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Rinconada fault zone, Rinconada section (Class A) No. 63c

Last Review Date: 2003-07-17

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Synopsis	**General:** Late Quaternary active, predominantly dextral strike-slip fault zone. The Rinconada fault zone is mapped at regional scales of mainly 1:62,500 and 1:24,000. In this compilation the fault zone is divided into 3 sections, from north to south the Espinoza [63a], San Marcos [63b], and Rinconada [63c] sections. No paleoseismic data is available for this fault. Wesnousky (1986 #5305) reported a preferred late Cenozoic dextral slip rate of 2.4 mm/yr, based on data from Durham (1965 #6189) and Hart (1976 #6197). Bird and Rosenstock (1984 #6183) reported a late Cenozoic slip rate between 2.4 mm/yr and 12 mm/yr, based on 53 km dextral offset of Oligocene (?) to early Miocene boulder conglomerate. Three sites have been investigated by trenching. At the Chicago Grade site [63c-2] two splays of the Rinconada fault zone offset Plio-Pleistocene Paso Robles Formation (GeoSyntec Consultants, 2002 #6195). Relative age estimates of carbonate

	horizon and fault relationships allowed GeoSyntec Consultants to estimate "seismic horizons" for the most recent paleoevents of 100-500 ka and 50-100 ka for faults F1 and F2, respectively. **Sections:** This fault has 3 sections.
Name comments	**General:** **Section:** The Rinconada section as delineated by Dibblee (1976 #6170) extends from the complex intersection with the San Marcos section [63b] near Paso Robles southeastward to the vicinity of the Rinconada Mine near Santa Margarita. This fault separates Franciscan basement on the southwest from Salinian basement on the northeast, in a zone of closely spaced, parallel to branching faults (Hart, 1976 #6197). Although much of the Rinconada section is concealed beneath alluvium of the Salinas River valley, it offsets Tertiary sedimentary rocks (Vaqueros Sandstone and Monterey Formation) from the Pliocene-Pleistocene Paso Robles Formation. Locally, the fault is revealed in roadcuts and streambanks, where steeply dipping beds are exposed. Hart (1976 #6197) recognized geomorphic expression of this section in the form of aligned saddles, notches, drainages, and low scarps. Hot springs are spatially associated with the Rinconada section. Dibblee (1971 #6185) mapped a northward-striking branch through the city of Paso Robles based on the alignment of hot springs. In a subsequent evaluation of geothermal resources in the Paso Robles area, Campion and others (1983 #6184) proposed an alternative explanation for the Paso Robles hot springs. Their explanation was that Tertiary sedimentary rocks lapping against a bedrock high forced the water to the surface. They cited well logs and gravity and magnetic data to support their alternate hypothesis. However, Campion and others (1983 #6184) also noted high boron content in the springs, which they believed was either derived from sands below the Paso Robles Formation or from faults serving as conduits for deeper aquifers. On the other hand, a hot-spring fed channel at San Ysabel Ranch aligns with a splay of the Rinconada fault, and provides additional evidence for a fault origin of hydrothermal waters. **Fault ID:** Refers to number 239 (Rinconada fault) of Jennings (1994 #2878) and L01 (Rinconada fault) of Working Group on Northern California Earthquake Potential (1996 #1216).
County(s) and	MONTEREY COUNTY, CALIFORNIA

State(s)	SAN LUIS OBISPO COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations based on 1:62,500 mapping of Dibblee (1971 #6185) and 1:24,000 mapping of Hart (1976 #6197).
Geologic setting	The Rinconada fault zone is a major, high-angle dextral strike-slip fault that is part of the San Andreas fault system. The fault zone extends from the hills west of King City southeast for approximately 120 km to the vicinity of Santa Margarita. Dibblee (1976 #6170) suggests that south of the Santa Margarita area, the boundary between Salinian block crystalline basement rocks to the east and Franciscan rocks to the west, delineated by a fault considered by many workers to be the southern part of the Sur/Nacimiento fault zone, is actually part of his Rinconada fault zone. The Rinconada fault zone marks the western margin of the La Panza Range and locally defines the western margin of the Salinian block. The Rinconada fault zone is thought to have accommodated as much as 60 km of Neogene dextral strike-slip displacement and 38 km of post- late Miocene dextral offset (Dibblee, 1976 #6170).
Length (km)	This section is 87 km of a total fault length of 122 km.
Average strike	N32°W (for section) versus N35°W (for whole fault)
Sense of movement	Right lateral *Comments:* Dextral sense of displacement is delineated by clockwise rotation of bedding and stratigraphic units near fault, truncation of fold axes, slivers of exotic Franciscan rocks along fault, and dextrally deflected ridges and drainage channels (Hart, 1976 #6197).
Dip Direction	SW *Comments:* Regionally, the Rinconada section has a near-vertical dip based on linear trend of fault zone through hilly terrain (Dibblee, 1976 #6170). Locally, the dip has been measured in exploratory trenches as vertical to 75? NE (Pacific Geoscience

