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Leveling Data from the Epicentral Area of the March 27, 1975, Earthquake in Pocatello Valley, Idaho

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Introduction

The epicentral area of the March 27, 1975, magnitude-6.0 earthquake in Pocatello Valley, Idaho, is traversed by a line of benchmarks established by the U.S. Geological Survey (USGS) in 1966 and releveled in July 1975 (fig. 1). The elevations determined by those two surveys are presented in table 1 of this report; they define a widespread area of subsidence generally centered over the epicentral region (fig. 2). Maximum relative subsidence along the line is 13 cm. Because no tectonic ground ruptures were associated with the earthquake, the origin of the inflection in the trends of elevation changes in the vicinity of benchmark 3FMK in the southwest part of the valley is unclear at present. No inflection is evident where the line enters the Samaria Mountains in the vicinity of the fault-bounded, geomorphically youthful, eastern margin of Pocatello Valley, described by Platt (1975).

Abstracts of papers describing the seismological and surface effects of the earthquake have been published by Arabasz and others (1975), Cook and Nye (1975), and Kaliser (1975); a brief report of the earthquake is given by Rogers, Langer, and Bucknam (1975).

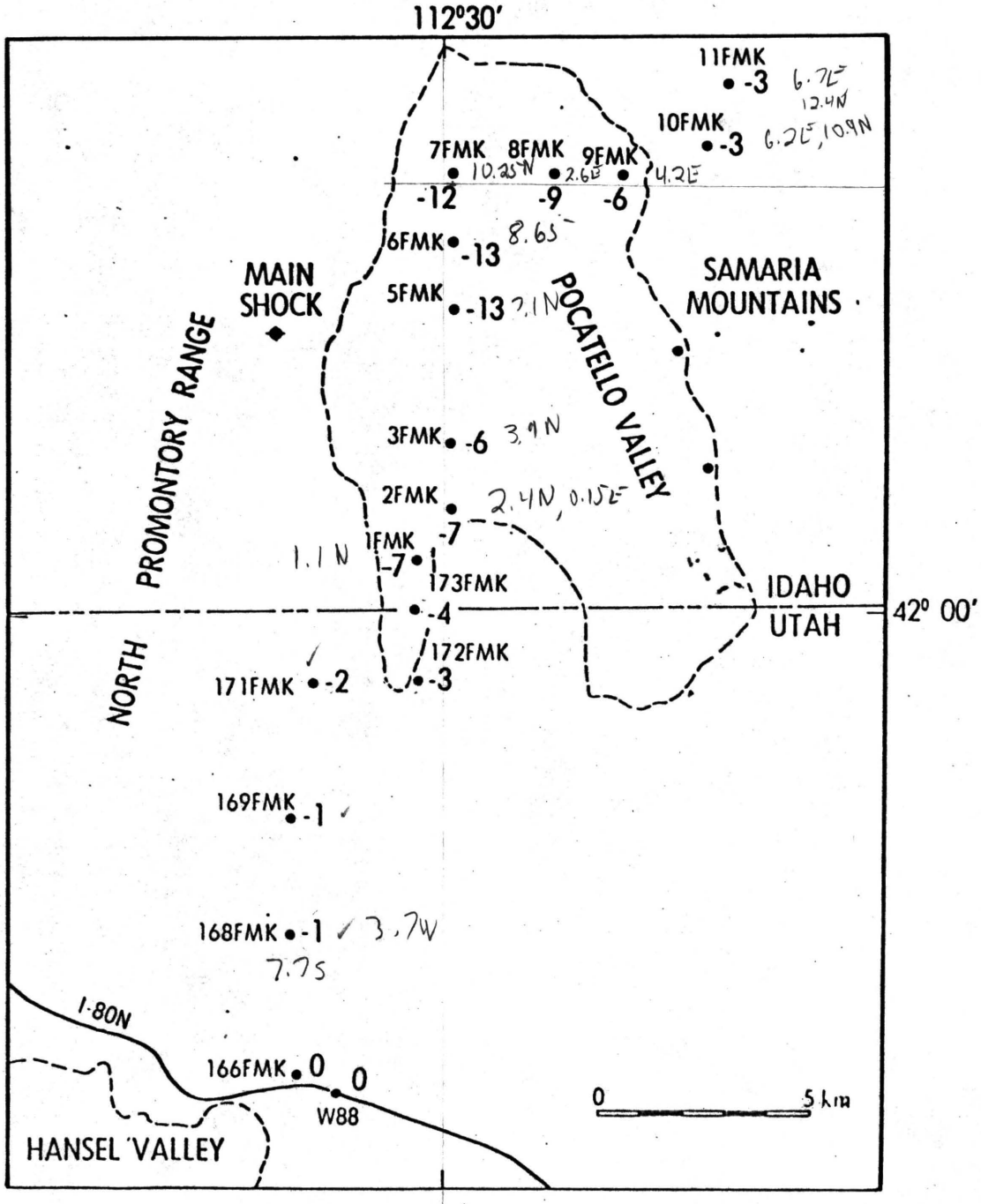

Figure 1.--Index map to level-line stations of the 1966 and 1975 surveys in the Pocatello Valley, Idaho-Utah. area. W88 and FMK are benchmark designations; adjacent numbers give the elevation change between the two surveys in centimetres, with station W88 held fixed. Main shock location from Arabasz and others (1975).

