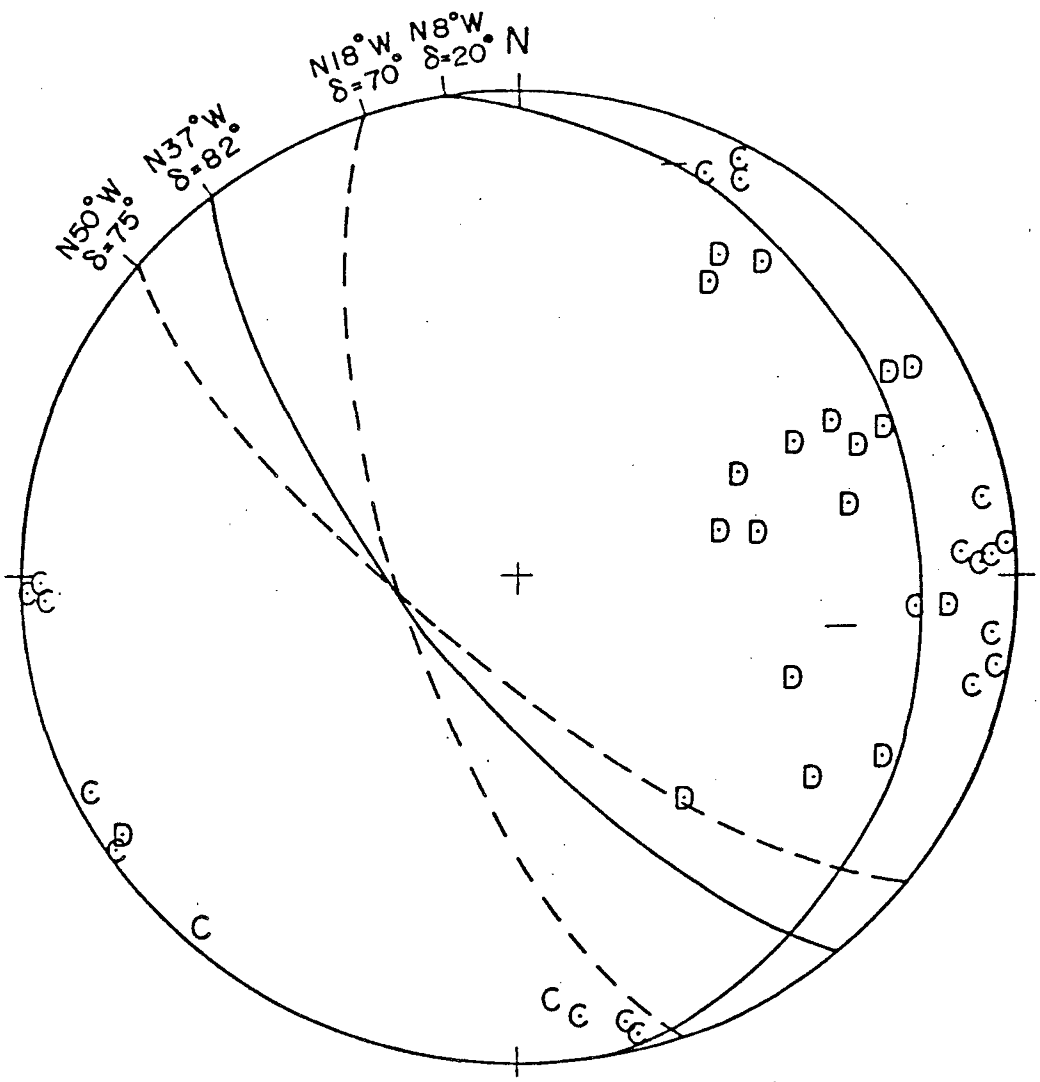

MINERAL MOUNTAINS SWARM
JUNE 27 - AUGUST 28 1981
Total number of earthquakes = 1044
Number of Earthquakes
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
6/27
7/1
8/1
8/28

Figure - 6



MINERAL MTN. SWARM
JUNE-AUGUST 1981
AMPLITUDE-DURATION RELATIONSHIP
AS OBSERVED ON CVE, MWA, WLD
Amplitudes
Durations (sec.)
6000
5000
4800
4000
3000
2000
1600
1000
500
0
60
30
20
12
0 5 7.5 10 15 20 25 30 35 40 45 50 60 70 80 90 100

Figure - 7



COMPOSITE FOCAL MECHANISM OF
FOUR LARGEST EARTHQUAKES

Figure - 8

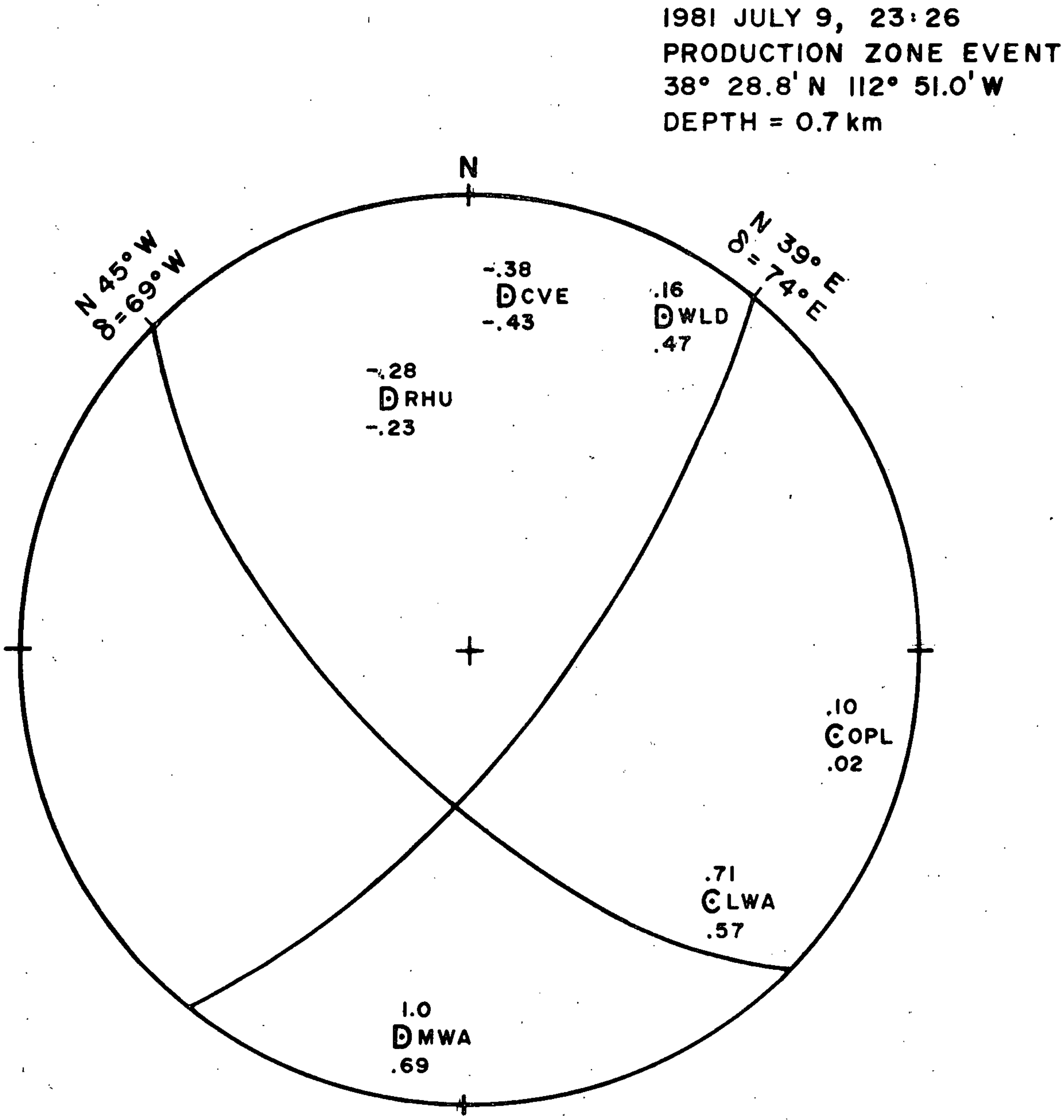

1981 JULY 9, 23:26
PRODUCTION ZONE EVENT
38° 28.8' N 112° 51.0' W
DEPTH = 0.7 km
N
N 45° W
δ=69° W
N 39° E
δ = 74° E
-.38
D CVE
-.43
.16
D WLD
.47
-.28
D RHU
-.23
.10
C OPL
.02
.71
C LWA
.57
1.0
D MWA
.69

Figure - 9

Appendix A. Array Implementation (by Schuyler C. Schaff)

Roosevelt Hot Springs Array

Work on the Roosevelt Hot Springs induced seismicity project and planning for the Raft River project both began in January 1979 (see Table 1). Equipment for Roosevelt Hot Springs had been ordered prior to January 1979; design, fabrication, and implementation began in January and February 1979, as the equipment arrived. A site survey was conducted with portable seismographs in late January and early February 1979, and the site permitting process was started.

Late arrival of some equipment delayed functional tests of the recording and playback system until June. Work on the field installations at Roosevelt Hot Springs began in June 1979, following receipt of site permits from BLM. The requisite equipment to complete the recording facility was ordered in June and installed in September, and data recording began on a production basis in September 1979.

Seismic data are transmitted and recorded by standard telemetry techniques; Figure A-1 shows a schematic diagram of the system. Field equipment at Roosevelt Hot Springs consists mainly of Geotech S-13 seismometers, Develco VCO-amplifiers and Monitron radios; a few Emheiser-Rand VCOs and radios are also in use as well as three L-4 seismometers.

Figure A-2a shows the Roosevelt array's telemetry configuration in April 1980. The received signals at Delta, Utah, were placed on telephone lines for transmission to Salt Lake City. Transmission noise was entering the system in the BAP-Delta radio link. To eliminate this noise, the telemetry configuration was changed to that shown in Fig. A-2b. This resulted in an immediate improvement in data quality, as shown in Figures A-3a and b. Mixed seismic signals and time are recorded on a Bell and Howell VR-3700 B tape recorder. An identical tape recorder plays back through Develco discriminators onto an 8-channel Gould Brush chart recorder.

Data quality from the Roosevelt array has been good to excellent since the change in telemetry. Stations of the Roosevelt array were calibrated during the summer and fall of 1981. The calibration procedure is described in Appendix B.

Raft River Array

Work on the Raft River area before September 1979 consisted of a few planning sessions and trips to the Raft River site to evaluate equipment and sites, and to make plans to re-establish a seismograph array there. EG&G Idaho, Inc. operated a three-station array at Raft River for about two years ending in January 1978. The records are sufficient only to support a qualitative estimate of activity; no earthquakes were recorded within the array during its operation. Due to the low gain, only the larger regionals and teleseisms were recorded.

Ordering of new equipment and radio frequency permitting for Raft River began in September 1979. Site studies with portable seismographs were conducted in October and November, and the site-permitting process was started. Construction and instrumentation of the field sites began in March 1980, following receipt of site permits from BLM. Frequency permits were received in mid-April, which allowed crystals for the radios to be ordered. After receiving the radios on 9 May 1980, recording of the telemetered data began on 12 May 1980. Field equipment at Raft River consists of Geotech S-500 seismometers, Sprengnether VCO-amplifiers, and Monitron radios.

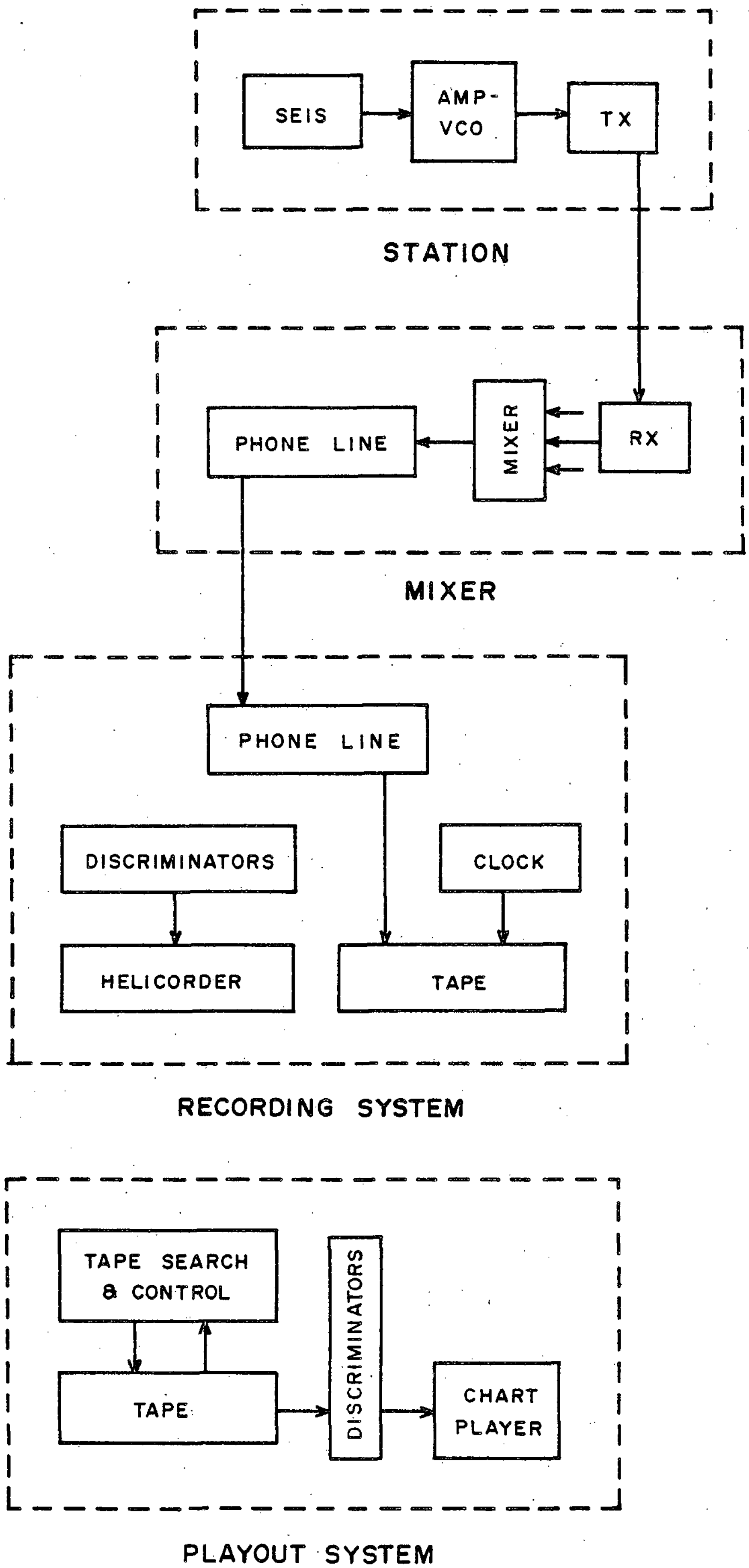
The three stations in the Raft River Valley transmit their FM-encoded signals to a relay in the Black Pine Mountains south of the valley. There the signals are mixed and transmitted to another relay, near the south end of the Great Salt Lake. The signals are relayed from there across the Salt Lake Valley to the Earth Science Laboratory recording facility where they are recorded on magnetic tapes. Mixed seismic signals and time are recorded on a Bell and Howell VR-3700 B tape recorder. An identical tape recorder plays back through Develco discriminators onto an 8-channel Gould Brush chart recorder.

There were some initial problems with some of the older equipment, but since June 1980 data quality from the Raft River array has been good to excellent. Figure A-4 shows Raft River geothermal wells and the seismograph array.

