

This map shows the trace of the main surface rupture in the San Andreas fault zone formed during the earthquake of April 18, 1906, as reconstructed from published and unpublished descriptions of earthquake-related damage, airphoto interpretations, and recent field investigations. Publications by Schussler (1906), Lawson and others (1908), Reid (1910), and Louderback (1937) are the principal sources of published "eyewitness" data. Historical photographs, maps, and information about the San Francisco Water Department (SFWD) and its predecessor in this area, the Spring Valley Water Company (SVWCo), were provided by E. L. Fonseca of the Peninsula Division, SFWD, and the archives of the San Francisco Public Utilities Commission (SFPUC). Additional information on the fault trace comes from geologic studies in the area by Bonilla and others (1978) and Pampeyan (1975: 1981a: 1981b) and from Gary Halkens, of the San Francisco Utilities Engineering Bureau, who generously undertook to locate and mark the position of specific submerged structures in Lower Crystal Springs Reservoir by scuba diving. Other faultrelated studies in this area have been done by Wahler and Associates (1977), Earth Science Associates (1980), and Smith (1981a; 1981b), but their data are not incorporated herein. During the summer of 1981 N. T. Hall (oral commun., 1981) mapped the San Andreas fault zone between San Andreas dam and Lower Crystal Springs Reservoir at a scale of 1:4,800 as part of a seismic safety evaluation of the San Andreas dam (Earth Science Associates, 1982, and oral commun., 1981). That study confirms the position of the 1906 surface rupture between San Andreas and Lower Crystal Springs Reservoirs as shown on this map and notes additional geologic and geomorphic reference points marking the 1906

8.25 ft RL from 9.57 ft RS.

~30 ft of tunnel crushed 7. See figure 2

 $\sim 11$  ft RS S

~ 9 ft RS, west

side down (?) 2-3 in

8.8 ft RS. See figure 8

See figures 4 and 5

~9 ft RS

~7 ft RS

5 ft 6 in. RL,

west side down

~ 12 in., 20 ft

possibly in 1838 or somewhat earlier. The evidence for some of these

features, for example at the north edge of the map, subsequently has been destroyed in the process of urban development. Over much of the map area, however, evidence of recent faulting has changed little since the great earthquake of 1906, due to the nature of land use. Several of the manmade structures offset in 1906 still exist, though some of them are under water or otherwise rarely exposed to view: some of the fault-produced geomorphic features, likewise, are usually concealed by water but are remarkably well preserved. The main break of 1906 was probably close to any breaks caused by the questionable earthquake of 1838 (Louderback, 1947) and previous other large earthquakes along the San Andreas fault. This accounts for the persistence of geomorphic evidence and the alinement of drainage offsets in a narrow zone; offsets which show separations of tens of feet, more than

Along with the 1906 fault trace a few other young-appearing lineaments

seen in aerial photographs and fault traces are shown that are presumed to

have ruptured in the recent geologic past, most probably not in 1906 but

Bonilla, M. G., Alt, J. N., and Hodgen, L. D., 1978, Trenches across the 1906 trace of the San Andreas fault in northern San Mateo County, California: II.S. Geological Survey Journal of Research, v. 6, no. 3, p. 347-358 Earth Science Associates, 1980, Fault rupture analysis of San Andreas dam: unpub. report prepared for the San Francisco Water Department (Jan. 1980), 1982, Seismic safety analysis of San Andreas dam: unpub. report prepared for the San Francisco Department (March 1982), 46 p., with

