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San Jacinto fault, Borrego Mountain section (Class A) No. 125e

Last Review Date: 1999-03-01

Compiled in cooperation with the California Geological Survey

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Synopsis	**General:** This is the most seismically active fault in southern California, with significant earthquakes (larger than M5.5), including surface rupturing earthquakes in 1968 (M6.6 Borrego Mountain earthquake) and 1987 (M6.6 Superstition Hills and M6.2 Elmore Ranch earthquakes), and numerous smaller shocks within each of its main sections. Slip rates in the northern half of the fault system are around 12 mm/yr but are only around 4 mm/yr for faults in the southern half where strands overlap or are sub-parallel.

	Sections: This fault has 7 sections. Sections taken from segments defined by Working Group on California Earthquake Probabilities (1995 #4945) and by Petersen and others (1996 #4860), and include from north to south into: San Bernardino section [125a], San Jacinto Valley section [125b], Anza section [125c], Coyote Creek section [125d], Borrego Mountain section [125e], Superstition Hills section [125f], and Superstition Mountain section [125g]. Sanders and Magistrale (1997 #6396) defined 18 segments based on inferred and observed historic ruptures and bends or steps in the continuity of the faults (these "segments" are listed under the seven sections described herein). Wesnousky (1986 #5305) divided the fault zone into nine segments, including the entire Claremont fault in the northern segment, including the Casa Loma fault with the Clark fault, and distinguishing the Hot Springs, Thomas Mountain and Buck Ridge faults as separate segments, in addition to the Coyote Creek, Borrego Mountain, Superstition Hills and Superstition Mountain sections as used by Working Group on California Earthquake Probabilities (1995 #4945).
Name comments	**General:** San Jacinto fault named by Lawson and others (1908 #4969). Later mapping of major parts of zone by Fraser (1931 #6379), Dibblee (1954 #6376) and Sharp (1967 #6397). Major named faults within the zone include the Claremont, Casa Loma, Clark, Buck Ridge, Coyote Creek, Superstition Mountain, and Superstition Hills faults. See section discussions for more detail. **Section:** Section represented herein consists of southern portion of Coyote Creek fault that had surface rupture in 1968 (nos. 479 and 497 of Jennings, 1994 #2878); Coyote Creek fault was first mapped by R.T. Hill and named by Arnold (1918 #6373). Section herein incorporates southern 31 km of Borrego Mountain segment of Sanders and Magistrale (1997 #6396). Section is defined by extent of 1968 surface rupture. Sanders (1989 #6395) included additional 9 km to the north that did not rupture in 1968, but was marked by a zone of aftershocks. Fault is probably continuous with the Superstition Mountain fault to the south, based on nearly continuous surface trace (Rockwell, personal communication, 1999). **Fault ID:** Refers to numbers 400 (Lytle Creek fault), 401 (San Jacinto fault), 402 (Glen Helen fault), 429 (Rialto-Colton fault), 447 (Claremont fault), 457 (Casa Loma fault), 458 (Hot Springs fault), 459 (Clark fault), 471 (Buck Ridge fault), 478 (Coyote Mountain fault), 479 & 480 (Coyote Creek fault), 504

	(Superstition Hills fault), 505 (Superstition Mountain fault) and 506 (Wienert fault) of Jennings (1994 #2878); numbers 2 (Glen Helen fault), 3 (San Jacinto fault), 4 (Lytle Creek fault), 5 (Claremont fault), 6 (Casa Loma fault), 7 (Hot Springs fault), and 8 Clark fault) of Ziony and Yerkes (1985 #5931).
County(s) and State(s)	IMPERIAL COUNTY, CALIFORNIA SAN DIEGO COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Traces based on State of California Alquist-Priolo Earthquake Fault Zone maps.
Geologic setting	The San Jacinto fault zone is a major element of the San Andreas fault system in southern California, with historic earthquakes (if not ground rupture) associated with most of its sections. This dextral fault zone branches off from the San Andreas near Cajon pass and extends southeastward through the Peninsular Ranges for 240 km into southwestern Imperial Valley. Sharp (1967 #6397) believes that this is currently the most active strand of the San Andreas system in southern California, but is relatively young, with only about 24 km of total dextral offset. The fault zone may be divided into four principal sections: the Claremont, Clark, Coyote Creek and Superstition sections which are separated by major discontinuities (Sanders and Magistrale, 1997 #6396). The fault zone is further subdivided for seismic-hazard modeling purposes into from 5 to as many as 20 "segments" by various authors. The principal faults within the zone overlap in a right-stepping fashion, with a major overlap (50 km in length) occurring between the Clark and Coyote Creek faults.
Length (km)	This section is 34 km of a total fault length of 244 km.
Average strike	(for section) versus N58°W (for whole fault)
Sense of movement	Right lateral, Normal *Comments:* Clark (1972 #6374) describes significant vertical displacements from the 1968 Borrego Mountain earthquake but does not indicate whether these are normal or reverse. The trenching study by Clark and others (1972 #6375) showed normal

	separation at one locality. Reverse displacements may have also occurred, depending on fault geometry.
Dip	80° NE. *Comments:* Dip based on focal mechanism and aftershock distribution of 1968 Borrego Mountain earthquake; dips are not shown on available maps of the fault.
Paleoseismology studies	Site 125-5 Old Kane Springs Road of Pollard and Rockwell (1995 #6390): 3-D trenching documented lateral offset of dated Holocene shoreline and partial paleoseismic history. Trenches and natural exposures (observed shortly after the 1968 Borrego Mountain earthquake) along with radiocarbon dating, provided data on fault recurrence and slip rate during the last 3,000 yr (Clark and others, 1972 #6375); the age of faulted sediments was revised by later studies (Sharp, 1981 #6398).
Geomorphic expression	Historic scarps
Age of faulted surficial deposits	Holocene alluvium and lakebeds; Plio-Pleistocene sediments
Historic earthquake	Borrego Mountain earthquake 1968
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Penultimate event post-dates 1680 A.D. (Pollard and Rockwell, 1995 #6390); events on the northernmost Superstition Mountain fault, presumed to be continuous with this section, timed at 1440–1637 A.D., 1280–1640 A.D., 820–1280 A.D. and pre-964 A.D. (Gurrola and Rockwell, 1996 #6380).
Recurrence interval	*Comments:* Recurrence interval of 175 yr derived from assumed characteristic displacement (Working Group on California Earthquake Probabilities, 1995 #4945); 60–100 yr suggested by Pollard and Rockwell (1995 #6390) based on assumption that 1968 rupture is typical; 200 yr recurrence estimated by Clark and others (1972 #6375) but Wesnousky (1986 #5305) states recurrence may be more realistically 100–200 yr. M6.8 Borrego

	Mountain earthquake occurred on this section in 1968.
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* 4.5 mm/yr since 300 yr BP (Pollard and Rockwell, 1995 #6390); 2.8–5 mm/yr since 400 yr BP and 1.4–2 mm/yr in the past 6 k.y. but may not be total (Sharp, 1981 #6398); 3 mm/yr (Clark and others, 1972 #6375); 2 mm/yr assigned by Wesnousky (1986 #5305). Petersen and others (1996 #4860) assign a slip rate of 4.0 mm/yr (with minimum and maximum assigned slip rates of 2.0 mm/yr and 6.0 mm/yr, respectively) for probabilistic seismic hazard assessment for the State of California.
Date and Compiler(s)	1999 Jerome A. Treiman, California Geological Survey Matthew Lundberg, California Geological Survey
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