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Ortigalita fault zone, Cottonwood Arm section (Class A) No. 52a

Last Review Date: 2000-05-09

Compiled in cooperation with the California Geological Survey

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Synopsis	**General:** The Ortigalita fault zone is a major Holocene dextral strike-slip fault in the central Coast Ranges that is an eastern part of the larger San Andreas fault system. The Ortigalita fault zone extends from about 20 km northwest of San Luis Reservoir southeast to the vicinity of Panoche Valley. The Ortigalita fault zone is characterized by en echelon fault traces separated by pull-apart basins. Anderson and others (1982 #5344; 1982 #5345) excavated trenches along each of the four sections, demonstrating that the Ortigalita fault zone is latest Pleistocene to Holocene (active) and that the Little Panoche Valley section is late

	Holocene active. Most of the Ortigalita fault zone is delineated by geomorphic evidence of latest Pleistocene to Holocene dextral strike-slip displacement and is locally marked by complex dextral normal offset, primarily at the section boundaries marked by pull-apart basins (Anderson and others, 1982 #5344; 1982 #5345; Hart, 1985 #5350; Manson, 1985 #5355). Late Quaternary slip rates and recurrence intervals are unknown, although Anderson and others (1982 #5344) concluded that the recurrence interval for the entire Ortigalita fault zone is about 2–5 k.y. Clark and others (1984 #2876) reported a minimum vertical slip rate of 0.01–0.04 mm/yr. The dextral slip component is probably greater than the vertical component, but this has not been documented. **Sections:** This fault has 4 sections. Anderson and others (1982 #5344) defined four segments of the Ortigalita fault, from north to south: Cottonwood Arm, Los Banos Valley, Piedra Azul, and Little Panoche. There is insufficient data to define these as seismogenic fault segments. The names and segment boundaries from Anderson and others (1982 #5344) are adopted as sections for this compilation and include the Cottonwood Arm [52a], Los Banos Valley [52b], Piedra Azul [52c], and Little Panoche [52d] sections.
Name comments	**General:** The Ortigalita fault zone was first recognized and mapped by Anderson and Pack (1915 #5347) for a fault that juxtaposes Cretaceous Franciscan Complex rocks against Upper Cretaceous Chico Group along the eastern side of Ortigalita Peak. The fault was first named by Taliaferro (1943 #5356), who identified a steeply west-dipping reverse fault (cross-section VII) that he named the Ortigalita Thrust. The fault has also been referred to as the Tesla-Ortigalita fault (e.g., Cotton, 1972 #5348). This compilation refers to the Ortigalita fault zone (most common name) as the zone of faults from about 20 km northwest of San Luis Reservoir southeast to Panoche Valley that are characterized by predominantly dextral late Pleistocene and Holocene strike-slip. **Section:** The Ortigalita fault zone was first recognized and mapped by Anderson and Pack (1915 #5347) for a fault that juxtaposes Cretaceous Franciscan Complex rocks against Upper Cretaceous Chico Group along the eastern side of Ortigalita Peak. The fault was first named by Taliaferro (1943 #5356), who identified a steeply west-dipping reverse fault (cross-section VII) that he named the Ortigalita Thrust. The fault has also been referred to as the Tesla-Ortigalita fault (*e.g.*, Cotton, 1972 #5348).

	This compilation refers to the Ortigalita fault zone (most common name) as the zone of faults from about 20 km northwest of San Luis Reservoir southeast to Panoche Valley that are characterized by predominantly dextral late Pleistocene and Holocene strike-slip. **Fault ID:** Refers to number 214 (Ortigalita fault) of Jennings (1994 #2878) and number L03 (Ortigalita fault) of Working Group on Northern California Earthquake Potential (1996 #1216).
County(s) and State(s)	MERCED COUNTY, CALIFORNIA STANISLAUS COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Dibblee (1975 #4832) and Cotton (1972 #5348) at 1:62,500 scale, mapping by Cowan (1974 #5349) at 1:30,000 scale, and mapping by Anderson and others (1982 #5345), Hart (1985 #5350), and Manson (1985 #5355) at 1:24,000 scale.
Geologic setting	The Ortigalita fault zone consists of near vertical dipping dextral strike-slip faults located along the eastern border of the central Diablo Range (Anderson and others, 1982 #5344; Lettis, 1985 #5354). This fault zone separates the Franciscan core of the range from the Great Valley Sequence of the eastern foothills of the range (Anderson and others, 1982 #5344). The fault's style of displacement locally is complex with minor reverse and normal components to the predominant dextral strike-slip displacement (Anderson and others, 1982 #5344; 1982 #5345; Manson, 1985 #5355). Cumulative dextral displacement is unknown, but the large-scale dextral displacement of Los Banos Creek suggests at least 5 km of offset (Manson, 1985 #5355). Anderson and La Forge (1990 #5346) estimated that at least 1–2 km of dextral slip is indicated by the size of pull-apart basins associated with the Ortigalita fault zone. Lettis (1985 #5354) argued that the location of Basalt Hill, an outlier of the late Miocene Quien Sabe volcanic field, limits the amount of significant late Cenozoic dextral displacement along the Ortigalita fault zone. Elevations of the Quien Sabe volcanic rocks on either side of the Ortigalita fault