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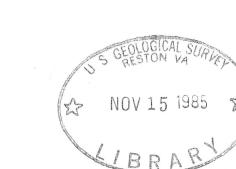
Reid, H. F., 1910, The mechanics of the earthquake, v. 2 of The California earthquake of April 18, 1906: Report of the State Earthquake Investigation Commission: Carnegie Institute of Washington Publication Schussler, Herman, 1906, The water supply of San Francisco, California, before, during and after the earthquake of April 18th, 1906, and the subsequent conflagration: New York, Martin Brown Press, 103 p. Symington, R. B., 1911, A boundary line deflection: Seismological Society of America Bulletin, v. 1, no. 2, p. 85. Smith. T. C., 1981a, San Andreas fault, northern San Mateo County area: California Division of Mines and Geology Fault Evaluation Report FER 120 unpub.) scale 1:24,000. 1981b, Evidence of Holocene movement of the San Andreas fault zone, northern San Mateo County, California: California Division of Mines and Geology Open-File Report 81-6, scale 1:24,000. Taber, Stephen, 1906, Local effects of the California earthquake of 1906: Journal of Geology, v. 14, no. 4, p. 303-315. U.S. Coast Survey, 1867, Map showing the approaches to San Francisco, California, for use of Engineer Department U.S. Army: Register No. 1067, scale 1:10,000. Wahler, W. A. and Associates, 1977, Final report, Investigation of seismic stability, Lower Crystal Springs dam, San Mateo County, California:

unpubl, report prepared for the San Francisco Water Department by W. A.

10 Systems, v. 1 text, v. 2 appendices (Nov. 1977).

Wahler & Assoc. in association with Lindvall, Richter & Assoc., and Group

OFFSET DRAINAGE CHANNEL PIPELINE OR TUNNEL ALINEMENT FENCELINE -- Showing property ownership X ..... X .... X in 1906. SVWCo, Spring Valley Water Company; others are family names



Interior—Geological Survey, Reston, Va.—1983 For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225

Measured across one break. Measured across three breaks Measured across two breaks. Zone of deformation >75 ft wide. Scaled from Schussler (1906) and Lawson and others (1908).

8. Waste-weir tunnel, "K" of Schussler

9. Fence "L" of Schussler; same as

11. Fence "N" of Schussler; same as

12. Fence "N" of Schussler

14. Locks Creek 37-in. pipeline

fence "B" of Lawson and others

fence "A" of Lawson and others

13. Locks Creek 44-in. pipeline, "O" of Schussler

16. Upper Crystal Springs Reservoir outlet tunnel

17. Road across Upper Crystal Springs dam

15. Hayward dam: same as old San Andreas dam of Louderback

 $\frac{1}{(\pm 5)}$  ft RS S) $\frac{6}{}$ 20-25 ft of

crushed S

8 ft RS

9 ft RS

Symington's surveys published in Lawson and others (1908, figs. 31,37, and 38) Fence also surveyed in 1900.

10. Pilarcitos 24-in pipeline, "M" and " $M_1$ " of Schussler  $\sim 7$  ft RS

This map, as well as the original maps by Schussler (1906, p. 79) and Lawson and others (1908), shows the main fault trace as a single line, because the original observers focused their attention upon the surface rupture along which the major offsets were noted. There are, however, references in print to branching, secondary, and sets of en echelon fractures, but only a few of such features were adequately described or shown on maps or in photographs. In addition, there were problems associated with relocating significant fault features, for some of the published location descriptions are ambiguous and

occurred here in 1906. The branching and secondary fractures, some of which originally may have resulted from nontectonic processes triggered by earthquakes, are less persistent and, therefore, virtually impossible to Notations on the accompanying map indicate the sites of published descriptions of fault damage ascribed to the earthquake of April 18, 1906 and to other sites where surface rupture most likely did or, in some cases, did not occur in 1906. In addition, a few notations supply historical data of interest and value to this study. Geologic relations along the fault are complex and poorly exposed, hence rock outcrops are not commonly diagnostic in pinpointing the site of 1906 surface rupture without the aid of some offset cultural feature for a nearby reference point. The data on fault offsets that occurred on April 18, 1906, are summarized

Pampeyan, E. H., 1975, Geologic map of the San Andreas fault zone in San Miscellaneous Field Studies Map MF-652, scale 1:6,000. 1981a, Geologic map of the Montara Mountain quadrangle, San Mateo County, California: U.S. Geological Survey Open-File Report 81-451, scale 1981b, Geology and former shoreline features of the San Mateo 7 1/2minute quadrangle, San Mateo County, California: U.S. Geological Survey Open-File Report 81-839, scale 1:24,000.