

INTER-OFFICE MEMORANDUM

SUBJECT: Microearthquake Monitoring in the Black Mountains, DATE May 24, 1976  
Iron County, Utah

TO: W. M. Dolan, H. J. Olson, J. Roth, G/T Staff

FROM: A. L. Lange

-----

The Amax Dual-channel seismograph was operated outdoors on volcanic outcrops in the Black Mountains during 14 days between 29 April and 13 May 1976. In 1973 seven major earthquakes occurred within 15km of the site. Records from Amax stations farther north in the Mineral Range earlier had detected events that might have emanated from the Black Mountains; hence, this station was established for corroboration (cf., my memo dated 7 May 1976). Again two seismometers were employed having a separation of about 150m. John Deymonaz was the operator.

Findings

During the 14 days of monitoring, 48 events having S-P time intervals of less than 10 seconds were detected, corresponding to activity within a radius of 75km. More distant regional events and worldwide teleseisms were also seen, but these are easily distinguished from the local events, and are not considered here. Some of the larger local events are duplicated in Figure 2.

Epicentral distances were calculated as in my previous memo; i.e., by assuming that the foci lie at a depth of 5km, and that the ground consists of an upper layer 1.7km-thick of 3.4km/sec. material, and a lower layer of 6.0km/sec. material, resulting in a mean P-wave velocity of 4.8km/sec. In Figure 1, the distribution of events with distance is shown by the upper graphs. Actually the distribution should be drawn as a suite of concentric circles, but for simplicity of portrayal, the bar graph suffices. The distribution is plotted along the lines of the charts of the previous memo for ready comparison with those data. The yellow graph shows the events as though all originated from the southwest; the green, as though they all came from the northeast. The blue and violet inverted graphs reproduce the distributions plotted north and south of Minersville, as logged from the stations in the Mineral Range, and discussed in the 7 May memo.

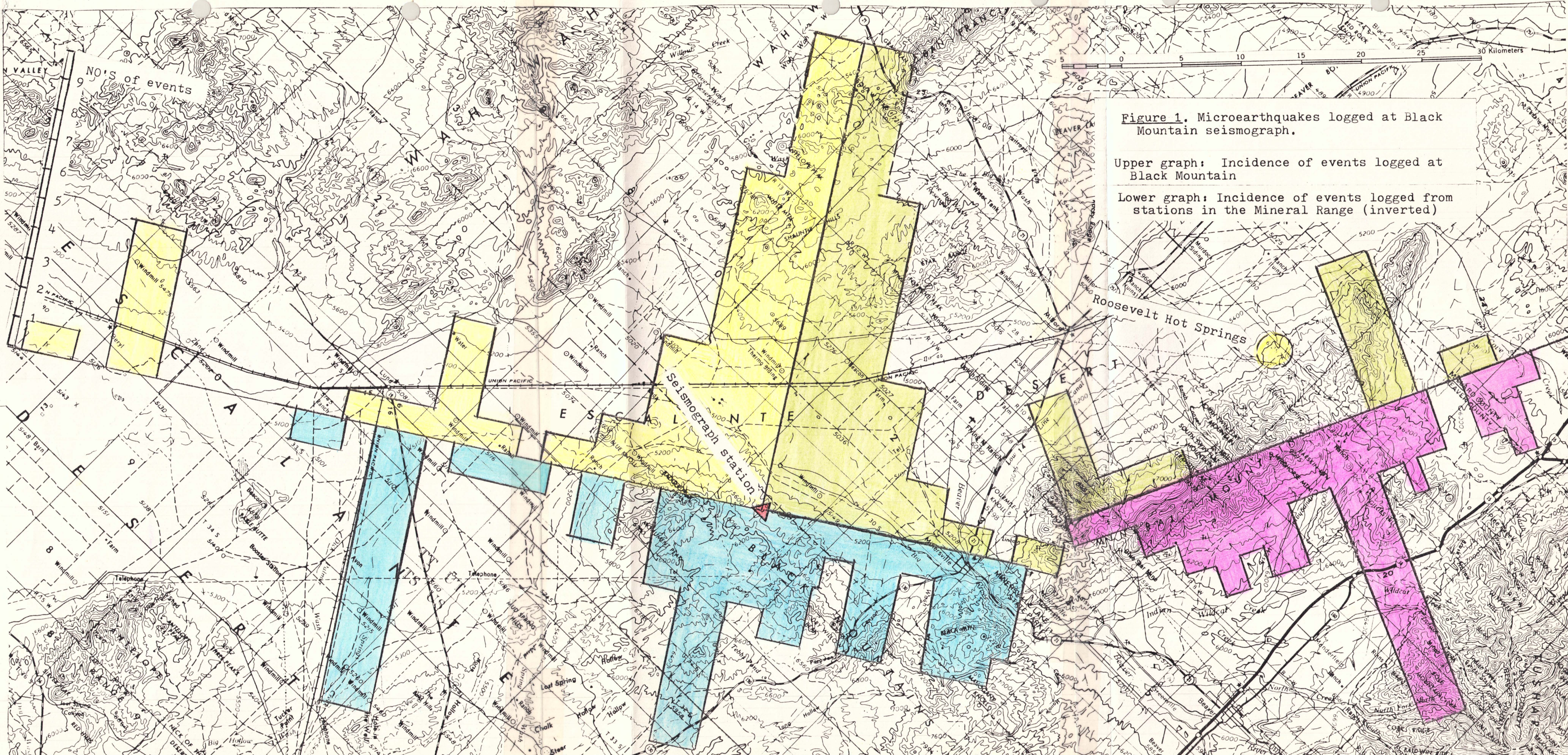


Figure 1. Microearthquakes logged at Black Mountain seismograph.