TABLE 1

RAFT RIVER		ROOSEVELT HOT SPRINGS
	S	Begin Ordering and Planning
	O	
	N	
	D	
	1979	
	J	Begin Design and Fabrication
	F	Site Survey
	M	
	A	
	M	
	J	Last of Equipment Arrives Begin Field Installations
	J	Begin Telemetry
	A	
Order Equipment Begin Frequency Permitting	S	Fully Operational
Site Surveys	O	
	N	
	D	
	1980	
	J	
	F	
Prepare Sites	M	
Deploy Portables	A	
Remove Portables Begin Telemetry	M	Change to Telephone Lines
	J	
	J	
	A	Site Survey
Calibration	S	Calibration
	O	
	N	
	D	
	1981	

Fig. A-1 DATA ACQUISITION SYSTEM



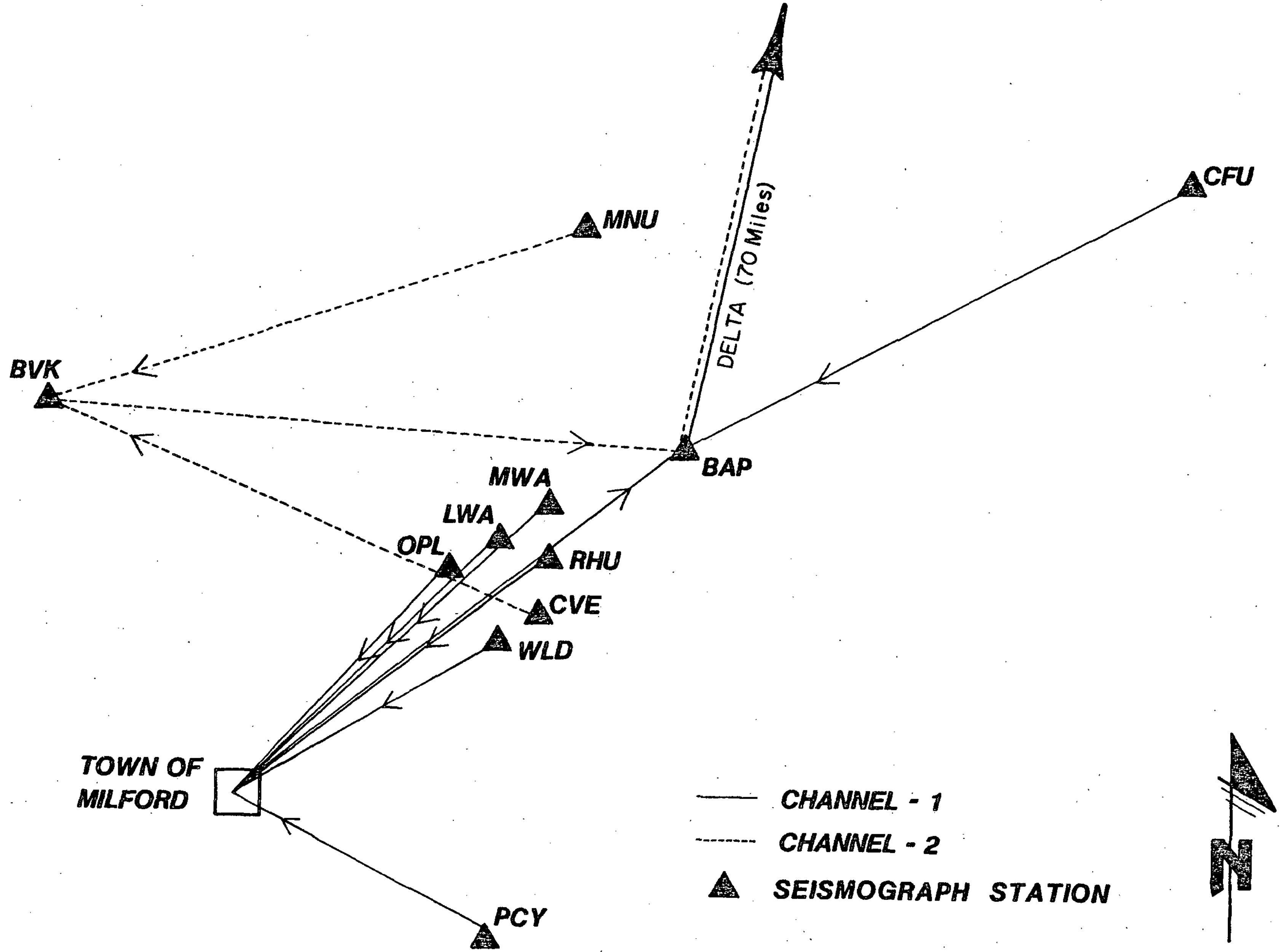


Fig. A-2a

ROOSEVELT TELEMETRY CONFIGURATION APRIL 1980

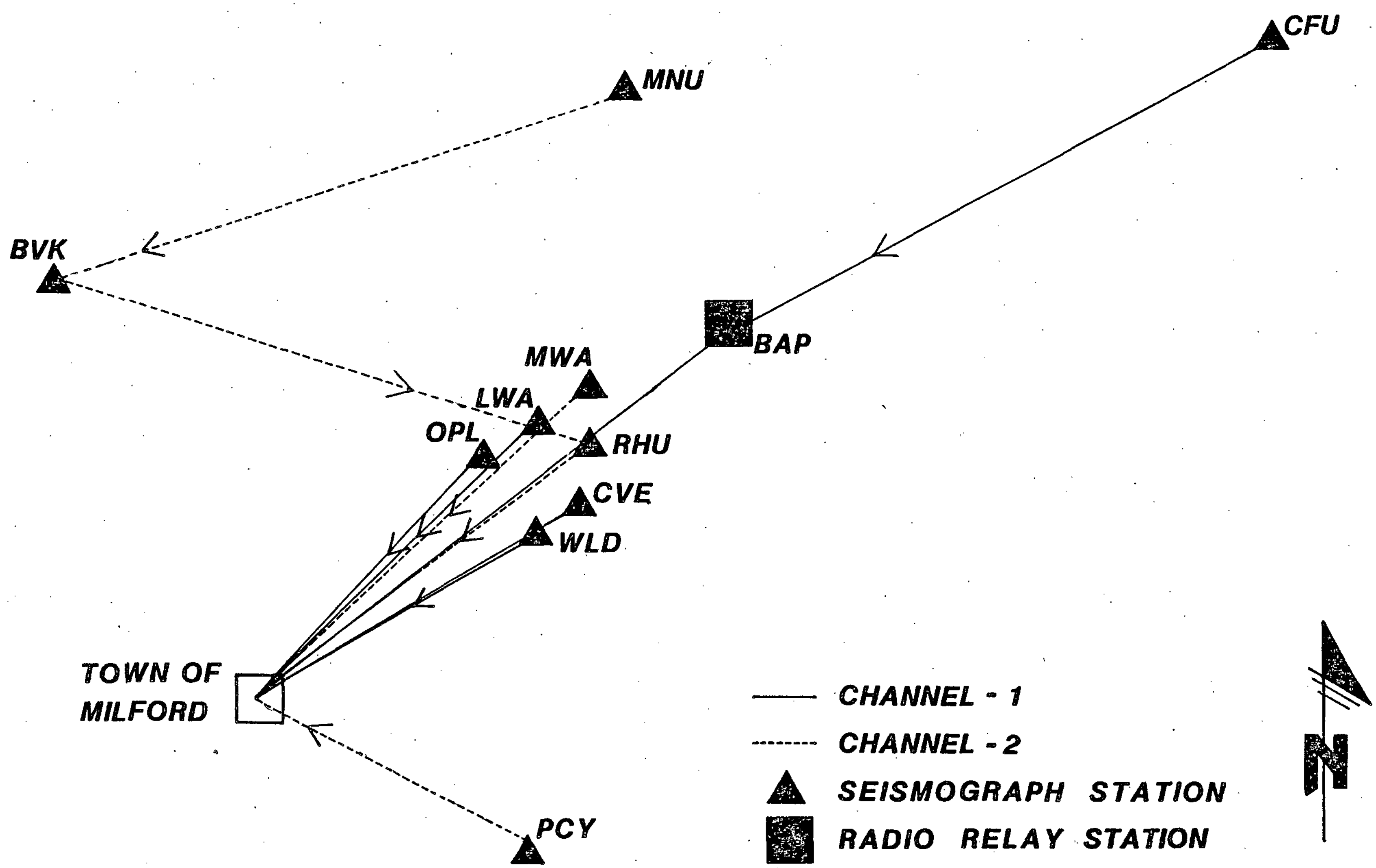


Fig. A-2b

NEW TELEMETRY CONFIGURATION AT ROOSEVELT

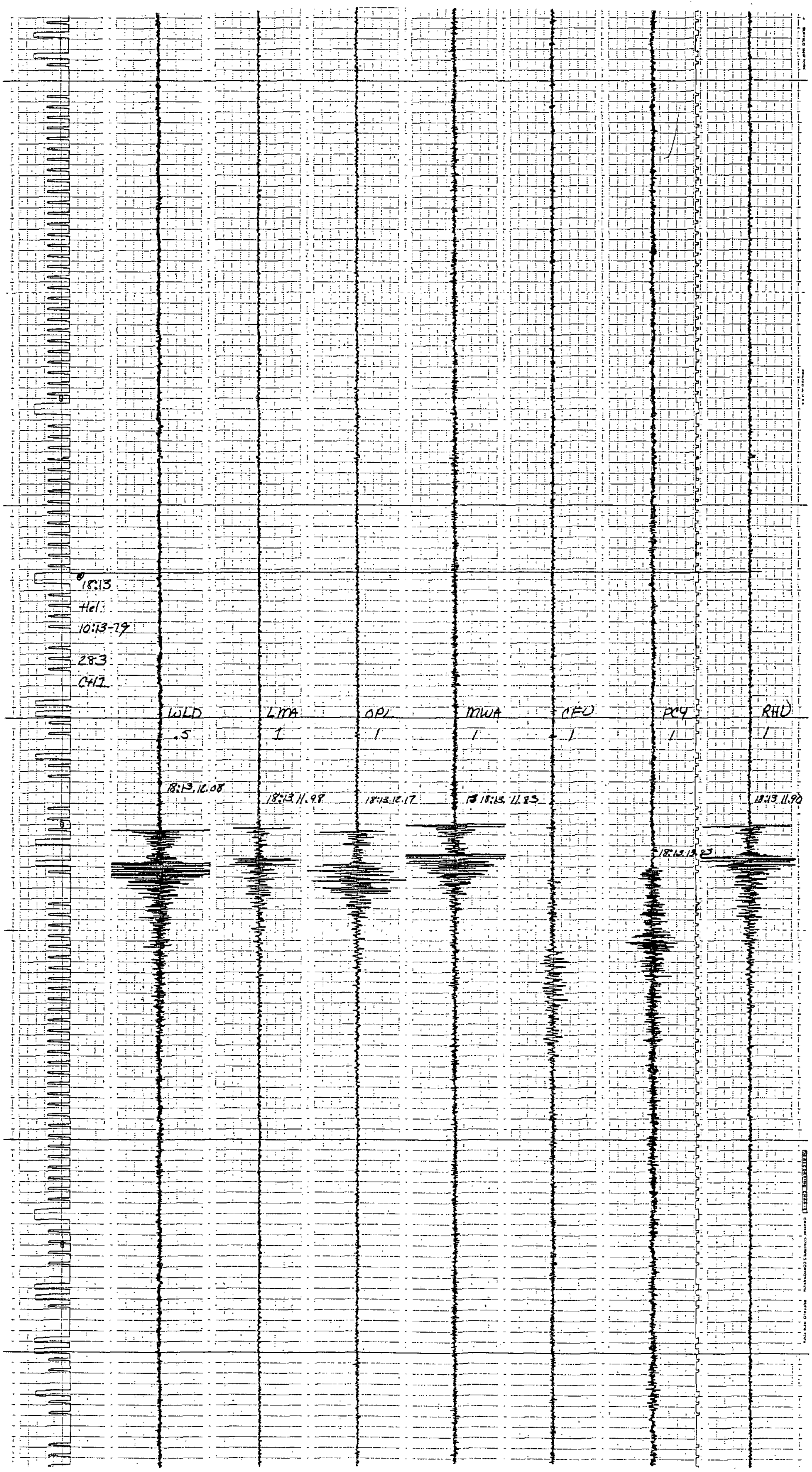


Fig. A-3a TYPICAL SEISMOGRAM OLD TELEMETRY

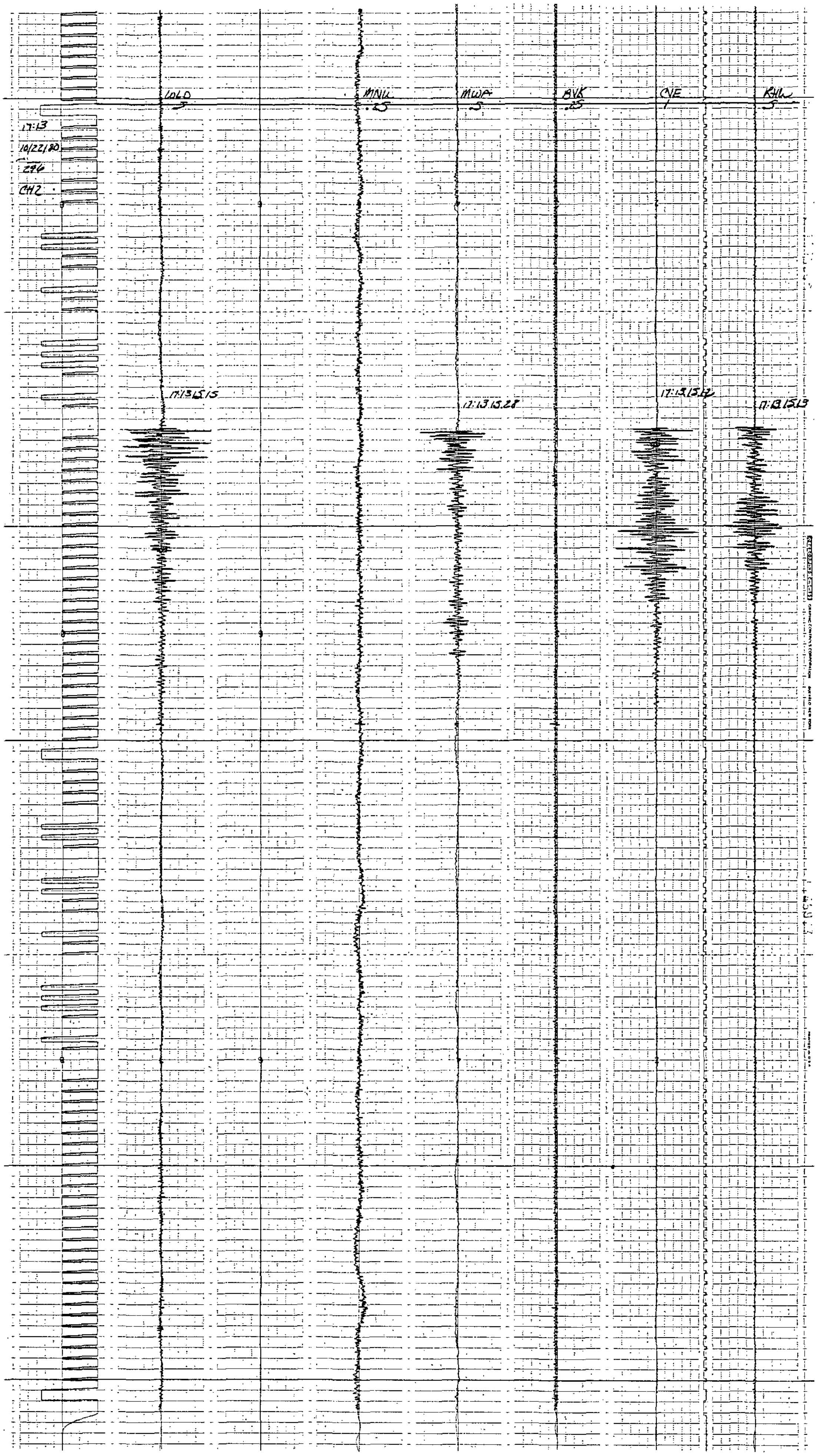
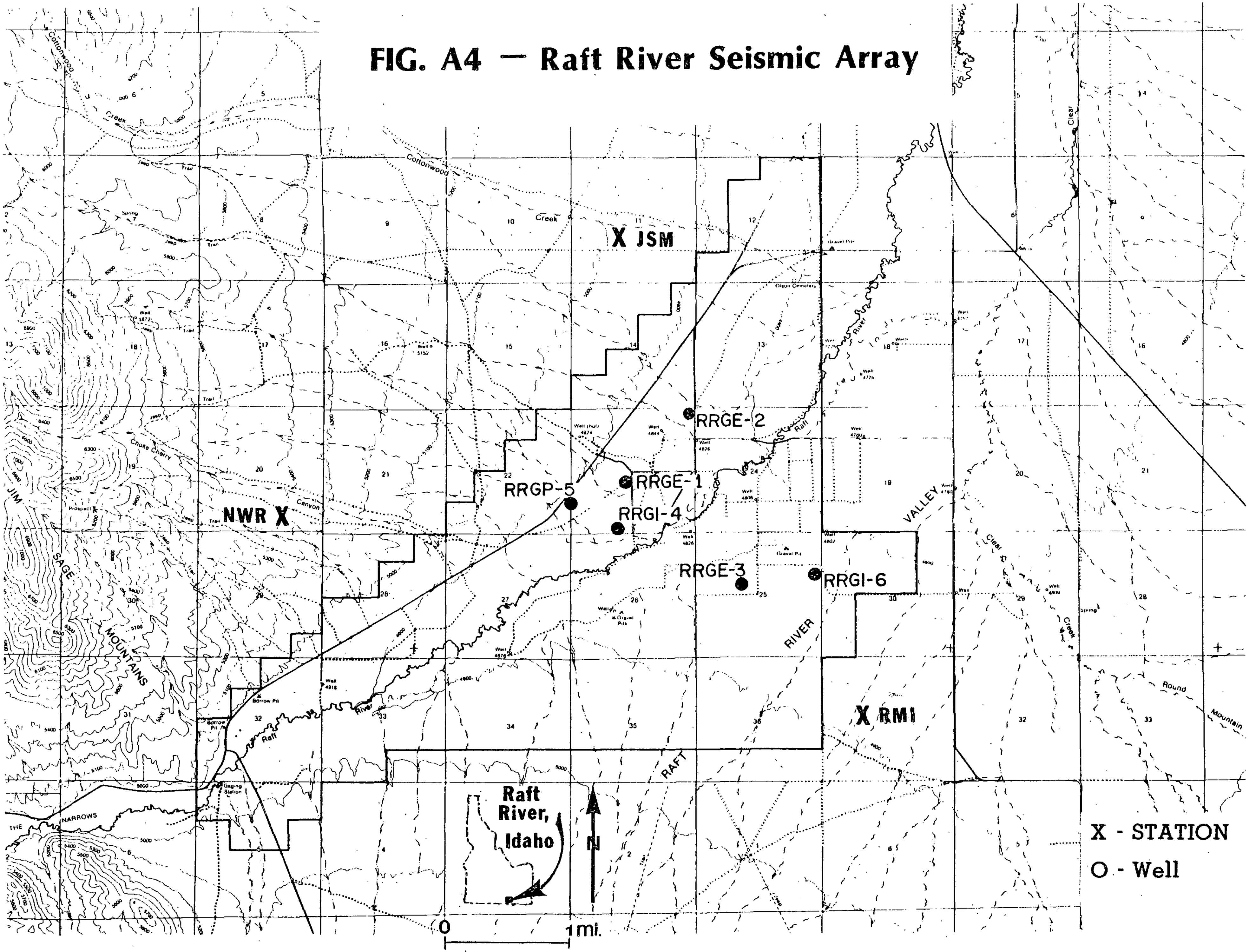


