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Quaternary Fault and Fold Database of the United States

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San Diego Trough fault zone (Class A) No. 292

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Synopsis	The San Diego Trough fault zone is one of several northwest-trending fault zones mapped between San Clemente Island and the mainland in the offshore southern California borderland. It was first mapped by Moore (1969) using seismic reflection profiling and was subsequently described in much greater detail by Kennedy and others (1979), Legg and Kennedy (1979), Legg (1991), Legg and others (1991), and Legg and Goldfinger (2002). The fault zone is generally comprised of one to two high angle fault strands that cut through Quaternary sediment at or just beneath the seafloor near the axis of the San Diego Trough. The main trend of the fault zone is N. 30° W., which is more northerly than present Pacific-North American plate motions (DeMets and Dixon, 1999). Although the fault zone is not clearly delineated by seismicity, a magnitude 5.3 earthquake accompanied by a swarm of aftershocks occurred in 1986 near the northern end of the fault zone offshore of Oceanside (Hauksson and Jones,1988; Astiz and

	Shearer, 2000). It is unclear whether these earthquakes were associated with a left bend in the San Diego Trough fault zone or movement on a blind thrust fault (Rivero and others 2000).
Name comments	The fault zone lies within and is named after the San Diego Trough, a pronounced bathymetric feature offshore of San Diego County between Coronado and Thirty-mile banks. A fault zone associated with the San Diego Trough was initially mapped by Moore (1969) and Vedder and others (1974) using sparsely spaced seismic reflection profiles. The name San Diego Trough fault zone was first used by Kennedy and others (1979, 1980). **Fault ID:** Refers to number 486 (San Diego Trough fault zone) of Jennings (1994).
County(s) and State(s)	SAN DIEGO COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Poor Compiled at 1:750,000 and unspecified scale. *Comments:* Location of fault from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to 1:750,000-scale map by Jennings (1994), and Ryan and others (2009, 2012) mapped at unspecified scale. The fault zone was mapped using seismic reflection data including deep penetration industry multichannel seismic reflection profiles with a nominal trackline spacing of about 3 km that are available for the offshore region from the Mexican border to about 15 km south of the northern end of the fault zone (USGS, 2006). These data were supplemented by several high resolution reflection profiles collected across the fault zone that have a vertical resolution of about 1 m and were used to document recency of faulting (Gutmacher and others 2000; Ryan and others 2012).
Geologic setting	The San Diego Trough fault zone is one of a number of northwest trending fault zones that cut through the inner part of the southern California continental borderland. The main fault trace is a relatively long, through-going fault that offsets Quaternary sediment and locally offsets the seafloor. It extends south of the Mexican border and may merge with the Agua Blanca fault zone,

	which cuts across the Baja California peninsula. At its northern end, the San Diego Trough fault zone steps across a 5-km-wide stepover and extends to the northwest as far north as the San Gabriel fan valley. Here the fault bends more westerly and is on trend with the San Pedro Basin fault zone [282] (Ryan and others 2012).
Length (km)	166 km.
Average strike	
Sense of movement	Right lateral *Comments:* Dextral strike-slip motion is inferred by the relatively simple, straight trace of the fault, which shows alternating east and west side up scarps along strike. Locally, folding associated with left bends and graben with right bends are indicative of dextral slip.
Dip Direction	V *Comments:* The dip is constrained by industry reflection profiles that image the fault as a vertical feature to depths of at least 5 km.
Paleoseismology studies	
Geomorphic expression	Locally, the fault shows minor seafloor offset, but generally there are no large-scale geomorphic features associated with the fault zone.
Age of faulted surficial deposits	Greene and Kennedy (1986) show a Holocene age for the San Diego Trough fault zone based on the inferred age of the youngest reflectors cut by the fault. A Holocene age is confirmed by a radiocarbon reservoir corrected age of 9 ka at the base of a shallow core that correlates with reflectors that are offset along the fault (J. Covault, pers. commun.).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The timing is based on the age of faulted deposits.
Recurrence	

interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Ryan and others (2012) reported a dextral deformation rate of 1.5±0.3 mm/yr for the past 12,270 yr, based on an approximately 18 m of offset of the San Gabriel submarine channel. Ryan and others (2012) estimated the age of the base of acoustically transparent sediments (that post-date channel-wall offset) to be 12,270±1,880 yr based on sedimentation rates calculated from radiocarbon ages of foraminifera from cores sampled within about 500 m of the offset channel.
Date and Compiler(s)	2017 Holly F. Ryan, U.S. Geological Survey William A. Bryant, California Geological Survey
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