	zone also limit the amount of late Cenozoic vertical displacement (Lettis, 1985 #5354).
Length (km)	This section is 31 km of a total fault length of 71 km.
Average strike	N34°W (for section) versus N28°W (for whole fault)
Sense of movement	Right lateral *Comments:* Geomorphic features show a consistent sense of dextral displacement. Horizontal slickensides were observed in trench exposures in Cottonwood Creek (Anderson and others, 1982 #5344), (1982 #5345); (Manson, 1985 #5355). La Forge and Lee (1982 #5352) reported that dextral strike-slip focal mechanisms characterize seismicity associated with the Ortigalita fault zone.
Dip Direction	V *Comments:* A focal mechanism for the Cottonwood Arm section indicates a near-vertical dipping (*i.e.*, 90°) dextral strike-slip fault (LaForge and Lee, 1982 #5352). Trenches excavated by Anderson and others (1982 #5344; 1982 #5345) show predominantly steeply dipping to vertical faults.
Paleoseismology studies	Anderson and others (1982 #5344; 1982 #5345) conducted a detailed study of the fault zone, and about nine fault-normal trenches were excavated along traces of the Ortigalita fault zone for the Cottonwood Arm, Los Banos Valley, Piedra Azul, and Little Panoche Valley sections. One study site was examined along the Cottonwood Arm section. Site 52-1 involved the excavation of three trenches by Anderson and others (1982 #5344; 1982 #5345). These trenches exposed faulted latest Pleistocene to Holocene colluvium (San Luis Ranch equivalent, 10–100 ka, Lettis, 1982 #5353). Horizontal slickensides were observed in their trench T-9b.
Geomorphic expression	The Cottonwood Arm section is delineated by geomorphic indicators of Holocene dextral strike-slip displacement, such as aligned shutter ridges, dextrally deflected drainages, linear scarps, side-hill benches, aligned saddles, and linear vegetation contrasts (Anderson and others, 1982 #5345; Hart, 1985 #5350; Manson, 1985 #5355).

Age of faulted surficial deposits	The faults offset Tulare age (>500 ka) Quaternary alluvium, late Pleistocene San Luis Ranch alluvium (10–100 ka) (Lettis, 1982 #5353), and early Holocene colluvium. Overlying younger colluvium is not offset (Anderson and others, 1982 #5344). The early Holocene age of the colluvial deposits is based on soil profile development (Anderson and others, 1982 #5344; 1982 #5345).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The most recent paleoevent is not precisely dated. Anderson and others (1982 #5344; 1982 #5345) reported that the latest surface-rupturing event along the Cottonwood Arm section occurred before 5–8 ka, but less than 10 ka (*i.e.*, middle to early Holocene).
Recurrence interval	*Comments:* Anderson and others (1982 #5344) concluded that the average recurrence interval for movement somewhere along the entire fault is about 2–5 k.y. based on their observations that there have been at least four major surface rupturing earthquakes on the Ortigalita fault zone in the past 15 k.y. There is no documentation for recurrence intervals on specific fault sections, although Anderson and others (1982 #5344) state that recurrence of large earthquakes on individual sections may occur on the order of every 10–15 k.y.
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Clark and others (1984 #2876) reported late Pleistocene vertical displacement rates of 0.01–0.04 mm/yr for the Cottonwood Arm section; the dextral component of slip is unknown. Clark and others (1984 #2876) qualify this rate by stating that the vertical rate is an extreme minimum, that trench exposures and geomorphic expression of the fault zone suggest a much greater dextral rate—on the order of 0.5–1.0 mm/yr or greater. Kelson and others (1992 #5351) suggested that the Ortigalita fault zone could account for about 0.4±0.4 mm/yr of dextral slip, based on a comparison of the relative plate motion in the San Francisco Bay region predicted by the NUVEL-1 model with the amount and orientation of observed geologic slip and

	creep along mapped faults. Petersen and others (1996 #4860) used a probable slip rate of 1—0.5 mm/yr, so the 1–5 mm/yr category seems to fit best.
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey Sereyna E. Cluett, California Geological Survey
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#2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000.

#5351 Kelson, K.I., Lettis, W.R., and Lisowski, M., 1992, Distribution of geologic slip and creep along faults in the San Francisco Bay region, *in* Borchardt, G., Hirschfeld, S.E., Lienkaemper, J.J., McClellan, P., Williams, P.L., and Wong, I.G., eds., Proceedings of the Second Conference on earthquake hazards in the eastern San Francisco Bay area: California Division of Mines and Geology Special Publication 113, p. 31-38.

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