Fig. A-3b TYPICAL SEISMOGRAM

FIG. A4 — Raft River Seismic Array



FILE NAME SCALIB.DOC rev 6

APPENDIX B. (by Steven L. Olsen)

SEISMIC CALIBRATION TECHNIQUE

EARTH SCIENCE LAB / UURI
420 Chipeta Way Suite 120
Salt Lake City, Utah 84108

19-NOV-81

ABSTRACT:

This document describes the method used for calibration of the induced- seismicity network at Roosevelt Hot Springs, Utah.

Hardware was constructed to drive the seismometer's calibration coil with a forcing function of accurately known amplitude and frequency content. This unit is also equipped with a discriminator so that the technician can evaluate the signal that is being telemetered.

At the receiving station the signal is filtered and digitized. The Fast Fourier transform is used to separate the signal into its various components. The frequency response is obtained by normalizing each component by a factor based on its strength in the calibration signal.

The final report is given terms of MILLI-VOLTS/MICRON/SECOND as a function of frequency.

GENERAL DESCRIPTION

A constant current square wave is applied to the calibration coil of the seismometer at three frequencies - 0.05 Hz, 0.50 Hz and 5.00 Hz. The driving amplitude is chosen such that the output signal is between one half and full scale. The signal from the seismometer is amplified, band-limited and used to modulate a voltage-controlled oscillator. The encoded information is carried by voice-grade communication equipment to a central receiving site. At the receiving station the frequency-encoded information is decoded by a discriminator yielding a voltage proportional to the velocity of the ground at the seismometer site. For calibration purposes, a computerized data acquisition system records and analyzes the data. The frequency response curve is made from the three frequencies and their harmonics.

CALIBRATOR FREQUENCY CONTENT AND AMPLITUDE

The ESL calibrator generates 12 frequencies over four decades with three frequencies per decade. A 16.000 MHz crystal is divided down to yield precise control of frequency. The amplitude is based on an Analog Devices AD2700 voltage reference. The seismometer is driven by a current source which has five decade ranges and an attenuator with ten steps per decade.

The output is a square wave with the amplitude ranging between zero and the range setting. An audible alarm sounds if the current source is not regulating.

A square wave is comprised of odd harmonics of its fundamental frequency. The amplitude of each harmonic is inversly proportional to its harmonic number.

$$ical(t) = \sum_{n=1}^{m} \frac{1}{2n-1} \sin (2n-1)wt$$

SEISMOMETER TRANSFER FUNCTION

The operation of a seismometer can be described by a mathematical model. The technique chosen is to define complex impedance relations for the various components. Conventional circuit analysis methods can then be used to define the transfer function. Impedance is defined as the ratio of the velocity to the force. The symbol Zx is used to represent impedance where x can be m, k, or b indicating mass, spring, or damping respectivly. The units of mechanical impedance are meter-newtons / second. The symbol Vx represents velocity of mass spring or damping. The units of velocity are meters / second. The symbol Fx represents force on the specified element. The unit of force is the newton. The symbol M is for mass in kilograms, and it has units of newton-seconds^2/ meter. The symbol k is for spring constant and has units of newtons / meter. The symbol B is the damping factor, with units of seconds / meter-newton.

MASS:	Zm	=	Vm / Fm	=	1.0 / sM
SPRING:	Zk	=	Vk / Fk	=	s / K
DAMPING:	Zb	=	Vb / Fb	=	1.0 / B

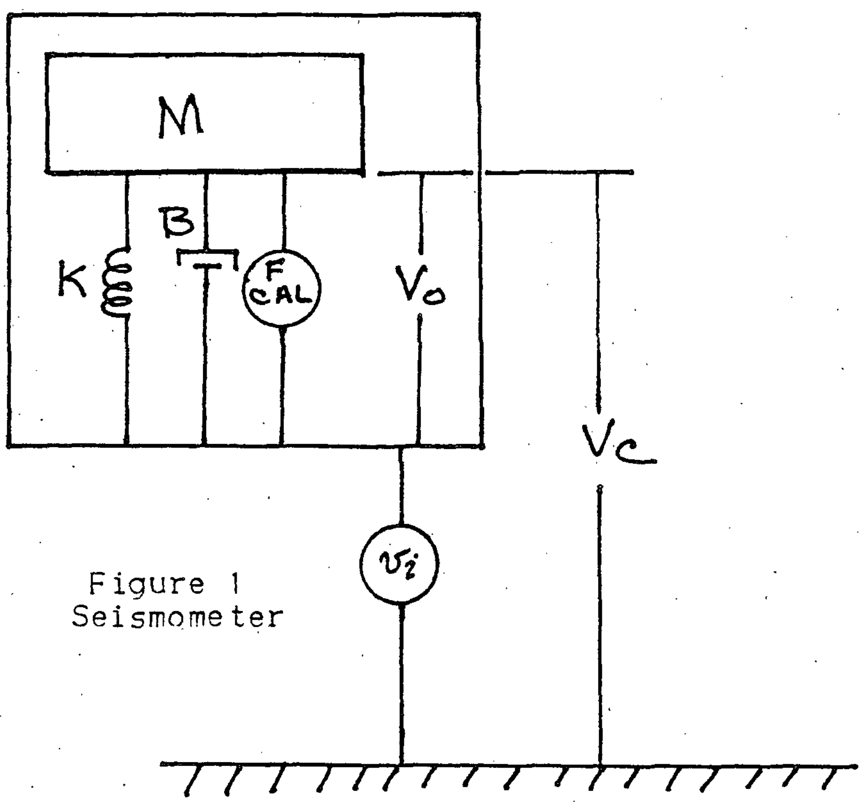


Figure 1
Seismometer

The output velocity is defined as the velocity of the mass with respect to the seismometer case, since this is the velocity which generates voltage. The velocity input is the velocity of the seismometer as a whole. Refer to figure 1 for a schematic representation of the seismometer. A mechanical equivalent to Kirchhoff's law says that the sum of velocities around a loop must equal zero and the sum of forces at a given node must equal zero. Vc is the velocity of the mass with respect to the fixed reference, Vi is the input velocity, i.e. the velocity of the seismometer with respect to the fixed reference, and Vo is the velocity of the mass with respect to the seismometer case. Fm is the force on the mass, Fk is the force on the spring, and Fb is the force on the damping.

Therefore:

$$Vc - Vi - Vo = 0.0$$

$$Fm - Fk - Fb = 0.0$$

The next equations relate velocities Vc and Vo to the force at node 1.

$$Vc = F\ Zm$$

The combined impedance of spring and the damping.

$$Z1 = \frac{Zk\ Zb}{Zk + Zb}$$

$$Vo = F\ Z1$$

Substitution into the force equation yields:

$$Vi = Vo \frac{Zm}{Z1} + 1$$

After some minipulation the transfer function in frequency domain is:

$$\frac{Vo}{Vi} = \frac{s^2}{s^2 + s\frac{B}{M} + \frac{K}{M}} = H(s)$$

A similar method is used to develop the transfer function for the force applied by the calibration coil and the velocity output. Fcal represents the force from the calibration coil in newtons:

$$\frac{Vo}{Fcal} = \frac{s / M}{s^2 + s\frac{B}{M} + \frac{K}{M}} = G(s)$$

A few other interesting relations show the resonant frequency and the damping factor:

$$wo = \sqrt{\frac{k}{m}} \quad ; \text{ resonant frequency}$$

$$\zeta = \frac{b}{2\ M\ wo} \quad ; \text{ normalized damping factor}$$

For the purpose of calibration a relation between the force applied by the calibration coil and the equivalent input velocity is needed.

$$Vo = Fcal\ G(s)$$

$$Vo = Vi\ H(s)$$

$$Vi = \frac{Fcal\ G(s)}{H(s)}$$

The result after mathematical reduction and replacing s with jw

$$Vi = \frac{-j\ Fcal}{w\ M}$$

DIGITIZING AND ANTI ALIAS FILTERING

The Nyquist criterion states that if an analog signal to be digitized contains energy above one half of the sampling frequency, the resulting digitized data will masquerade as some lower frequency. This is called aliasing.

The computerized data collection system built by ESL for magneto-telluric exploration was used to collect the seismic calibration data. It has a 14-bit analog-to-digital converter which is preceded by a programmable four-pole Butterworth filter to prevent aliasing. The following table gives the hardware configuration used to collect calibration data.

Data frequency	Sample frequency	Filter frequency
0.05 Hz	51.20 Hz	2.51 Hz
0.50 Hz	512.0 Hz	24.9 Hz
5.00 Hz	5120 Hz	273 Hz

The filters are set 3.4 octaves below the sampling frequency, which yields 80DB of attenuation of frequencies that would alias. The 14-bit ADC has a dynamic range of 84DB. Because the data is band-limited by its nature, this will more than meet the Nyquist requirements.

STACKING TO REDUCE THE AMPLITUDE OF NONSYNCHRONOUS NOISE

The calibration must be performed in the actual field environment with the seismometer installed in its well, since there is no way of eliminating the ground vibration contribution to the signal. A method of separating calibration signals from ground signals must be devised. The calibration data is a square wave with an accurately controlled frequency. Therefore, many cycles can be summed to the advantage of synchronous calibration information and to the disadvantage of the nonsynchronous ground vibrations.

FOURIER TRANSFORM FOR FREQUENCY SEPARATION

The stacked data from the seismograph is presented only as the real component to the Fast Fourier Transform. The result, in complex form, is converted to amplitude and phase. At this time the phase information is not used. However the information is there to do relative phase analysis. Absolute phase analysis will require a closed loop technique which is only practical in the laboratory.

NORMALIZATION OF RESULTS

The final result of this method is a table of gains in terms of volts per meter per second over a range of frequency.

The gain equation is:

$$\text{Gain} = \frac{-j\ E\ w\ M\ N}{Fcal}$$

$$Fcal = G\ Ical / 2.0$$

G is the generator constant of the seismometer. Ical is the calibration current (peak to peak). E is the measured voltage at the frequency of the interest. N is the harmonic number. Since the phase information is not used at this time the -j operator can be dropped.

$$\text{Gain} = \frac{2\ E\ w\ M\ N}{G\ Ical}$$

COMPUTER PROGRAMS

Two computer programs have been developed. SEISMO.FOR is used to collect and evaluate calibration data. STRAN.FOR is a general-purpose transfer function evaluation program that has been customized for the seismometer. Both programs are written in Fortran with some subroutines in assembly language to control special hardware.

Appendix C. Current Data Acquisition and Analysis Procedure

(by Louise McPherson)

Signals from three selected stations at Roosevelt Hot Springs are displayed in real time along with time code extracted from WWVB on three Sprengnether Instrument Company Model VR-60 drum recorders. Record duration limit is 26 hours. Drum records are examined daily for signals of interest and their time of occurrence. All seismic data and time codes (10 stations) are recorded on a Bell and Howell 3700B recorder. The tapes that are currently being used are Ampex Model 787 with a maximum duration of 38 hours. Tape speed is 15/16 inches per second. A Bell and Howell 3700B reproduce recorder plays data back through Emtel discriminators onto a seismogram produced by an 8 channel Gould Model 2800 chart recorder. Tape search and control is performed by a Systron Donner 8134 Time Code Reader interfaced to the tape recorder through a filter constructed by Scientific Devices. The playouts that appear to be local or nearly local to the arrays are timed using a Tektronics digitizing tablet system and the ESL PRIME computer program PICKS. This program writes data necessary for locating the earthquakes to a file in the PRIME computer. The file created is then used as input to the hypocenter location program.

Appendix D. Station Locations

Station	Latitude	Longitude	Elev. (m)
PCY	38 20.07N	112 54.15W	2033
RHU	38 28.34N	112 50.83W	1890
CFU	38 37.13N	112 32.32W	2012
MNU	38 37.19N	112 50.84W	1664
BAP	38 31.59N	112 47.70W	2387
BVK	38 28.22N	113 04.29W	1707
WLD	38 27.61N	112 51.83W	1804
CVE	38 27.89N	112 51.08W	1890
OPL	38 28.98N	112 52.42W	1766
LWA	38 29.32N	112 51.71W	1817
MWA	38 30.10N	112 50.73W	1878
ARUT*	37 47.20N	113 26.42W	1646
BKU*	38 32.11N	113 07.61W	1859
FSU*	39 43.35N	113 23.48W	1487
SGU*	39 10.97N	111 38.60W	2365
MSU*	38 30.80N	112 10.45W	2141
WCU*	38 57.88N	112 05.40W	2714
RMI	42 04.48N	113 20.94W	1900
JSM	42 07.84N	113 22.98W	2000
NWR	42 05.96N	113 26.29W	2100

*Stations of the Univ. of Utah Seismograph Station

Appendix E. Earthquake Hypocenter Summary Listing

EXPLANATION

The following data are listed for each event:

1. Year (YR), date and origin time in Universal Coordinated Time (UTC). Subtract seven hours to convert to Mountain Standard Time (MST).
2. Earthquake location coordinates in degrees and minutes of north latitude (LAT-N) and west longitude (LONG-W), and depth in kilometers. "*" indicates depth restricted to the initial trial depth due to poor depth resolution.
3. MAG, computed local magnitude for each earthquake (see description of magnitude determination in text).
4. NO, number of P, S and S-P readings used in solution.
5. GAP, largest azimuthal separation in degrees between recording stations used in the solution.
6. DMN, epicentral distance in kilometers to the closest station.
7. RMS, root-mean-square error in seconds of the travel-time residuals.

$$RMS = (\Sigma(W_i R_i^2)/NO)^{1/2}$$

where:

R_i is the observed minus the computed arrival times of P, S, or S-P data at the i-th station.

W_i is the relative weight given to the i-th station (0.0 for no weight through 1.0 for full weight) for the type of data (P, S, or S-P).

NO as described above.

8. Q, quality class of the hypocenter.

Q is the average of S and D defined as follows:

S	RMS	ERH	ERZ
A	0.15	1.0	2.0
B	0.30	2.5	5.0
C	0.50	5.0	
D	Others		

D	NO	GAP	DMN
A	6	90°	Depth or 5 km
B	6	135°	2xDepth of 5 km
C	6	180°	50 km
D	Others		

Where:

ERH and ERZ represent the largest horizontal and vertical deviation respectively in kilometers within the error ellipsoid (see description of quality in section 6).

NOTE: The values in these tables represent the minimum acceptable values for each quality class.