	Inc., 1990 #6201; GeoSolutions Inc., 2000 #6194; GeoSyntec Consultants, 2002 #6195) and in a railroad cut as 72? SW (L.I. Rosenberg and J.C. Clark, unpublished mapping, 2002).
Paleoseismology studies	Three studies (San Ysabel Ranch, 16 trenches; Chicago Grade Landfill, 2 trenches; and Atascadero State Hospital, 2 trenches) have been excavated on the Rinconada section. These studies were not detailed paleoseismology studies; instead, their focus was to locate faults at potential land development sites. San Ysabel Ranch (Site 63c-1). Trenching by GeoSolutions, Inc. (2000 #6194) exposed the Rinconada section in 11 out of 16 trenches logged. The fault is demarcated by juxtaposed beds of sand and mudstone of the Paso Robles Formation in a zone ranging from 3 to 60 m wide. The fault location in the trenches corresponds to topographic breaks in slope, suggesting possible Holocene displacement. However, colluvial deposits are not offset by the fault. No estimates of recurrence interval, slip rate, or timing of most recent paleoevent were made by GeoSolutions, Inc. (2000 #6194). Chicago Grade (Site 63c-2). Field mapping by GeoSyntec Consultants (2002 #6195) revealed several fault splays exposed in a landfill borrow pit. These splays are subsidiary branches of the Rinconada section and have poor geomorphic expression. Subsequent trenching of these splays showed that the two faults (F1 and F2) exposed in trench T-1 clearly offset the lower part of the Paso Robles Formation, with as much as 1.2 m of apparent west side up vertical separation of a stage II+ to III carbonate seam (estimated age 100-500 ka) along fault F1. Fault F2 offsets the Paso Robles Formation by approximately 30 cm, with the west side up. A unit with an estimated minimum age of 50-100 ka based on stage II+ to II+ carbonate development truncates fault F2 and therefore, post-dates F2 faulting. These age determinations are based on correlation with soils in the southwestern United States, and not with a local soil chronosequence (Machette, 1985 #1267; Rice and Moody, 2002 #6203). Therefore, the precise ages of the unfaulted units are unknown. Confirmation of this late Pleistocene age by radiocarbon dating was not performed because no dateable carbon deposits were found in the trench. GeoSyntec Consultants (2002 #6195) did not estimate recurrence intervals or slip rates. However, they used the apparent carbonate ages to establish "seismic horizons" for the most recent paleoevents of 100-500 ka and 50-100 ka for faults F1 and F2, respectively.

	Combining these age estimates with the observed displacements yield low vertical slip rates, which are three to four orders of magnitude less than the dextral slip rate. Atascadero State Hospital (Site 63c-3). In the Pacific Geoscience, Inc. (1990 #6201) study, one trench revealed a near-vertical contact between the Paso Robles Formation and highly fractured and shattered Monterey Formation. The second trench encountered "vertical linear fractures filled with loose, fine to coarse white sand" along strike with the Paso Robles Formation/Monterey Formation contact in the first trench. Although Pacific Geoscience, Inc. (1990 #6201) interpreted the Paso Robles Formation/Monterey Formation contact as an erosional feature, an alternative explanation is that the contact is a fault because of the near-vertical orientation, the sheared Monterey Formation, and the parallelism with the sand-filled linear fractures. Pacific Geoscience did not estimate recurrence interval, slip rate, or timing of most recent paleoevent.
Geomorphic expression	The Rinconada section is delineated by aligned benches and saddles, aligned linear drainages, linear tonal and vegetation contrasts, and, locally, dextrally deflected drainages and closed depressions (Hart, 1976 #6197). Dibblee (1976 #6170) reported that the fault generally is poorly expressed geomorphically. Near the southern end of the section, at Santa Margarita Ranch, the fault coincides with a break in slope (L.I. Rosenberg, unpublished mapping, 1999).
Age of faulted surficial deposits	Pliocene-Pleistocene Paso Robles Formation is offset (Dibblee, 1976 #6170; Hart, 1976 #6197). Alluvium of probable late Quaternary age, based on soil profile development, locally is offset (Hart, 1976 #6197).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Timing of the most recent paleoevent is poorly constrained. GeoSyntec Consultants (2002 #6195) used apparent carbonate ages to establish "seismic horizons" for the most recent paleoevents of 100-500 ka and 50-100 ka for faults F1 and F2, respectively, at the Chicago Grade site [63c-2]. Hart (1976 #6197) reported that Rinconada section has geomorphic evidence of late Pleistocene and possible Holocene displacement, based on

	dextrally deflected drainages, a closed depression about 1 km northwest of Fivemile Bridge, and poorly defined linear tonal contrasts in younger alluvium in the Rinconada drainage area.
Recurrence interval	1,883 yr *Comments:* Wesnousky (1986 #5305) calculated a recurrence interval of 1,883 yr based on a preferred slip rate of 2.4 mm/yr and an assumed Mw 7.6 earthquake.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Late Quaternary slip rate for the Rinconada section is not known. Bird and Rosenstock (1984 #6183) calculated a Cenozoic dextral slip rate of 2.4 mm/yr to 12 mm/yr. This is based on 53 km dextral displacement of a giant boulder conglomerate of the Oligocene (?) to early Miocene Simmler(?) Formation and associated marine beds of the marine Vaqueros Formation reported by Hart (1976 #6197). Bird and Rosenstock (1984 #6183) assumed age of displacement ranged from 4.5 Ma to 22 Ma. Wesnousky (1986 #5305) reported a preferred late Cenozoic rate of 2.4 mm/yr, based on the data from Durham (1965 #6189) and Hart (1976 #6197).
Date and Compiler(s)	2003 Lewis I. Rosenberg, San Luis Obispo County Planning Department William A. Bryant, California Geological Survey
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