Upper graph: Incidence of events logged at Black Mountain

Lower graph: Incidence of events logged from stations in the Mineral Range (inverted)

Roosevelt Hot Springs

Seismograph station

NO'S of events

1  
2  
3  
4  
5  
6  
7  
8  
9

0 5 10 15 20 25 30 Kilometers

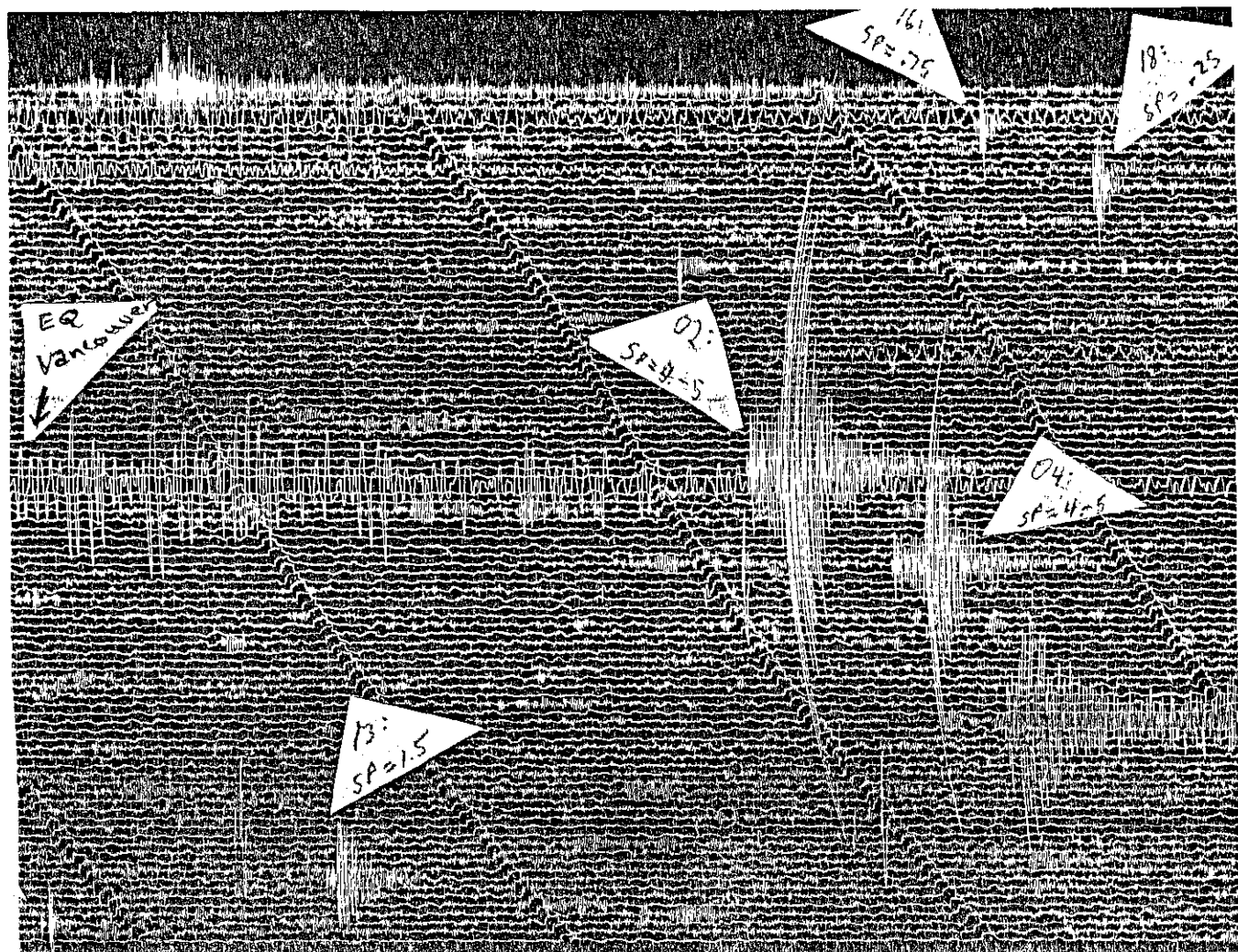
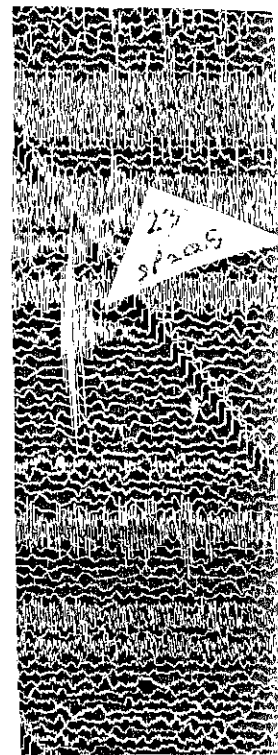
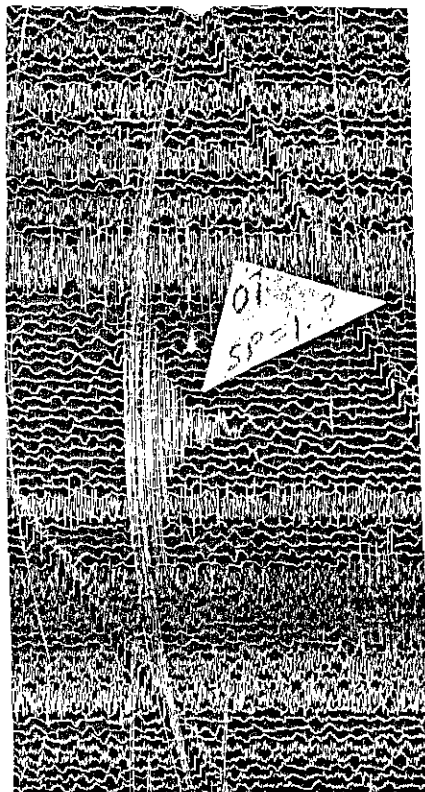
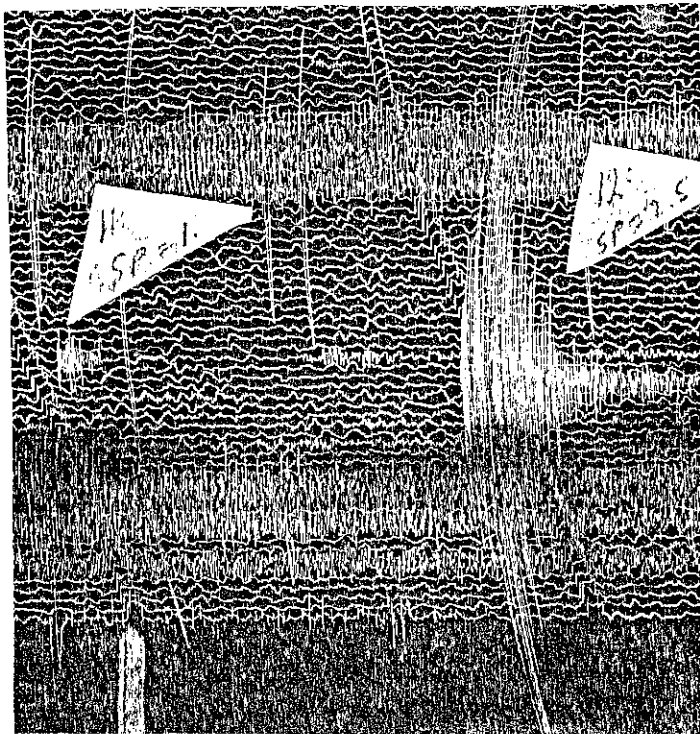