APPENDIX E

DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QS
810623	4 0 10.25	38N28.75	112W50.35	5.10	-.2	8	226	1.0	.01	3.6	.9	D
810623	437 .32	38N28.84	112W50.78	5.31	-.2	8	182	.9	.01	3.8	.5	D
810623	437 5.06	38N28.86	112W50.62	5.37	-.2	8	202	1.0	.01	4.4	.7	D
810623	437 15.71	38N28.73	112W50.35	5.21	-.2	8	225	1.1	.01	3.6	.9	D
810623	437 30.99	38N28.76	112W50.45	5.21	-.2	8	219	1.0	.01	3.8	.8	D
810623	1347 42.75	38N28.90	112W51.02	5.30	-.2	8	165	1.1	.02	4.3	.4	C
810623	1512 57.35	38N28.81	112W50.62	5.21	-.2	8	203	.9	.02	3.4	.6	D
810623	1538 4.55	38N28.85	112W50.64	5.43	-.2	8	200	1.0	.01	3.8	.6	D
810623	1538 7.23	38N28.89	112W50.53	5.32	-.2	8	212	1.0	.01	3.7	.7	D
810623	1557 14.23	38N28.96	112W50.69	5.42	-.2	8	191	1.1	.01	4.0	.6	D
810623	1557 28.81	38N28.92	112W50.50	5.40	-.2	8	213	1.2	.02	4.3	.8	D
810623	1749 1.67	38N35.41	112W47.25	5.56	.1	14	259	6.2	.05	5.0	6.1	D
810624	822 45.05	38N28.95	112W50.69	5.47	-.2	8	191	1.1	.01	4.0	.5	D
810625	625 46.12	38N28.83	112W50.21	5.22	-.2	8	234	1.3	.01	4.3	1.3	D
810626	23 7 34.01	38N28.65	112W49.74	4.83	-.2	10	263	1.7	.03	2.8	1.5	D
810627	916 25.72	38N28.92	112W50.52	5.34	-.2	8	211	2.1	.01	5.0	.9	D
810627	916 49.26	38N29.14	112W50.29	5.23	-.2	12	209	1.7	.08	2.6	.7	D
810627	15 3 11.60	38N29.16	112W50.29	5.03	.4	16	209	1.7	.12	.9	.5	C
810627	2226 3.77	38N28.89	112W50.58	5.24	-.2	8	205	1.1	.01	4.4	.8	D
810628	715 20.81	38N28.89	112W50.60	5.32	-.2	8	[illegible]	1.1	.01	4.3	.7	D
810628	2248 15.81	38N28.97	112W51.05	5.25	-.2	6	169	2.0	.01	5.5	.5	D
810629	546 53.07	38N28.76	112W50.45	5.11	-.2	8	219	1.0	.01	4.1	1.0	D
810629	746 3.84	38N28.78	112W50.49	5.17	-.2	8	216	1.0	.01	4.1	.9	D
810629	841 52.50	38N28.81	112W50.61	5.24	-.2	6	236	1.8	.01	5.3	1.0	D
810629	921 36.84	38N28.72	112W50.08	5.10	-.2	8	244	1.3	.02	3.7	1.3	D
810629	1822 22.72	38N28.77	112W50.44	5.11	-.2	8	220	1.0	.01	4.1	1.0	D
810630	23 3 48.22	38N28.90	112W50.14	4.93	-.2	12	220	1.4	.08	2.6	1.0	D
810701	941 .98	38N28.84	112W50.87	5.32	-.2	8	172	.9	.02	4.0	.4	C
810701	942 22.00	38N28.72	112W50.43	5.10	-.2	8	221	.9	.01	4.1	1.0	D
810701	1230 27.64	38N29.91	112W51.15	5.54	-.2	8	177	1.2	.03	4.1	.5	C
810701	1238 47.56	38N28.72	112W50.36	5.03	-.2	8	226	1.0	.01	3.8	1.1	D
810701	1238 55.06	38N28.74	112W50.45	5.14	-.2	8	220	.9	.01	3.6	.9	D
810701	1238 56.96	38N28.33	112W48.86	3.98	.4	12	293	2.9	.06	1.9	2.4	C
810701	1239 7.17	38N28.75	112W50.41	5.03	-.2	8	222	1.0	.01	4.0	1.0	D
810701	1239 36.46	38N28.80	112W50.65	5.30	-.2	8	200	.9	.00	3.5	.6	D
810701	1239 44.24	38N28.71	112W50.13	4.81	-.2	8	241	1.2	.01	3.6	1.3	D
810701	1241 12.56	38N28.42	112W49.06	4.14	.7	12	288	2.6	.05	1.6	1.9	C
810701	1241 17.19	38N28.79	112W50.52	5.15	-.2	8	213	.9	.01	3.8	.8	D
810701	1243 45.48	38N28.75	112W50.38	5.14	-.2	8	224	1.0	.01	3.5	.9	D
810701	1244 .38	38N28.50	112W49.69	4.72	.4	10	268	1.7	.04	2.4	1.4	D
810701	1244 20.63	38N28.76	112W50.50	5.22	-.2	8	215	.9	.01	3.4	.7	D
810701	1246 5.53	38N28.54	112W49.63	4.57	.4	10	269	1.8	.05	2.3	1.5	D
810701	15 4 47.14	38N28.94	112W50.35	4.91	.4	16	211	1.3	.11	.9	.4	C
810701	1819 41.77	38N28.90	112W50.15	4.78	-.2	12	220	1.4	.09	2.6	1.0	D
810701	1913 17.57	38N28.95	112W50.50	4.98	-.2	12	204	1.2	.09	2.6	.6	D
810701	1914 9.54	38N28.72	112W50.56	5.11	-.2	8	212	.8	.01	4.1	.9	D
810701	2119 3.68	38N28.60	112W50.29	4.89	.1	14	234	.9	.06	1.0	.5	C
810701	2320 38.18	38N28.48	112W49.45	4.46	.1	10	277	2.0	.04	2.9	2.1	D
810702	153 33.62	38N28.48	112W49.24	4.06	-.2	12	283	2.3	.04	1.6	1.8	D
810702	154 27.27	38N28.76	112W50.55	5.01	-.2	7	212	.9	.02	4.7	1.0	D
810702	156 55.12	38N28.78	112W49.79	4.87	.9	14	234	1.7	.12	1.0	.7	C
810702	157 53.70	38N28.52	112W49.65	4.59	-.2	10	268	1.7	.04	2.6	1.5	D
810702	214 1.10	38N29.05	112W51.06	1.36	.7	14	150	1.0	.34	.4	.2	C
810702	223 5.18	38N28.75	112W50.57	5.04	-.2	8	210	.9	.01	4.0	.8	D

810702	224	49.84	38N28.70	112W50.35	4.92	-.2	8	227	1.0	.01	3.9	1.1	D
810702	234	17.37	38N29.30	112W51.03	4.48	.4	16	155	1.0	.15	.9	.3	C
810702	2047	30.01	38N29.03	112W51.43	.86	-.2	8	195	1.5	.12	1.1	1.0	C
810702	3 3	46.98	38N28.90	112W50.95	1.65	-.2	8	162	1.1	.29	2.1	.3	C
810702	357	1.75	38N29.01	112W51.01	1.18	.1	12	157	1.2	.29	.5	.3	C
810702	4 9	31.28	38N28.37	112W49.24	4.25	.1	12	284	2.3	.05	1.9	1.8	D
810702	513	31.55	38N28.71	112W50.14	4.82	.1	8	240	1.2	.02	3.3	1.1	D
810702	524	1.04	38N28.89	112W50.64	.73	.1	11	199	1.1	.17	.5	.7	C
810702	623	41.73	38N29.02	112W51.09	1.32	.4	15	149	1.1	.30	.4	.2	C
810702	851	2.01	38N27.76	112W51.50	6.36	-.2	8	172	.6	.03	5.3	.5	D
810702	2 4	1.11	38N29.01	112W51.08	1.26	.9	13	150	1.1	.32	.5	.3	C
810703	2012	1.53	38N27.90	112W54.91	2.13	-.2	10	176	4.5	.44	1.3	7.2	C
810704	1245	54.48	38N28.75	112W50.47	5.00	-.2	6	218	1.8	.01	4.7	1.2	D
810704	1248	11.10	38N28.75	112W50.42	5.03	-.2	6	222	1.9	.00	4.8	1.3	D
810704	13 9	10.64	38N28.75	112W50.51	5.04	-.2	8	215	.9	.01	4.0	.9	D
810704	1340	55.87	38N28.73	112W50.40	5.16	-.2	8	223	1.0	.01	4.1	1.0	D
810704	1449	1.88	38N28.81	112W50.64	5.21	-.2	6	203	1.6	.02	5.0	.9	D
810704	16 3	54.29	38N29.07	112W50.34	5.07	.7	16	209	1.5	.10	.9	.4	C
810704	16 4	5.90	38N28.76	112W50.49	5.12	-.2	8	216	.9	.01	4.2	.9	D
810704	16 4	29.83	38N28.71	112W50.31	5.05	-.2	6	230	1.9	.01	5.1	1.5	D
810704	16 7	55.06	38N28.97	112W50.42	5.12	-.2	12	208	1.3	.08	2.6	.7	D
810704	1618	51.70	38N28.74	112W50.38	5.09	-.2	8	224	1.0	.01	4.1	1.0	D
810704	1623	41.00	38N28.86	112W50.71	5.35	-.2	8	190	1.0	.02	4.4	.6	D
810704	18 1	48.59	38N28.97	112W50.29	5.08	.4	16	213	1.4	.10	1.0	.5	C
810704	1817	33.67	38N28.47	112W49.28	4.18	-.2	12	262	2.3	.05	1.9	1.7	D
810704	19 1	53.02	38N28.72	112W50.11	4.91	-.2	8	242	1.3	.02	3.8	1.4	D
810704	2053	52.39	38N28.70	112W50.10	4.90	-.2	6	243	2.1	.01	4.9	1.9	D
810704	2054	11.14	38N28.98	112W50.18	5.09	.9	16	216	1.5	.11	.9	.5	C
810704	2152	11.06	38N28.76	112W50.37	5.01	-.2	6	224	1.9	.01	4.6	1.3	D
810705	2139	.63	38N28.84	112W51.78	4.72	-.2	8	211	1.7	.03	3.4	1.0	D
810706	3 8	15.70	38N28.87	112W50.83	4.92	.4	8	176	1.0	.02	3.9	.5	C
810706	449	58.71	38N28.92	112W50.64	.79	-.2	11	198	1.1	.16	.5	.6	C
810707	033	55.05	38N28.56	112W49.04	4.22	.9	12	287	2.6	.05	1.9	1.9	C
810707	035	55.08	38N28.64	112W49.16	4.87	.9	12	284	2.5	.04	2.1	1.6	D
810707	751	31.76	38N28.68	112W51.40	1.65	-.2	8	183	1.0	.30	.9	.2	D
810707	2047	57.94	38N29.00	112W51.14	1.30	-.2	9	143	1.0	.12	.7	.4	B
810708	139	14.63	38N28.75	112W50.55	5.25	-.2	8	212	.9	.01	3.6	.7	D
810708	337	18.95	38N28.78	112W50.62	5.22	-.2	8	204	.9	.01	3.6	.6	D
810708	411	5.32	38N28.89	112W51.87	4.98	-.2	6	249	1.8	.01	20.8	7.2	D
810708	126	33.90	38N28.70	112W50.23	4.91	-.2	8	235	1.1	.01	3.8	1.2	D
810709	1117	54.03	38N25.21	112W50.74	8.14	-.2	8	340	4.7	.01	8.2	3.4	D
810709	23 3	45.03	38N28.75	112W51.25	1.66	.4	15	124	1.0	.29	.5	1.5	B
810709	2326	38.29	38N28.75	112W50.99	.68	-.2	12	154	.6	.17	.3	.4	C
810710	015	58.01	38N28.93	112W51.80	.20	-.2	8	215	1.6	.08	1.0	6.2	D
810710	017	5.30	38N28.87	112W51.54	.56	-.2	8	197	1.4	.13	.9	1.6	C
810710	019	23.74	38N28.88	112W51.52	.59	-.2	8	196	1.4	.12	.9	1.5	C
810710	033	32.73	38N28.88	112W51.56	.58	-.2	8	199	1.5	.13	.9	1.6	C
810710	041	.94	38N28.94	112W51.71	.06	-.2	8	210	1.7	.07	1.1	20.8	D
810710	1 5	4.16	38N28.83	112W51.39	.26	-.2	9	137	1.0	.14	.5	1.6	B
810710	7 5	53.94	38N28.80	112W51.24	.70	-.2	8	176	1.0	.19	.9	.8	C
810713	9 2	33.59	38N28.79	112W50.39	5.15	-.2	8	222	1.0	.01	4.4	1.1	D
810713	1215	16.10	38N28.75	112W50.30	5.37	-.2	8	229	1.1	.01	4.3	1.1	D
810713	2326	7.25	38N28.74	112W50.35	5.22	-.2	8	227	1.0	.01	3.7	.9	D
810713	2326	22.79	38N28.89	112W50.17	5.02	-.2	12	219	1.4	.08	2.6	.9	D
810713	2327	3.67	38N28.69	112W50.32	4.53	-.2	8	230	1.0	.01	3.3	1.0	D
810714	0 9	20.51	38N28.70	112W50.14	4.83	-.2	8	241	1.2	.01	3.4	1.2	D
810714	418	45.78	38N28.72	112W50.27	5.18	-.2	8	232	1.1	.01	4.2	1.2	D