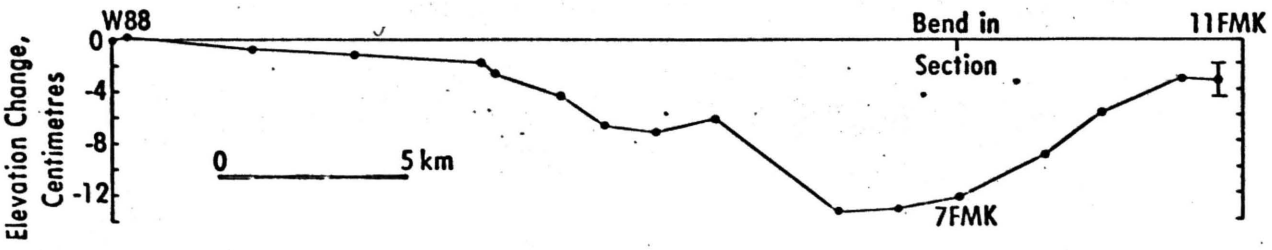

Figure 2.--Profile of elevation changes occurring between the 1966 and 1975 surveys of the Pocatello Valley, Idaho-Utah, area. W88 and FMK are benchmark designations, and changes are relative to W88, which was held fixed.

Leveling data

Benchmarks established in the USGS 1966 survey extended between two second-order National Geodetic Survey (NGS) level lines. The 1975 releveling by topographic engineers of the USGS extended from benchmark W88 on the southerly NGS line at Interstate Highway 80N northward through Pocatello Valley and into the Samaria Mountains east of the valley (fig. 1).

Both the 1966 and 1975 surveys were run forward and backward; closures for the 1966 survey were within second-order limits and closures for the 1975 survey were within first-order limits.

Table 1 lists unadjusted elevations for the two surveys. Elevations for the 1975 survey are relative to NGS benchmark W88, which was arbitrarily held fixed. Grids about 1.5 km on a side were installed in the epicentral area in the 1975 survey to provide a means of determining possible subsequent tilting in the epicentral area.

Error bars on the profile (fig. 2) represent one standard deviation for the determination of the relative change between the ends of the releveled portion of the line. The standard deviation of ±1.2 cm was calculated, in the manner described by Savage and Church (1974), from the closures of forward and backward levelings of the intervals between monuments.

Table 1.--Pocatello Valley, Idaho elevations

Benchmark	Map designation[1]	1966 elevations (metres)	1975 elevations (metres)	Elevation change (centimetres)
W88	BM 5236	1595.784	1595.784	0.0
166FMK	BM 5271	1606.4668	[2]1606.4686	+0.2
167FMK	BM 5272	1606.8091	[3]1606.8358	+2.7
168FMK	BM 5310	1618.4137	1618.4071	-0.7
169FMK	BM 5362	1634.3455	1634.3337	-1.2
171FMK	BM 5196	1583.7893	1583.7710	-1.8
172FMK	BM 5123	1561.3377	1561.3098	-2.8
173FMK	BM 5062	1542.9679	1542.9243	-4.4
1FMK		1533.8199	1533.7532	-6.7
2FMK	BM 5016	1528.9110	1528.8386	-7.2
3FMK	BM 4983	1518.8718	1518.8097	-6.2
5FMK	BM 4974	1516.2073	1516.0730	-13.4
6FMK	BM 4984	1519.0245	1518.8922	-13.2
7FMK	BM 5006	1525.9848	1525.8620	-12.3
8FMK	BM 5006	1525.9356	1525.8443	-9.1
9FMK	BM 5022	1530.7685	1530.7091	-5.9
10FMK	BM 5399	1645.7488	1645.7165	-3.2
11FMK	BM 5233	1594.9880	1594.9543	-3.4

[1] Map designation refers to benchmarks shown on U.S. Geological Survey 7 1/2' topographic quadrangles of the area. Symbols for W88 through 173FMK are on the Rattlesnake Pass, Utah (1968), sheet; symbols for 2FMK through 11FMK are on the Grover Canyon, Idaho-Utah (1968), sheet.

[2] Monument was slightly loose and elevation may have been affected by retamping done before releveling.

[3] Monument had been disturbed and was leaning at 45°. It was reset in same place. Not shown on figures 1 and 2.

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