Figure 2. Typical local microearthquakes observed at Black Mountain and a teleseism from Vancouver, B.C. Approximate hour and S-P time shown.

### Interpretation

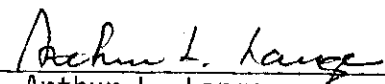
The high incidence of seismicity in the vicinity of the Black Mountain site demonstrates that the area is indeed active, and that some of the events observed earlier from the Minerals, probably originated here. This is the area in which Thermex found sufficient seismicity in 1973 to justify leasing. A few events fall also around the radii, of Lund and Beryl, but they might have just as well come from the northeast; that is, from the southern Minerals or Roosevelt areas. Our previous observations showing seismicity in the vicinity of Roosevelt Hot Springs has been confirmed by a simultaneous Senturion Sciences' survey that located some of the same events.

### Conclusions and recommendations

The observed seismicity rate of about 3 events per day in the Black Mountains seems adequate for a microearthquake survey, since outlying stations of such a survey would no doubt pick up events not detectable from our site. Such a survey would permit the mapping of active structures between Minersville and Lund. The existence of seismicity at Black Mountain, as well as around Roosevelt, may relate to the presence of geothermal fluids lubricating these structures, or fluids undergoing phase changes in a reservoir.

### Ongoing Work

The seismograph is presently operating in the Rowley Mine north of Dog Valley, and will shortly be installed in the White Hope Mine of Twin Peaks, north of the Mineral Range. Plans include another monitoring episode in the Salt Cove mine, near Roosevelt Hot Springs.

  
Arthur L. Lange

ALL:d