810714	445	46.98	38N28.72	112W50.28	5.14	-.2	8	231	1.1	.01	4.1	1.2	D
810714	1124	28.62	38N28.73	112W50.53	5.12	-.2	6	214	1.7	.31	5.1	1.2	D
810714	1148	27.90	38N29.13	112W51.77	5.01	-.2	10	183	2.0	.05	3.2	.9	D
810714	1159	33.19	38N28.80	112W50.79	5.23	-.2	6	192	1.7	.00	5.2	.7	D
810714	1216	23.41	38N29.02	112W50.64	5.03	-.2	12	193	1.3	.09	2.6	.5	D
810714	1217	52.29	38N28.75	112W50.54	5.19	-.2	8	213	.9	.01	4.1	.8	D
810714	1227	52.01	38N29.02	112W50.48	5.14	-.2	12	204	1.3	.08	2.6	.6	D
810714	1232	27.11	38N28.76	112W50.62	5.03	-.2	8	205	.8	.01	4.0	.8	D
810714	1241	28.49	38N28.77	112W50.59	5.16	-.2	8	238	.9	.01	4.1	.8	D
810714	1255	2.16	38N28.66	112W50.21	4.91	-.2	8	237	1.1	.02	3.5	1.1	D
810714	1255	6.09	38N28.68	112W50.35	4.93	-.2	8	228	.9	.01	3.5	.9	D
810714	1347	39.11	38N28.74	112W50.52	5.10	-.2	8	214	.9	.01	3.6	.7	D
810714	1354	56.15	38N28.97	112W50.04	4.89	.4	14	221	1.6	.10	1.9	.8	C
810714	1442	13.24	38N28.90	112W51.30	3.27	-.2	8	182	1.2	.01	2.7	.7	D
810714	1452	36.55	38N29.16	112W51.59	4.93	-.2	10	177	1.9	.06	3.1	.8	C
810714	1515	37.39	38N28.74	112W50.52	5.08	-.2	8	215	.9	.01	3.7	.8	D
810714	1548	16.58	38N28.72	112W50.45	5.09	-.2	8	220	.9	.01	4.0	.9	D
810714	1734	28.03	38N28.72	112W50.43	5.16	-.2	8	221	.9	.01	4.4	1.0	D
810714	18 0	39.06	38N28.66	112W50.31	5.02	-.2	8	231	1.0	.01	3.5	1.0	D
810714	18 8	8.07	38N28.70	112W50.25	4.92	-.2	8	234	1.1	.01	3.5	1.0	D
810714	19 3	41.71	38N28.78	112W50.53	5.09	-.2	8	213	.9	.01	4.1	.9	D
810714	1925	25.23	38N29.15	112W51.37	5.03	-.2	10	170	1.7	.07	3.2	.6	C
810714	1948	38.48	38N28.83	112W50.93	5.45	-.2	8	164	.9	.02	4.5	.5	C
810714	2020	42.86	38N29.17	112W51.62	4.94	-.2	10	178	1.9	.07	3.1	.8	C
810714	21 4	58.75	38N28.96	112W50.63	5.19	-.2	12	195	1.2	.09	2.6	.5	D
810714	2327	22.78	38N28.71	112W50.61	5.10	-.2	8	208	.6	.02	4.1	.8	D
810715	141	47.44	38N28.71	112W50.52	5.08	-.2	8	215	.8	.01	4.0	.9	D
810715	626	44.15	38N28.90	112W51.67	.66	-.2	8	206	1.6	.10	.9	1.2	C
810715	633	49.16	38N28.97	112W51.96	.10	-.2	8	225	2.0	.06	1.0	14.7	D
810715	636	48.19	38N28.90	112W51.64	.10	-.2	7	204	1.5	.07	1.0	10.7	D
810715	638	15.29	38N28.89	112W51.65	.52	-.2	8	204	1.6	.10	1.0	2.0	C
810715	640	58.03	38N28.90	112W51.66	.28	-.2	8	205	1.6	.09	1.0	3.6	C
810715	641	2.63	38N28.85	112W51.40	.55	-.2	7	138	1.3	.10	1.1	1.3	C
810715	641	17.61	38N28.92	112W51.74	.16	-.2	8	211	1.7	.07	1.0	7.0	D
810715	718	15.55	38N28.78	112W51.33	.81	-.2	12	119	1.1	.14	.4	.4	B
810715	725	30.00	38N28.82	112W51.40	.54	-.2	8	187	1.2	.14	.8	1.3	C
810715	738	53.50	38N28.88	112W51.65	.21	-.2	7	204	1.6	.08	1.1	5.1	D
810718	1037	38.99	38N28.75	112W50.33	5.09	-.2	8	223	1.1	.02	3.7	1.0	D
810718	1041	56.18	38N29.16	112W50.39	4.91	.4	16	206	1.6	.11	.7	.4	C
810718	1044	57.09	38N28.92	112W49.46	4.29	-.2	14	239	2.3	.10	1.8	1.4	C
810718	1048	53.20	38N29.06	112W49.71	4.31	-.2	14	229	2.1	.12	1.8	1.2	C
810718	1049	40.84	38N28.74	112W50.26	5.00	-.2	8	232	1.1	.01	3.9	1.1	D
810718	16 5	34.54	38N28.82	112W50.38	5.21	-.2	8	223	1.1	.02	4.4	1.1	D
810718	1943	21.69	38N28.74	112W50.29	5.01	-.2	8	231	1.1	.01	3.6	1.0	D
810718	2344	51.62	38N28.85	112W50.52	5.32	-.2	8	212	1.0	.03	4.3	.8	D
810719	426	29.03	38N29.75	112W50.20	5.05	-.2	8	236	1.2	.01	4.1	1.3	D
810719	429	10.83	38N28.79	112W50.20	4.95	-.2	8	235	1.2	.02	4.2	1.3	D
810719	437	48.80	38N28.85	112W50.45	5.20	-.2	8	218	1.1	.01	4.2	.9	D
810719	1830	56.44	38N28.81	112W50.26	5.11	-.2	8	231	1.2	.01	4.1	1.2	D
810719	19 6	.69	38N28.71	112W50.21	5.14	-.2	8	236	1.1	.01	4.2	1.3	D
810719	1914	16.25	38N28.91	112W50.50	5.39	-.2	8	213	1.2	.04	4.5	.9	D
810719	1941	26.80	38N28.71	112W50.14	4.82	-.2	6	241	2.0	.01	4.8	1.8	D
810719	20 6	48.10	38N28.66	112W49.96	4.94	-.2	8	252	1.4	.01	3.5	1.4	D
810719	2013	9.07	38N28.67	112W49.87	4.82	-.2	10	256	1.5	.03	2.7	1.3	D
810719	2119	59.38	38N28.84	112W50.29	5.20	-.2	8	228	1.2	.01	4.3	1.1	D
810720	012	18.47	38N28.90	112W50.65	5.25	-.2	8	197	1.1	.01	4.3	.7	D
810720	030	52.67	38N28.92	112W50.70	5.17	-.2	8	191	1.1	.02	4.2	.6	D

810720	153	43.70	38N28.91	112W50.49	5.14	-.2	8	213	1.2	.01	4.2	.9	D
810720	433	12.91	38N28.81	112W49.73	4.86	-.2	8	260	1.9	.02	4.1	2.0	D
810720	519	58.58	38N28.81	112W50.19	5.05	-.2	8	236	1.3	.01	4.1	1.3	D
810720	524	49.20	38N28.81	112W50.20	4.99	-.2	8	244	1.3	.02	5.3	1.8	D
810720	553	20.12	38N30.26	112W52.45	2.10	-.2	10	201	2.5	.16	4.2	14.5	D
810720	610	36.66	38N28.78	112W50.00	4.84	-.2	8	247	1.4	.01	4.0	1.6	D
810720	652	35.51	38N28.90	112W50.55	5.34	-.2	8	209	1.1	.01	4.2	.7	D
810720	652	44.76	38N28.85	112W50.46	5.13	-.2	8	217	1.1	.01	4.2	.9	D
810720	734	55.17	38N28.81	112W50.32	5.21	-.2	8	227	1.1	.01	4.1	1.1	D
810720	756	14.82	38N28.80	112W50.12	4.97	-.2	8	240	1.3	.01	3.6	1.2	D
810720	1126	24.36	38N28.91	112W50.50	5.32	-.2	8	213	1.2	.01	3.9	.7	D
810720	1145	10.93	38N28.84	112W50.28	5.19	-.2	8	229	1.2	.01	4.1	1.1	D
810720	12 5	8.90	38N28.88	112W50.43	5.26	-.2	8	218	1.2	.01	4.3	.9	D
810720	1238	3.07	38N28.69	112W49.56	4.75	-.2	10	269	2.0	.03	2.8	1.7	D
810720	13 2	18.35	38N28.65	112W49.59	4.73	-.2	10	269	1.9	.03	2.8	1.7	D
810720	1521	55.02	38N28.63	112W49.36	4.45	-.2	10	277	2.2	.03	2.7	2.0	D
810720	1623	14.85	38N28.88	112W50.34	5.12	-.2	8	224	1.2	.01	4.2	1.1	D
810720	1623	31.11	38N28.96	112W50.61	5.28	-.2	8	200	1.2	.01	4.3	.7	D
810720	1647	19.71	38N28.96	112W50.75	5.32	-.2	8	185	1.2	.01	4.3	.6	D
810720	17 0	32.03	38N28.95	112W50.83	5.34	-.2	6	166	2.0	.00	5.2	.6	D
810720	1720	14.02	38N28.93	112W50.69	5.35	-.2	8	193	1.1	.01	4.4	.6	D
810720	1722	12.44	38N28.84	112W50.19	5.21	-.2	8	235	1.3	.01	4.1	1.2	D
810720	1737	1.25	38N29.01	112W50.96	5.62	-.2	8	165	1.3	.03	4.6	.4	C
810720	1745	44.38	38N28.90	112W50.65	5.39	-.2	8	197	1.1	.01	4.4	.7	D
810720	1922	36.19	38N28.84	112W50.28	5.22	-.2	10	229	1.2	.02	2.9	.9	D
810720	1944	19.59	38N28.85	112W50.34	5.36	-.2	8	225	1.2	.01	4.3	1.0	D
810720	2027	14.13	38N28.85	112W50.28	5.06	-.2	8	229	1.2	.02	3.7	1.0	D
810721	0 1	15.98	38N28.84	112W50.32	5.20	-.2	8	227	1.2	.01	4.1	1.1	D
810721	033	47.86	38N28.81	112W50.37	5.17	-.2	8	224	1.1	.01	3.8	.9	D
810721	052	38.22	38N28.66	112W48.40	7.80	-.2	8	301	3.6	.02	6.2	3.4	D
810721	059	13.64	38N28.86	112W50.44	5.18	-.2	8	218	1.1	.01	4.4	1.0	D
810721	125	59.88	38N28.83	112W50.03	5.26	-.2	12	245	1.5	.02	2.9	1.0	D
810721	130	26.01	38N29.01	112W50.31	5.04	.9	16	211	1.5	.11	.6	.4	C
810721	131	54.16	38N28.61	112W49.62	4.56	-.2	10	268	1.8	.04	2.7	1.6	D
810721	133	31.73	38N29.07	112W50.31	5.02	.4	16	210	1.5	.11	1.0	.5	C
810721	139	39.37	38N28.96	112W50.82	5.42	-.2	8	177	1.1	.02	4.4	.5	C
810721	140	19.15	38N28.86	112W50.35	5.22	-.2	8	224	1.2	.01	4.2	1.1	D
810721	252	14.05	38N29.15	112W50.04	4.93	.9	16	217	1.9	.12	.6	.5	C
810721	254	17.64	38N28.91	112W50.63	5.21	-.2	8	200	1.1	.01	4.2	.7	D
810721	311	50.29	38N28.76	112W50.31	4.95	-.2	12	229	1.1	.04	1.1	.5	C
810721	312	42.94	38N28.86	112W50.53	5.29	-.2	8	211	1.1	.01	3.9	.7	D
810721	323	17.53	38N28.78	112W50.20	5.09	-.2	8	235	1.2	.01	4.1	1.2	D
810721	331	45.16	38N28.83	112W50.55	5.15	-.2	8	210	1.0	.01	4.2	.8	D
810721	349	6.39	38N29.00	112W50.78	5.13	-.2	8	182	1.2	.02	3.6	.5	D
810721	4 9	38.18	38N28.85	112W50.56	5.33	-.2	8	208	1.0	.01	4.3	.8	D
810721	636	48.06	38N29.09	112W50.24	4.82	.9	16	212	1.6	.12	.9	.5	C
810721	640	15.87	38N28.94	112W50.85	5.38	-.2	8	173	1.1	.01	4.4	.5	C
810721	644	7.17	38N28.58	112W48.94	4.12	.4	12	290	2.8	.04	1.9	2.1	C
810721	650	49.59	38N28.71	112W49.18	4.37	.4	13	250	2.5	.08	1.6	1.6	D
810721	721	5.74	38N28.89	112W50.51	5.26	-.2	8	213	1.1	.01	4.3	.8	D
810721	724	9.30	38N28.88	112W50.45	5.26	-.2	8	217	1.1	.00	3.6	.8	D
810721	936	28.22	38N28.84	112W50.41	5.06	-.2	8	220	1.1	.01	3.7	.8	D
810721	938	24.99	38N28.79	112W50.17	5.09	-.2	8	237	1.3	.02	4.1	1.3	D
810721	938	47.69	38N28.81	112W50.56	5.26	-.2	8	210	1.0	.01	4.2	.8	D
810721	959	53.86	38N28.83	112W50.21	5.17	-.2	8	234	1.3	.01	3.4	1.0	D
810721	1016	46.94	38N28.39	112W48.75	3.94	-.2	12	295	3.0	.05	1.9	2.4	C
810721	11 2	43.83	38N28.66	112W49.39	4.43	-.2	11	276	2.2	.04	2.3	1.8	D

810721	1159	50.68	38N28.84	112W49.98	5.07	-.2	8	247	1.5	.01	3.9	1.5	D
810721	1324	30.72	38N28.90	112W50.69	5.29	-.2	8	192	1.1	.01	4.1	.6	D
810721	1337	13.35	38N28.87	112W50.27	5.25	-.2	8	229	1.3	.01	4.2	1.1	D
810721	1343	40.69	38N28.81	112W50.41	5.12	-.2	8	221	1.1	.01	3.7	.9	D
810721	1515	23.13	38N28.89	112W50.53	5.16	-.2	8	211	1.1	.02	4.2	.8	D
810721	1522	32.37	38N28.89	112W51.14	5.67	-.2	8	172	1.1	.04	4.4	.4	C
810721	1525	3.31	38N28.74	112W49.81	4.69	-.2	8	258	1.7	.01	4.0	1.9	D
810721	1551	6.12	38N28.86	112W50.70	5.30	-.2	8	193	1.0	.01	4.4	.7	D
810721	17 3	51.38	38N28.70	112W50.01	4.92	.4	14	248	1.4	.06	1.0	.6	C
810721	1718	39.25	38N28.98	112W50.71	5.32	-.2	8	190	1.2	.01	4.7	.6	D
810721	1726	3.38	38N28.93	112W50.61	5.32	-.2	8	201	1.1	.01	3.6	.6	D
810721	1811	6.10	38N28.84	112W50.37	5.19	-.2	8	223	1.1	.02	4.0	1.0	D
810721	1834	24.83	38N28.94	112W50.71	5.31	-.2	8	190	1.1	.01	4.4	.6	D
810721	1841	2.31	38N28.63	112W49.41	4.55	.1	12	276	2.1	.05	1.9	1.4	D
810721	19 5	31.31	38N29.01	112W49.59	4.46	.1	14	233	2.2	.11	1.8	1.2	C
810721	1953	53.29	38N28.88	112W50.47	5.30	-.2	8	215	1.1	.01	4.1	.8	D
810721	1958	46.97	38N28.89	112W50.44	5.30	-.2	8	217	1.2	.01	4.1	.9	D
810721	2018	29.72	38N29.17	112W50.32	5.02	.4	16	208	1.7	.10	1.0	.5	C
810721	2020	11.59	38N28.92	112W50.73	5.30	-.2	8	189	1.1	.01	4.5	.6	D
810721	2120	51.61	38N28.92	112W50.58	5.29	-.2	6	207	2.0	.01	5.2	.9	D
810721	2131	41.74	38N28.79	112W50.21	5.13	-.2	6	235	2.1	.01	5.0	1.5	D
810721	22 4	49.66	38N28.93	112W50.60	5.30	-.2	8	202	1.1	.01	4.5	.7	D
810721	23 1	.94	38N28.63	112W49.57	4.79	-.2	10	270	1.9	.04	2.8	1.7	D
810721	2342	39.91	38N28.87	112W50.59	5.32	-.2	8	204	1.0	.01	4.0	.7	D
810722	0 9	5.34	38N28.72	112W50.22	5.17	-.2	8	235	1.1	.02	4.7	1.4	D
810722	016	22.63	38N29.07	112W49.65	4.78	-.2	14	230	2.2	.10	2.0	1.2	C
810722	038	10.76	38N29.11	112W49.61	4.40	-.2	14	230	2.3	.13	1.6	1.2	C
810722	110	24.71	38N29.32	112W50.33	4.74	.9	16	205	1.6	.12	.8	.4	C
810722	128	5.08	38N28.70	112W48.78	4.32	-.2	10	293	3.1	.05	2.9	3.0	C
810722	137	4.29	38N28.82	112W50.39	5.24	-.2	8	222	1.1	.01	3.7	.8	D
810722	229	33.48	38N28.76	112W50.02	5.04	-.2	8	246	1.4	.02	3.4	1.2	D
810722	233	15.07	38N28.82	112W50.37	5.33	-.2	8	223	1.1	.01	4.1	1.0	D
810722	255	36.69	38N28.87	112W50.46	5.27	-.2	8	216	1.1	.01	4.5	1.0	D
810722	313	54.63	38N28.72	112W49.53	4.73	-.2	10	270	2.0	.04	2.7	1.6	D
810722	315	9.09	38N28.69	112W49.60	4.64	-.2	12	268	1.9	.05	2.0	1.3	C
810722	317	34.59	38N28.66	112W49.36	4.47	-.2	12	277	2.2	.05	1.7	1.4	C
810722	349	.02	38N28.91	112W50.71	5.32	-.2	8	190	1.1	.01	3.8	.5	D
810722	4 3	8.36	38N28.75	112W50.05	5.28	-.2	10	245	1.4	.02	2.8	1.0	D
810722	440	35.16	38N28.57	112W48.95	4.35	-.2	12	290	2.8	.06	2.0	2.0	C
810722	442	15.72	38N28.98	112W49.95	5.14	-.2	12	224	1.7	.09	2.4	1.0	D
810722	445	33.67	38N28.94	112W50.67	5.33	-.2	8	194	1.1	.01	3.8	.5	D
810722	5 8	24.44	38N29.09	112W50.36	5.08	.4	14	208	1.5	.09	.8	.4	C
810722	521	15.60	38N28.68	112W50.12	5.22	.4	14	242	1.2	.07	.9	.5	C
810722	521	24.12	38N28.96	112W50.69	5.37	-.2	8	192	1.2	.01	3.8	.5	D
810722	537	20.77	38N28.90	112W50.31	5.40	-.2	8	226	1.3	.01	4.3	1.0	D
810722	6 0	47.23	38N28.99	112W50.61	5.30	-.2	8	200	1.2	.01	3.9	.6	D
810722	6 8	40.44	38N28.85	112W50.47	5.33	-.2	8	216	1.1	.01	3.6	.7	D
810722	629	25.64	38N28.89	112W50.54	5.25	-.2	8	209	1.1	.02	3.6	.6	D
810722	646	34.98	38N28.89	112W50.52	5.27	-.2	8	212	1.1	.00	3.5	.6	D
810722	647	.60	38N28.57	112W49.03	4.37	-.2	10	287	2.6	.05	2.4	2.1	D
810722	649	24.25	38N28.90	112W50.53	5.33	-.2	8	211	1.1	.01	4.2	.8	D
810722	649	39.53	38N28.93	112W50.49	5.17	-.2	8	213	1.2	.01	3.9	.7	D
810722	7 4	51.43	38N28.90	112W50.66	5.34	-.2	8	196	1.1	.01	3.9	.6	D
810722	711	1.96	38N28.91	112W50.70	5.24	-.2	6	197	2.0	.00	4.7	.7	D
810722	735	39.14	38N28.59	112W49.27	4.59	.4	12	281	2.3	.05	2.1	1.6	D
810722	741	11.56	38N28.89	112W50.48	5.38	-.2	8	214	1.1	.01	4.2	.8	D
810722	742	37.07	38N29.02	112W50.26	5.21	-.2	12	213	1.5	.08	2.6	.7	D

810722	752	31.68	38N28.79	112W50.18	5.07	-.2	8	236	1.3	.01	3.7	1.1	D
810722	833	36.23	38N28.87	112W50.43	5.39	-.2	8	218	1.1	.02	4.8	1.0	D
810722	9 7	52.65	38N28.87	112W50.36	5.10	-.2	8	223	1.2	.02	4.5	1.1	D
810722	919	5.11	38N29.37	112W49.32	4.23	.9	21	136	2.5	.31	.5	.6	C
810722	928	5.02	38N28.88	112W50.67	5.30	-.2	6	201	1.9	.00	4.7	.7	D
810722	929	11.20	38N28.85	112W50.20	5.11	-.2	8	234	1.3	.01	3.8	1.1	D
810722	929	43.90	38N28.80	112W50.32	5.05	-.2	8	227	1.1	.01	3.2	.8	D
810722	937	21.82	38N28.80	112W49.99	4.82	-.2	8	248	1.5	.02	3.5	1.4	D
810722	944	37.53	38N28.85	112W50.17	5.16	-.2	8	236	1.3	.02	4.2	1.3	D
810722	959	46.65	38N28.68	112W49.79	4.59	-.2	8	260	1.6	.02	3.4	1.7	D
810722	1014	53.30	38N28.82	112W49.97	5.14	-.2	8	248	1.5	.01	4.2	1.5	D
810722	1028	12.44	38N28.59	112W48.94	4.10	.4	12	290	2.8	.04	1.9	2.1	C
810722	1030	37.80	38N28.81	112W50.22	5.13	-.2	8	234	1.2	.02	3.6	1.1	D
810722	1129	46.16	38N28.65	112W49.74	4.83	.4	10	263	1.7	.04	2.7	1.4	D
810722	12 8	27.79	38N28.84	112W50.36	5.27	-.2	8	224	1.2	.01	3.6	.9	D
810722	1222	10.84	38N28.61	112W49.04	4.15	.4	12	287	2.7	.05	2.1	2.1	C
810722	1243	6.69	38N28.58	112W49.11	4.22	.4	12	286	2.5	.05	2.0	1.9	D
810722	1252	14.91	38N35.37	112W37.49	1.74	.2	9	183	8.2	.27	5.6	79.7	D
810722	1323	59.06	38N29.10	112W49.38	4.40	.9	14	236	2.5	.13	1.6	1.5	C
810722	1351	26.82	38N28.90	112W50.40	5.24	-.2	8	220	1.2	.01	3.8	.8	D
810722	14 4	20.78	38N29.66	112W49.70	4.88	.7	10	264	1.7	.04	2.7	1.4	D
810722	1416	51.43	38N28.86	112W50.53	5.33	-.2	8	211	1.0	.01	4.0	.7	D
810722	1421	29.61	38N28.83	112W50.42	5.28	-.2	8	220	1.1	.01	3.9	.8	D
810722	1427	35.62	38N28.90	112W50.66	5.26	-.2	8	196	1.1	.01	4.3	.7	D
810722	1541	58.51	38N28.83	112W50.31	5.19	-.2	8	227	1.2	.01	3.8	1.0	D
810722	1553	59.04	38N28.81	112W50.31	5.05	.4	8	227	1.2	.02	3.6	.9	D
810722	15 5	50.58	38N28.93	112W50.51	5.26	-.2	8	212	1.2	.01	3.9	.7	D
810722	1638	35.20	38N28.66	112W49.66	4.94	-.2	10	266	1.8	.04	2.9	1.6	D
810722	1659	6.81	38N28.61	112W49.40	4.61	-.2	12	276	2.1	.05	2.0	1.5	D
810722	1715	22.97	38N28.93	112W50.41	5.36	-.2	8	219	1.3	.01	4.2	.9	D
810722	1738	57.95	38N28.80	112W50.41	5.39	-.2	8	221	1.0	.02	4.4	1.0	D
810722	1822	5.20	38N29.15	112W50.27	5.16	.9	16	210	1.7	.12	.9	.4	C
810722	1827	37.88	38N28.55	112W48.87	3.91	.4	12	291	2.9	.05	1.6	2.0	C
810722	1852	21.13	38N28.85	112W50.46	5.21	-.2	8	216	1.1	.01	3.9	.8	D
810722	19 7	13.32	38N28.81	112W50.25	5.17	-.2	8	232	1.2	.01	3.9	1.1	D
810722	19 7	32.43	38N28.90	112W50.89	5.21	-.2	8	169	1.0	.01	4.3	.5	C
810722	20 2	25.62	38N28.57	112W49.10	4.32	-.2	10	286	2.5	.07	2.5	2.3	D
810722	2025	46.52	38N28.52	112W49.04	4.00	.4	12	287	2.6	.06	1.6	2.0	C
810722	2038	7.93	38N28.50	112W48.85	4.33	.4	12	292	2.9	.05	2.0	2.2	C
810722	21 4	15.62	38N28.59	112W48.76	3.64	.9	12	294	3.0	.06	1.4	2.0	C
810722	21 9	14.21	38N28.86	112W50.47	5.34	-.2	8	216	1.1	.01	3.6	.7	D
810722	2326	34.93	38N28.92	112W50.89	5.57	-.2	8	169	1.1	.02	4.5	.5	C
810723	316	57.23	38N28.60	112W49.33	4.24	1.7	24	118	2.2	.40	.5	.5	C
810723	344	56.82	38N29.39	112W50.46	5.31	.9	20	201	.6	.20	.5	.3	C
810723	424	38.81	38N29.26	112W51.92	4.88	.4	10	189	2.3	.06	3.1	1.1	D
810723	5 6	45.48	38N28.85	112W50.57	5.34	-.2	8	208	1.0	.01	3.6	.6	D
810723	5 7	34.91	38N28.99	112W50.84	5.33	.4	10	175	1.2	.04	3.0	.4	C
810723	511	3.54	38N29.15	112W51.57	5.38	-.2	10	176	1.8	.04	3.3	.7	C
810723	519	18.40	38N28.89	112W50.15	5.15	.4	18	220	1.4	.10	1.0	.5	C
810723	533	33.98	38N28.67	112W49.83	5.10	-.2	8	258	1.6	.02	3.7	1.6	D
810723	6 6	1.73	38N28.87	112W50.68	5.40	-.2	8	194	1.0	.01	3.6	.5	D
810723	646	47.75	38N28.83	112W50.54	5.27	-.2	8	211	1.0	.01	3.8	.7	D
810723	7 9	31.53	38N28.97	112W50.17	5.13	.4	16	217	1.5	.10	1.0	.5	C
810723	725	32.30	38N28.89	112W50.64	5.36	-.2	8	199	1.1	.01	4.1	.6	D
810723	742	37.13	38N28.84	112W50.59	5.30	-.2	8	206	1.0	.01	3.8	.6	D
810723	743	58.16	38N28.90	112W50.76	5.34	-.2	8	184	1.0	.01	3.6	.5	D
810723	753	20.12	38N28.68	112W49.95	4.95	.9	22	142	1.4	.32	.5	.4	C

810723	841	47.95	38N28.60	112W49.52	4.71	.4	10	272	2.0	.04	2.4	1.5	D
810723	843	17.99	38N28.80	112W50.25	5.19	-.2	8	232	1.2	.01	3.7	1.0	D
810723	851	18.44	38N28.72	112W49.91	5.07	-.2	10	253	1.5	.03	2.7	1.1	D
810723	855	25.58	38N28.85	112W50.25	5.16	-.2	8	231	1.3	.01	4.0	1.1	D
810723	856	41.22	38N28.81	112W50.28	5.20	-.2	8	230	1.2	.01	3.7	1.0	D
810723	9 9	51.16	38N29.22	112W51.26	5.25	-.2	10	167	1.7	.06	3.2	.5	C
810723	911	46.66	38N29.05	112W50.35	5.09	-.2	12	209	1.5	.08	2.5	.7	D
810723	915	29.61	38N28.90	112W50.70	5.24	-.2	8	191	1.1	.01	4.1	.6	D
810723	953	4.99	38N28.91	112W49.54	4.74	.4	14	237	2.2	.09	1.9	1.2	C
810723	956	33.68	38N28.87	112W50.54	5.22	-.2	8	210	1.1	.01	4.1	.8	D
810723	1048	39.21	38N28.84	112W50.51	5.33	-.2	8	213	1.0	.01	4.0	.7	D
810723	1050	39.67	38N28.83	112W50.46	5.32	-.2	8	216	1.0	.01	3.6	.7	D
810723	1054	42.06	38N28.84	112W50.47	5.49	-.2	8	216	1.1	.02	4.0	.8	D
810723	1215	27.78	38N28.72	112W48.48	2.46	.9	24	121	3.5	.44	.5	2.1	C
810723	1219	29.96	38N28.85	112W50.32	5.21	-.2	9	226	1.2	.01	3.8	.9	D
810723	1220	44.94	38N30.33	112W49.23	3.50	1.7	17	146	2.2	.40	.9	1.0	C
810723	1357	41.92	38N29.02	112W50.30	5.07	-.2	12	212	1.5	.09	2.6	.8	D
810723	1421	54.98	38N28.89	112W50.45	5.19	-.2	6	216	2.1	.01	5.3	1.2	D
810723	1452	40.08	38N28.89	112W50.69	5.29	-.2	8	192	1.0	.01	3.6	.5	D
810723	15 8	22.28	38N28.86	112W50.45	5.23	-.2	8	217	1.1	.02	4.2	.9	D
810723	1515	25.81	38N28.81	112W50.55	5.16	-.2	8	210	1.0	.01	4.1	.8	D
810723	1539	40.90	38N28.66	112W49.94	4.36	-.2	8	253	1.4	.01	3.6	1.5	D
810723	1554	12.78	38N28.73	112W49.85	4.85	-.2	10	256	1.6	.02	2.8	1.3	D
810723	1616	35.60	38N28.57	112W50.32	5.17	.9	18	202	.9	.18	1.0	.5	C
810723	1626	3.86	38N28.95	112W50.94	5.51	-.2	8	164	1.1	.04	4.1	.4	C
810723	1647	15.66	38N28.87	112W50.64	5.12	.1	8	199	1.0	.02	3.7	.6	D
810723	1650	14.16	38N28.68	112W49.85	5.07	.4	10	257	1.6	.04	2.6	1.2	D
810723	1653	50.45	38N28.62	112W49.34	4.46	.4	10	278	2.2	.06	2.3	1.8	D
810723	1717	1.97	38N28.56	112W50.56	5.30	.9	19	200	.6	.19	.9	.4	C
810723	18 9	43.29	38N28.82	112W50.06	5.17	-.2	8	243	1.4	.02	3.8	1.3	D
810723	18 9	46.87	38N28.47	112W50.14	5.19	.9	14	216	1.0	.10	1.5	.6	C
810723	1816	23.14	38N28.52	112W50.25	5.22	.9	18	203	.9	.17	.9	.5	C
810723	1818	20.42	38N28.68	112W49.73	4.80	.1	10	262	1.7	.04	2.8	1.5	D
810723	1850	15.11	38N28.92	112W50.61	5.40	-.2	8	201	1.1	.02	4.5	.7	D
810723	1912	58.01	38N28.91	112W48.75	4.28	.9	14	252	3.2	.07	1.7	1.9	C
810723	1944	39.07	38N28.56	112W49.25	4.65	.4	10	262	2.3	.05	2.6	2.0	D
810723	2019	55.95	38N28.50	112W49.66	4.84	.9	22	117	1.7	.34	.6	.5	C
810723	2027	.14	38N28.59	112W49.37	4.61	.4	10	278	2.2	.05	2.5	1.8	D
810723	2028	36.76	38N28.83	112W50.47	5.21	-.2	8	216	1.1	.01	3.8	.8	D
810723	2111	51.39	38N28.95	112W50.85	5.26	-.2	8	174	1.1	.01	4.3	.5	C
810723	2128	42.61	38N28.51	112W50.56	5.10	.9	20	200	.5	.19	.7	.4	C
810723	2129	32.55	38N28.84	112W50.36	5.24	-.2	8	224	1.1	.01	3.8	.9	D
810723	2217	5.11	38N28.84	112W50.33	5.29	-.2	8	226	1.2	.01	3.8	.9	D
810723	2219	43.81	38N28.83	112W50.23	5.21	.9	8	233	1.3	.02	3.8	1.0	D
810723	2222	43.53	38N28.89	112W50.49	5.33	-.2	8	214	1.1	.01	3.9	.7	D
810723	2223	21.95	38N28.72	112W49.81	5.03	.4	10	258	1.6	.03	2.9	1.3	D
810723	2223	40.11	38N28.87	112W50.68	5.47	-.2	8	194	1.0	.02	4.9	.6	D
810723	2224	5.66	38N28.86	112W50.42	5.25	-.2	8	219	1.1	.01	3.9	.8	D
810723	2224	34.84	38N28.87	112W50.58	5.23	-.2	8	206	1.0	.01	4.2	.7	D
810723	2243	18.10	38N28.84	112W50.24	5.18	-.2	8	232	1.3	.01	3.7	1.0	D
810723	2320	57.53	38N28.80	112W50.09	5.17	-.2	8	242	1.4	.01	3.7	1.2	D
810723	2350	25.07	38N28.69	112W49.70	4.92	-.2	10	263	1.8	.03	2.9	1.5	D
810724	045	28.05	38N28.80	112W49.85	5.10	-.2	10	255	1.7	.03	3.0	1.3	D
810724	056	25.36	38N28.91	112W50.44	5.27	-.2	8	217	1.2	.01	3.7	.7	D
810724	117	19.38	38N28.87	112W50.62	5.28	-.2	8	201	1.0	.01	3.8	.6	D
810724	219	14.44	38N28.91	112W49.47	4.70	.7	14	239	2.2	.08	1.8	1.3	C
810724	226	23.46	38N28.86	112W50.69	5.27	-.2	8	193	1.0	.01	3.7	.5	D

810724	3 8	35.46	38N28.80	112W50.49	5.21	-.2	8	215	1.0	.02	3.7	.8	D
810724	311	29.60	38N28.96	112W51.07	5.46	-.2	8	169	1.2	.01	4.5	.4	C
810724	326	36.15	38N28.78	112W50.30	5.10	-.2	8	229	1.1	.02	3.7	1.0	D
810724	354	39.46	38N28.81	112W49.58	4.69	.4	12	239	2.0	.09	2.2	1.4	D
810724	558	36.52	38N28.96	112W50.99	5.46	-.2	8	164	1.2	.02	4.3	.4	C
810724	625	31.28	38N28.41	112W50.35	5.00	.9	18	202	.7	.18	.7	.4	C
810725	139	47.67	38N28.81	112W48.25	3.43	1.7	23	122	3.9	.39	.6	1.3	C
810725	140	44.47	38N28.66	112W49.37	4.51	.4	10	277	2.2	.05	2.5	1.8	D
810725	142	19.52	38N28.85	112W50.17	5.02	-.2	8	236	1.3	.01	4.3	1.3	D
810725	159	6.43	38N28.68	112W49.63	4.71	-.2	10	267	1.9	.04	3.0	1.8	D
810725	218	46.65	38N28.86	112W49.66	4.76	-.2	10	263	2.0	.04	2.8	1.5	D
810725	225	17.83	38N28.93	112W50.63	5.33	-.2	8	199	1.1	.01	4.3	.7	D
810725	236	59.80	38N28.51	112W49.00	4.01	.7	12	289	2.7	.05	1.9	2.1	C
810725	253	45.93	38N29.04	112W50.68	5.28	-.2	8	192	1.3	.01	4.4	.6	D
810725	3 1	52.56	38N28.84	112W50.06	5.01	-.2	8	243	1.5	.02	3.7	1.2	D
810725	4 1	52.63	38N28.87	112W50.29	5.13	-.2	8	228	1.3	.01	4.2	1.1	D
810725	4 2	54.50	38N28.64	112W49.32	4.49	-.2	10	279	2.3	.04	2.7	2.0	D
810725	422	33.11	38N28.80	112W50.34	5.05	-.2	6	226	2.0	.02	5.0	1.4	D
810725	511	4.70	38N28.68	112W50.11	5.14	-.2	10	243	1.2	.02	2.9	1.0	D
810725	518	3.93	38N28.87	112W50.57	5.29	-.2	8	207	1.1	.01	4.4	.8	D
810725	532	57.59	38N28.84	112W50.51	5.07	-.2	8	213	1.0	.01	4.0	.8	D
810725	540	59.14	38N28.66	112W49.86	4.91	-.2	10	257	1.5	.03	2.8	1.3	D
810725	6 9	59.44	38N28.75	112W50.08	5.02	-.2	8	243	1.3	.01	3.8	1.3	D
810725	610	46.83	38N28.70	112W49.36	4.61	-.2	10	276	2.2	.03	2.8	1.9	D
810725	611	17.57	38N28.93	112W50.31	5.22	-.2	8	226	1.3	.01	4.3	1.1	D
810725	617	27.46	38N28.91	112W50.42	5.25	-.2	6	219	2.1	.01	5.7	1.3	D
810725	622	19.69	38N29.07	112W49.88	5.19	.9	16	224	1.9	.09	1.0	.6	C
810725	636	44.68	38N28.91	112W50.41	5.19	-.2	8	219	1.2	.01	4.3	1.0	D
810725	646	33.58	38N28.55	112W49.94	4.97	-.2	11	223	1.4	.09	2.9	1.3	D
810725	653	20.88	38N28.87	112W50.50	5.28	-.2	8	213	1.1	.01	4.3	.9	D
810725	7 8	42.27	38N28.66	112W49.40	4.69	-.2	10	276	2.2	.04	2.9	1.9	D
810725	712	50.02	38N28.87	112W50.41	5.25	-.2	8	220	1.1	.01	4.1	.9	D
810725	8 0	53.97	38N28.68	112W49.39	4.68	-.2	10	276	2.2	.03	3.2	2.1	D
810725	8 2	9.37	38N28.65	112W49.09	4.34	.4	12	286	2.6	.05	1.9	1.8	D
810725	816	5.69	38N28.87	112W50.05	5.03	-.2	8	243	1.5	.01	4.3	1.5	D
810725	912	22.37	38N28.91	112W50.65	5.17	-.2	6	201	2.0	.01	5.8	.9	D
810725	914	49.21	38N28.73	112W49.62	6.21	-.2	8	266	1.9	.02	4.7	1.8	D
810725	932	51.49	38N28.86	112W50.33	5.18	-.2	8	226	1.2	.01	4.2	1.1	D
810725	934	33.76	38N28.93	112W50.65	5.25	-.2	6	201	2.0	.01	5.3	.9	D
810725	953	6.89	38N28.61	112W50.66	5.58	.4	14	199	.6	.18	2.4	.5	D
810725	1116	49.50	38N28.93	112W50.46	5.05	-.2	8	215	1.2	.01	4.0	.8	D
810725	1119	25.97	38N28.27	112W50.33	5.41	.4	12	210	.7	.12	2.7	.8	D
810725	1137	18.32	38N28.72	112W50.51	5.30	.9	19	200	.8	.15	.7	.4	C
810725	1220	35.53	38N29.27	112W50.96	5.25	-.2	12	161	1.1	.10	2.7	.4	C
810725	1240	27.11	38N28.92	112W50.73	5.32	-.2	8	187	1.1	.01	3.9	.5	D
810725	1327	36.29	38N28.94	112W50.73	5.38	-.2	8	187	1.1	.01	3.9	.5	D
810725	1355	43.75	38N28.88	112W50.55	5.21	-.2	8	208	1.1	.01	4.6	.8	D
810725	1415	2.44	38N28.62	112W48.88	4.18	.9	12	291	2.9	.05	2.1	2.2	C
810725	1416	42.15	38N28.87	112W50.25	5.26	-.2	8	231	1.3	.01	3.9	1.0	D
810725	1427	37.96	38N28.94	112W50.43	5.19	-.2	8	217	1.3	.01	3.5	.7	D
810725	1656	57.59	38N28.46	112W49.36	3.72	.4	13	238	2.2	.11	1.6	1.6	C
810725	18 7	29.41	38N28.08	112W50.11	4.97	.9	16	215	1.2	.15	1.0	.6	C
810725	19 5	16.13	38N28.93	112W50.42	5.34	-.2	8	219	1.2	.01	3.6	.7	D
810725	19 5	47.28	38N28.91	112W50.44	5.37	-.2	8	217	1.2	.01	3.7	.7	D
810725	1919	32.71	38N28.96	112W50.61	5.31	-.2	8	201	1.2	.01	3.6	.6	D
810725	2019	34.75	38N28.89	112W50.43	5.33	-.2	8	218	1.2	.01	3.7	.7	D
810725	2049	49.06	38N28.85	112W50.21	5.15	-.2	8	234	1.3	.01	4.4	1.2	D

810725	2124	17.30	38N28.27	112W50.61	5.22	.9	19	200	.3	.17	.7	.4	C
810725	2155	6.09	38N28.91	112W50.63	5.33	-.2	8	199	1.1	.01	3.8	.6	D
810725	22 5	57.57	38N28.85	112W50.45	5.26	.9	20	200	1.1	.18	.7	.4	C
810725	2237	26.37	38N28.65	112W49.57	4.90	.4	10	270	1.9	.04	2.5	1.5	D
810725	2240	31.70	38N28.95	112W50.83	5.20	-.2	8	176	1.1	.01	3.9	.5	C
810725	2259	51.04	38N28.56	112W50.76	5.41	.9	16	192	.4	.21	1.9	.5	C
810725	23 2	21.64	38N28.51	112W48.96	4.03	.4	12	289	2.7	.05	1.8	2.0	C
810725	2327	34.12	38N28.63	112W49.49	4.76	.4	10	273	2.0	.04	2.7	1.7	D
810725	2328	44.36	38N28.85	112W50.26	5.08	-.2	8	230	1.3	.01	3.6	1.0	D
810725	2358	11.37	38N28.62	112W50.25	5.04	.9	14	236	1.0	.08	.6	.4	C
810726	151	13.06	38N28.79	112W50.40	5.14	.4	8	222	1.0	.01	3.4	.7	D
810726	217	41.44	38N28.84	112W50.30	5.06	-.2	8	228	1.2	.02	3.4	.9	D
810726	235	14.52	38N28.85	112W50.45	5.22	-.2	8	217	1.1	.01	3.5	.7	D
810726	245	17.08	38N28.39	112W49.71	4.84	.4	16	209	1.6	.19	1.7	1.0	C
810726	330	42.76	38N29.12	112W50.21	5.13	.9	16	213	1.7	.12	.8	.4	C
810726	635	15.30	38N28.96	112W50.89	5.29	-.2	6	182	2.0	.01	4.7	.5	D
810726	728	16.36	38N28.88	112W50.50	5.26	-.2	8	213	1.1	.01	4.3	.9	D
810726	938	47.16	38N28.87	112W50.56	5.27	-.2	8	208	1.0	.01	3.7	.7	D
810726	944	9.23	38N28.90	112W50.52	5.02	-.2	8	211	1.1	.01	3.8	.7	D
810726	946	38.06	38N29.00	112W50.87	5.20	-.2	8	172	1.2	.01	4.1	.4	C
810726	10 3	4.75	38N28.81	112W50.18	5.06	-.2	8	236	1.3	.01	3.7	1.1	D
810726	10 8	39.10	38N28.73	112W51.21	5.32	.4	14	127	.9	.18	2.5	.3	C
810726	1311	32.97	38N28.90	112W50.70	5.22	-.2	6	197	2.0	.01	5.2	.8	D
810726	1345	46.30	38N28.88	112W50.43	5.19	-.2	8	218	1.2	.01	4.1	.9	D
810726	1445	3.39	38N28.84	112W50.42	5.08	-.2	8	219	1.1	.01	3.6	.8	D
810726	19 4	22.58	38N28.77	112W50.20	5.16	-.2	8	235	1.2	.02	4.2	1.3	D
810726	2229	33.49	38N29.07	112W51.46	5.07	-.2	6	198	2.2	.01	6.9	1.3	D
810727	056	28.18	38N28.77	112W50.14	4.99	-.2	8	239	1.3	.01	3.6	1.2	D
810727	110	31.54	38N28.89	112W50.52	5.17	-.2	6	212	2.0	.01	4.8	1.0	D
810727	156	36.33	38N28.80	112W50.20	5.08	-.2	8	235	1.3	.01	3.7	1.1	D
810727	244	24.09	38N28.88	112W50.43	5.21	-.2	8	218	1.1	.01	4.1	.9	D
810727	333	47.28	38N28.84	112W50.38	5.14	-.2	8	222	1.1	.01	4.0	1.0	D
810727	334	.85	38N28.80	112W50.34	5.00	-.2	8	226	1.1	.02	3.9	1.0	D
810727	354	51.14	38N28.94	112W50.70	5.20	-.2	6	197	2.0	.01	4.6	.7	D
810727	4 1	27.86	38N28.63	112W50.77	5.25	-.2	15	189	.6	.18	1.7	.4	C
810727	410	58.27	38N28.84	112W50.29	5.15	-.2	8	229	1.2	.01	3.8	1.0	D
810727	427	58.61	38N28.82	112W50.35	5.12	-.2	8	225	1.1	.01	3.5	.8	D
810727	521	31.98	38N28.80	112W50.36	5.01	-.2	8	224	1.1	.02	4.1	1.1	D
810727	526	5.73	38N29.16	112W48.33	2.62	1.7	18	120	3.9	.43	.6	1.8	C
810727	530	37.59	38N28.83	112W50.22	5.14	-.2	8	233	1.3	.02	3.6	1.0	D
810727	531	13.68	38N28.78	112W50.12	4.95	-.2	8	240	1.3	.01	3.4	1.1	D
810727	532	44.98	38N28.90	112W50.70	5.36	-.2	8	192	1.0	.01	4.2	.6	D
810727	535	32.34	38N29.24	112W50.13	5.10	.1	16	213	1.6	.12	.7	.4	C
810727	542	16.11	38N28.74	112W50.02	4.94	-.2	8	247	1.4	.01	3.6	1.3	D
810727	542	22.59	38N28.83	112W50.37	5.05	-.2	8	223	1.1	.01	4.2	1.1	D
810727	543	48.87	38N28.80	112W50.36	5.08	-.2	8	225	1.1	.01	4.0	1.0	D
810727	546	45.94	38N28.84	112W50.18	5.01	-.2	8	236	1.3	.01	3.9	1.1	D
810727	554	59.19	38N28.75	112W50.17	4.96	-.2	8	238	1.2	.01	3.6	1.1	D
810727	555	47.06	38N28.82	112W50.46	5.15	-.2	8	217	1.0	.02	4.2	.9	D
810727	557	10.45	38N28.85	112W50.36	5.19	-.2	8	224	1.2	.01	4.1	1.0	D
810727	6 0	7.88	38N28.17	112W50.31	5.12	-.2	12	210	.8	.14	2.8	1.0	D
810727	6 0	16.21	38N28.92	112W50.57	5.31	-.2	8	205	1.1	.01	4.2	.7	D
810727	6 9	2.64	38N28.83	112W50.49	5.13	-.2	8	215	1.0	.01	4.2	.9	D
810727	635	21.14	38N28.95	112W50.62	5.23	-.2	9	200	1.2	.01	4.3	.7	D
810727	636	15.62	38N28.84	112W50.49	5.15	-.2	9	214	1.1	.01	4.2	.9	D
810727	641	34.02	38N28.18	112W50.17	5.07	-.2	12	214	1.0	.13	2.6	1.1	D
810727	642	59.93	38N28.60	112W50.41	5.03	.4	18	201	.8	.19	1.0	.4	C

810727	653	19.78	38N28.91	112W50.36	5.12	-.2	8	223	1.3	.01	4.2	1.0	D
810727	654	35.55	38N28.29	112W48.71	3.41	.9	20	152	3.1	.31	.7	1.3	C
810727	657	47.30	38N28.79	112W51.14	5.34	-.2	14	138	.9	.18	2.5	.3	C
810727	658	7.07	38N28.74	112W49.07	3.69	.9	24	119	2.7	.44	.4	.7	C
810727	7 1	21.68	38N28.56	112W50.11	5.31	.4	16	204	1.1	.16	1.9	.8	C
810727	7 1	51.58	38N28.81	112W50.39	5.26	-.2	8	222	1.1	.01	3.8	.8	D
810727	7 4	56.29	38N28.67	112W49.52	4.97	-.2	12	271	2.0	.04	2.0	1.3	D
810727	7 8	40.85	38N28.83	112W50.48	5.12	-.2	6	215	1.9	.01	5.5	1.2	D
810727	712	44.20	38N29.75	112W50.15	4.83	-.2	10	239	1.2	.04	2.6	1.0	D
810727	719	36.98	38N28.87	112W50.40	5.14	-.2	8	220	1.2	.02	4.1	.9	D
810727	724	38.60	38N28.91	112W50.79	5.17	-.2	8	181	1.1	.01	3.6	.4	D
810727	728	25.21	38N28.82	112W50.40	5.29	-.2	8	221	1.1	.01	4.1	.9	D
810727	741	1.46	38N28.86	112W50.59	5.24	-.2	8	205	1.0	.02	4.3	.8	D
810727	741	27.32	38N28.89	112W50.43	5.00	-.2	6	218	2.1	.01	5.5	1.3	D
810727	752	48.70	38N28.70	112W50.59	5.10	-.2	16	199	.7	.18	1.1	.4	C
810727	818	16.64	38N28.61	112W49.56	4.47	-.2	10	271	1.9	.04	2.6	1.7	D
810727	844	35.68	38N28.84	112W50.19	5.06	-.2	8	235	1.3	.01	3.7	1.1	D
810727	918	5.29	38N28.66	112W50.25	5.21	.1	18	203	1.0	.18	1.0	.5	C
810727	918	28.53	38N28.91	112W50.71	5.24	-.2	8	191	1.1	.01	4.3	.6	D
810727	919	22.60	38N28.86	112W49.24	4.12	.4	20	146	2.5	.33	.7	.7	C
810727	940	12.50	38N28.78	112W50.32	5.02	-.2	8	227	1.1	.01	3.9	1.1	D
810727	941	42.23	38N28.87	112W50.30	5.17	-.2	8	227	1.2	.02	4.4	1.1	D
810727	10 8	46.42	38N28.11	112W50.17	5.01	-.2	16	214	1.1	.13	1.0	.6	C
810727	1011	27.90	38N28.92	112W51.62	5.27	.4	14	157	.7	.16	2.5	.5	C
810727	1012	24.27	38N28.27	112W50.12	5.27	.4	13	216	1.0	.12	1.8	.7	C
810727	1018	29.06	38N28.89	112W50.39	5.13	.1	8	221	1.2	.01	3.7	.8	D
810727	1023	32.69	38N28.58	112W51.61	5.43	.4	14	161	1.2	.19	2.4	.4	C
810727	1029	27.61	38N28.86	112W50.44	5.08	.9	17	201	1.1	.14	.7	.4	C
810727	1030	7.75	38N28.85	112W50.40	5.17	.4	8	221	1.1	.02	3.6	.8	D
810727	1030	23.06	38N27.90	112W49.98	4.74	.4	14	218	1.5	.16	1.8	1.1	C
810727	1034	53.00	38N28.81	112W50.32	5.11	.1	8	227	1.1	.02	3.6	.9	D
810727	1044	15.12	38N28.81	112W50.36	5.11	-.2	8	224	1.1	.01	4.0	1.0	D
810727	1044	24.57	38N28.79	112W50.38	5.15	-.2	8	223	1.1	.02	3.7	.9	D
810727	1115	20.71	38N28.51	112W50.30	5.17	.9	18	203	.8	.18	.9	.4	C
810727	1130	13.78	38N28.83	112W50.17	5.06	-.2	8	236	1.3	.01	4.1	1.3	D
810727	1212	46.43	38N29.04	112W49.89	5.53	-.2	12	224	1.9	.06	1.1	.6	C
810727	1232	51.44	38N28.82	112W50.35	5.20	-.2	8	225	1.1	.02	3.9	.9	D
810727	1328	15.65	38N28.54	112W50.23	5.18	.0	18	203	.9	.20	.7	.4	C
810727	1428	15.65	38N28.54	112W50.23	5.18	.9	18	203	.9	.20	.7	.4	C
810727	1443	56.17	38N28.88	112W50.46	5.39	-.2	8	216	1.1	.02	4.0	.8	D
810727	1457	52.74	38N28.74	112W49.82	5.06	-.2	8	257	1.6	.02	4.0	1.7	D
810727	15 8	40.96	38N27.98	112W49.13	4.24	.4	14	237	2.6	.14	2.0	2.0	C
810727	1519	59.39	38N28.59	112W50.54	4.56	.9	18	200	.6	.26	.7	.4	C
810727	1520	56.91	38N28.73	112W49.80	4.99	-.2	8	258	1.7	.01	3.6	1.6	D
810727	1528	10.53	38N28.87	112W50.36	5.23	-.2	8	223	1.2	.01	3.6	.8	D
810727	1541	29.78	38N28.86	112W50.81	5.20	.4	13	179	1.0	.17	2.5	.4	C
810727	1548	35.96	38N28.75	112W49.83	4.84	.4	8	256	1.6	.01	3.5	1.5	D
810727	1555	21.14	38N28.77	112W50.10	4.96	-.2	8	241	1.3	.01	3.8	1.3	D
810727	1615	19.44	38N28.74	112W50.04	4.88	-.2	8	246	1.4	.02	3.5	1.3	D
810727	1616	44.65	38N28.80	112W50.49	5.31	-.2	8	215	1.0	.01	4.1	.8	D
810727	1618	52.91	38N28.94	112W49.89	4.94	.7	16	236	1.8	.22	1.6	.9	C
810727	1631	3.33	38N28.88	112W50.54	5.16	-.2	8	210	1.1	.01	4.1	.8	D
810727	1644	31.58	38N28.72	112W50.06	5.22	-.2	8	245	1.3	.02	4.2	1.5	D
810727	17 0	41.90	38N28.69	112W49.80	5.00	.1	8	259	1.6	.01	3.6	1.6	D
810727	1714	37.43	38N28.79	112W50.20	5.15	-.2	8	235	1.2	.01	3.4	.9	D
810727	1718	24.94	38N29.76	112W50.18	5.17	-.2	8	237	1.2	.01	3.5	1.0	D
810727	1725	39.90	38N28.65	112W50.33	5.30	.9	18	202	.9	.21	.7	.4	C

810727	1732	27.48	38N28.73	112W49.93	5.09	-.2	8	252	1.5	.01	3.8	1.5	D
810727	1738	38.05	38N28.77	112W50.03	5.26	-.2	8	246	1.4	.01	3.8	1.3	D
810727	1758	53.28	38N28.84	112W50.24	5.11	-.2	8	232	1.3	.01	3.7	1.0	D
810727	1833	32.55	38N28.81	112W50.27	5.24	-.2	6	230	2.1	.01	4.8	1.3	D
810727	1834	20.91	38N28.82	112W50.19	5.16	-.2	8	235	1.3	.01	4.0	1.2	D
810727	1837	10.19	38N28.90	112W50.47	5.26	-.2	8	215	1.2	.01	4.1	.8	D
810727	1843	38.70	38N29.02	112W50.94	5.27	-.2	8	164	1.3	.01	4.2	.4	C
810727	1912	19.15	38N28.78	112W50.42	5.15	-.2	8	220	1.0	.02	4.0	.9	D
810727	1931	54.84	38N29.21	112W50.34	6.16	-.2	8	223	1.7	.02	4.6	.8	D
810727	2021	40.37	38N28.95	112W50.43	5.37	-.2	6	217	2.2	.01	4.8	1.0	D
810727	2034	37.87	38N28.88	112W50.48	5.30	-.2	8	214	1.1	.01	4.1	.8	D
810727	2034	43.66	38N28.82	112W50.25	5.09	-.2	8	231	1.2	.01	4.0	1.1	D
810727	2038	27.64	38N28.98	112W50.74	5.27	-.2	6	194	2.1	.01	4.7	.6	D
810727	2115	16.51	38N29.12	112W50.75	5.05	-.2	8	134	1.4	.02	3.7	.5	D
810727	2115	44.92	38N28.94	112W51.23	5.13	.4	14	134	1.0	.18	2.5	.4	C
810727	22 4	45.21	38N28.88	112W50.50	5.22	-.2	6	213	2.0	.01	4.6	1.0	D
810727	22 4	53.93	38N28.86	112W50.46	5.17	-.2	8	216	1.1	.01	4.2	.9	D
810727	22 8	50.63	38N28.80	112W50.20	5.36	-.2	8	235	1.3	.01	3.9	1.0	D
810727	2240	47.18	38N28.97	112W50.77	5.43	-.2	8	183	1.2	.01	4.3	.5	D
810728	652	43.75	38N28.72	112W49.85	5.36	-.2	8	256	1.6	.01	4.5	1.8	D
810728	743	29.27	38N28.81	112W51.15	5.45	-.2	15	138	1.0	.17	2.4	.3	C
810728	1035	23.57	38N29.80	112W50.43	5.26	-.2	8	220	1.0	.01	4.1	.9	D
810728	1035	32.19	38N28.86	112W50.61	5.34	-.2	8	203	1.0	.01	4.1	.7	D
810728	1052	32.97	38N28.85	112W50.41	5.43	-.2	8	220	1.1	.02	4.7	1.0	D
810728	1225	50.64	38N28.31	112W50.13	5.04	.9	18	205	1.0	.18	.9	.5	C
810728	1232	51.40	38N28.90	112W50.64	5.44	-.2	8	198	1.1	.01	3.8	.5	D
810728	1237	31.78	38N28.92	112W50.44	5.29	-.2	8	217	1.2	.01	3.7	.7	D
810728	1258	46.90	38N28.89	112W50.55	5.60	-.2	8	213	1.1	.02	4.4	.8	D
810728	1314	44.54	38N28.92	112W50.54	5.29	-.2	9	209	1.2	.01	4.3	.8	D
810728	1357	37.39	38N28.82	112W50.37	5.12	.4	8	224	1.1	.01	3.7	.9	D
728	1426	39.65	38N28.60	112W49.54	5.18	-.2	6	272	2.6	.02	5.1	2.7	D
810728	1526	26.03	38N28.46	112W49.65	4.82	.9	16	209	1.7	.17	1.6	1.1	C
810728	1551	6.19	38N28.79	112W50.30	5.24	-.2	8	229	1.1	.01	3.7	.9	D
810728	1642	41.69	38N28.76	112W50.24	5.12	-.2	9	233	1.2	.02	3.7	1.0	D
810728	1732	51.44	38N28.81	112W50.34	5.14	-.2	8	226	1.1	.01	3.7	.9	D
810728	1735	26.09	38N28.86	112W50.54	5.44	-.2	8	210	1.1	.01	4.2	.8	D
810728	1758	45.22	38N28.84	112W50.66	5.53	-.2	8	198	1.0	.01	4.5	.7	D
810728	1827	57.08	38N28.46	112W50.23	5.23	.7	16	203	1.6	.19	1.0	.6	C
810728	1852	48.75	38N28.78	112W50.54	5.24	-.2	8	212	.9	.02	4.3	.9	D
810728	1931	1.19	38N28.53	112W48.88	4.02	.1	10	291	2.9	.06	2.6	2.8	C
810728	1931	34.68	38N28.53	112W49.70	4.97	.9	16	208	1.7	.19	1.5	.9	C
810728	1932	17.33	38N28.85	112W50.35	5.32	-.2	8	224	1.2	.01	3.9	.9	D
810728	2043	40.30	38N28.89	112W50.67	5.34	-.2	8	196	1.0	.01	4.1	.6	D
810728	21 5	52.99	38N28.89	112W49.99	5.22	.9	16	225	1.5	.10	1.0	.5	C
810729	527	55.33	38N28.80	112W50.24	5.38	-.2	8	233	1.2	.01	3.7	1.0	D
810729	650	37.36	38N28.69	112W49.98	5.09	-.2	8	250	1.4	.02	3.4	1.3	D
810729	653	39.41	38N29.00	112W50.82	5.29	-.2	8	177	1.2	.01	4.2	.5	C
810729	815	45.92	38N28.87	112W50.35	5.56	-.2	8	224	1.2	.01	4.5	1.0	D
810729	946	47.98	38N28.79	112W50.13	5.40	-.2	8	239	1.3	.01	3.4	1.0	D
810729	1018	22.51	38N28.74	112W50.24	5.46	-.2	8	234	1.1	.01	4.2	1.1	D
810727	2256	3.46	38N28.80	112W50.28	5.54	-.2	8	230	1.2	.02	4.7	1.2	D
810802	1438	46.14	38N28.75	112W49.87	4.96	-.2	8	255	1.6	.01	3.7	1.5	D
810802	1718	6.46	38N28.48	112W50.15	5.28	.9	18	204	1.0	.23	.8	.5	C
810802	1747	19.39	38N28.41	112W49.78	5.10	.9	15	226	1.5	.29	1.0	.6	C
810802	2033	17.09	38N28.75	112W50.04	5.20	.1	8	246	1.4	.01	3.7	1.3	D
810802	2035	58.12	38N28.74	112W49.93	4.89	-.2	8	252	1.5	.01	4.0	1.7	D
810802	2039	10.03	38N28.69	112W50.28	5.25	.9	18	202	1.0	.22	.7	.4	C

810802	2141	34.65	38N28.93	112W51.78	5.25	.9	14	173	.7	.20	2.3	.6	C
810802	2141	52.85	38N28.94	112W51.73	5.31	.4	14	170	.7	.19	2.3	.5	C
810804	2222	32.12	38N28.16	112W49.08	3.38	.7	13	215	2.6	.17	1.0	1.7	C
810806	318	15.64	38N27.76	112W51.45	5.32	-.2	8	176	.6	.02	3.5	.4	C
810806	329	21.91	38N27.78	112W51.01	5.04	-.2	8	241	.2	.02	3.9	.7	D
810806	551	29.86	38N28.74	112W50.12	5.16	-.2	8	241	1.3	.01	3.3	1.1	D
810806	636	37.79	38N28.74	112W50.17	5.34	-.2	8	238	1.2	.01	4.4	1.3	D
810806	845	49.38	38N28.86	112W50.55	5.24	-.2	8	210	1.0	.02	4.4	.8	D
810806	847	32.49	38N28.60	112W49.37	4.59	.4	10	278	2.2	.04	2.3	1.6	D
810806	928	46.99	38N27.68	112W50.77	4.91	-.2	8	264	.6	.01	3.8	1.0	D
810809	9 9	35.98	38N28.81	112W50.58	5.40	-.2	6	208	1.8	.01	5.1	1.0	D
810809	910	22.24	38N28.85	112W50.51	5.26	-.2	6	213	2.0	.01	5.0	1.1	D
810809	911	47.29	38N28.79	112W50.61	5.30	-.2	6	206	1.8	.01	4.6	.8	D
810809	915	11.46	38N28.83	112W50.62	5.41	-.2	6	205	1.9	.00	5.2	.9	D
810809	916	34.06	38N28.82	112W50.54	5.46	-.2	8	212	1.0	.00	3.6	.7	D
810809	921	30.05	38N28.83	112W50.65	5.45	-.2	8	199	.9	.01	4.0	.7	D
810809	929	13.14	38N28.76	112W50.41	5.24	-.2	8	222	1.0	.02	3.6	.9	D
810809	10 6	40.76	38N28.84	112W50.65	5.33	-.2	8	199	1.0	.01	4.0	.6	D
810809	1040	37.37	38N28.82	112W50.63	5.43	-.2	8	202	.9	.02	4.4	.7	D
810809	1057	57.73	38N28.83	112W50.59	5.35	-.2	8	206	1.0	.01	3.7	.6	D
810809	1137	31.65	38N28.84	112W50.67	5.40	-.2	8	196	1.0	.00	3.9	.6	D
810809	1151	23.48	38N28.77	112W50.46	5.28	-.2	8	218	1.0	.01	3.8	.8	D
810809	1228	.15	38N28.79	112W50.60	5.35	-.2	8	207	.9	.01	3.4	.6	D
810809	1350	46.25	38N28.75	112W50.36	5.22	-.2	8	225	1.0	.01	3.3	.8	D
810809	1528	30.03	38N28.61	112W49.85	5.01	-.2	10	258	1.5	.02	2.7	1.2	D
810809	2342	40.44	38N28.03	112W50.21	4.87	-.2	12	212	1.1	.15	2.4	1.0	D
810810	635	27.38	38N28.60	112W50.70	5.30	-.2	14	198	.5	.16	2.3	.5	C
810810	716	25.15	38N28.79	112W50.28	5.04	-.2	8	230	1.2	.01	3.4	.9	D
810810	730	23.68	38N28.77	112W50.26	4.98	-.2	8	232	1.2	.02	3.3	.9	D
810810	738	32.80	38N28.60	112W50.42	5.08	-.2	16	201	.5	.19	1.8	.6	C
810810	749	52.29	38N28.56	112W49.57	4.26	-.2	19	117	1.9	.39	.5	.6	C
810810	810	20.66	38N27.41	112W52.11	5.76	.0	18	145	.5	6.22	.7	.4	D
810810	926	35.49	38N29.18	112W50.52	4.88	.4	12	198	1.6	.08	1.0	.4	C
810810	1024	10.24	38N28.77	112W50.06	5.07	-.2	8	244	1.4	.02	3.5	1.2	D
810810	1146	1.45	38N28.78	112W50.20	5.16	-.2	8	236	1.2	.01	3.9	1.2	D
810810	1212	26.69	38N28.77	112W49.07	2.51	-.2	20	119	2.7	.46	.5	1.7	C
810810	1257	17.48	38N28.89	112W50.61	5.34	-.2	8	202	1.1	.01	3.9	.6	D
810810	1355	58.54	38N28.71	112W49.84	4.92	.9	22	115	1.6	.31	.5	.4	C
810810	1427	29.34	38N28.93	112W50.81	5.33	-.2	8	179	1.1	.01	4.2	.5	C
810810	1537	7.85	38N28.61	112W50.75	5.49	.4	14	193	.5	.16	2.4	.5	C
810810	1620	23.24	38N28.95	112W51.22	5.35	-.2	8	179	1.3	.01	4.0	.5	C
810810	22 6	50.50	38N28.90	112W50.76	5.18	-.2	8	184	1.0	.01	3.5	.4	D
810811	0 6	45.55	38N28.91	112W50.80	5.31	-.2	8	180	1.1	.01	4.2	.5	C
810811	2 9	12.40	38N28.92	112W50.54	5.13	-.2	6	210	2.1	.01	4.6	.9	D
810811	642	47.38	38N28.91	112W50.73	5.25	-.2	8	188	1.1	.01	4.3	.6	D
810812	1518	.17	38N29.23	112W50.29	5.56	.4	12	211	.8	.15	2.4	.8	D
810812	1551	10.44	38N28.32	112W49.46	4.90	.4	14	233	2.0	.13	1.6	1.2	C
810812	1551	19.77	38N29.11	112W50.26	5.40	-.2	8	228	1.7	.01	4.4	1.0	D
810812	1551	37.67	38N29.19	112W50.61	5.61	-.2	8	197	1.6	.03	4.9	.7	D
810812	1714	43.89	38N28.86	112W50.06	5.81	.4	16	204	1.5	.16	1.8	.7	C
810812	1729	32.02	38N28.29	112W49.37	4.86	-.2	14	235	2.1	.13	1.9	1.4	C
810812	1833	55.20	38N29.25	112W49.70	5.25	.1	12	225	2.2	.09	2.5	1.2	D
810812	1834	2.87	38N29.22	112W49.74	5.17	-.2	12	224	2.2	.08	2.4	1.1	D
810812	1834	29.50	38N28.41	112W49.13	4.83	.1	14	242	2.5	.13	1.7	1.5	C
810812	1836	30.57	38N29.16	112W50.57	5.47	-.2	8	201	1.6	.01	3.9	.6	D
810812	1836	41.01	38N29.13	112W50.71	5.53	-.2	8	187	1.6	.01	4.2	.5	D
810812	1846	16.86	38N29.30	112W50.77	5.21	-.2	8	181	1.5	.01	4.6	.5	D
810812	22 1	19.38	38N28.85	112W50.47	5.58	.9	20	200	1.1	.21	.5	.3	C
810812	22 3	26.41	38N28.99	112W50.13	5.39	.7	16	203	1.6	.18	1.9	.7	C
810812	23 3	24.41	38N28.78	112W49.89	5.18	.4	16	206	1.6	.19	1.7	.9	C
810817	1118	32.87	38N29.06	112W50.84	5.16	-.2	12	175	1.3	.09	2.3	.4	C
810817	1443	15.96	38N28.90	112W50.91	5.11	-.2	8	167	1.0	.01	3.6	.4	C
810818	229	36.29	38N29.45	112W48.78	5.95	-.2	10	296	3.1	.05	3.6	2.2	D
810823	427	40.89	38N28.91	112W50.53	5.33	-.2	8	210	1.1	.01	4.1	.7	D
810828	1443	50.74	38N24.35	112W48.40	8.84	.7	20	243	7.6	.15	1.0	1.3	C