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Cleghorn fault zone, Southern Cleghorn section (Class A) No. 108a

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Synopsis	**General:** The Cleghorn fault zone is a significant sinistral strike-slip zone of faults in the western San Bernardino Mountains (Transverse Ranges geomorphic province). Fault zone in this compilation is divided into 2 sections, the Southern Cleghorn section [108a] and Northern Cleghorn section [108b]. The Southern Cleghorn section consists of traces of the Cleghorn fault and the Northern Cleghorn section consists of the West and East Silverwood Lake faults and the Grass Valley fault. One detailed site for the Northern Cleghorn section exposed evidence of late Pleistocene and possible Holocene displacement along the East Silverwood Lake fault (California Department of Water Resources (CDWR), 1968 #6604; Weldon and others, 1981 #6610; Bryant, 1987 #6603). Meisling (1984 #6606) considered the Southern Cleghorn section to have ruptured in the Holocene, based on an approximately 1-km-long, youthful back-facing scarp

	and associated sinistrally deflected drainages west of Silverwood Lake. Bryant (1987 #6603) concurred that the back-facing scarp was probably Holocene, but noted that it extended for only about 500 m, was slightly sinuous, did not verify the sinistrally deflected drainages, and stated that these features did not extend beyond the boundaries of a larger, older landslide complex. Bryant (1987 #6603) concluded that the back-facing scarp, which is anomalously youthful and well-defined in comparison with the rest of the Cleghorn fault zone, is not tectonic in origin. Meisling (1984 #6606) reported a preferred late Quaternary sinistral slip rate of 2.75 mm/yr for the Southern Cleghorn section, based on 1,100 m displacement of dissected terrace remnants estimated to be 400 ka (60–730 ka) using soil profile development, paleomagnetism, and correlation. A preferred late Pleistocene slip rate of 3.3 mm/yr was estimated by Meisling (1984 #6606), based on 200 m sinistral offset of a stream channel incised into a 60 ka (12.4-60 ka) terrace surface. Clark and others (1984 #2876) estimated a preferred sinistral slip rate of 2.0–2.2 mm/yr, based on data presented by Meisling (1984 #6606). Petersen and Wesnousky (1994 #6024) reported slip rate of 3.0 mm/yr, based on Meisling (1984 #6606). Traces of the Northern Cleghorn section are less well-defined than those along the Southern Cleghorn section (Bryant, 1987 #6603) and are not characterized by slip-rate data. **Sections:** This fault has 2 sections. There is insufficient data to delineate seismogenic segments. The Cleghorn fault zone is divided into 2 sections in this compilation, principally based on the bifurcation of the Cleghorn fault into strands of the West Silverwood Lake fault, East Silverwood Lake fault, Grass Valley fault, and Cleghorn fault where Highway 138 wraps around the western end of Silverwood Lake. The Southern Cleghorn section [108a] consists of the Cleghorn fault and extends from the vicinity of Cajon Canyon and Highway 15 eastward to its intersection with the Tunnel Ridge fault [327] near Deer Lodge Park. The Northern Cleghorn section [108b] consists of the West Silverwood Lake fault, East Silverwood Lake fault, and Grass Valley fault.
Name comments	**General:** The Cleghorn fault was first mapped and named by Noble (1932 #6608) for exposures in Cleghorn Valley. Traces of the West and East Silverwood Lake and Grass Valley faults were first mapped by Dibblee (1965 #4816) and named by Meisling (1984 #6606).

	Section: The Southern Cleghorn section in this compilation extends from the vicinity of the junction of Highways 138 and 15 in Cajon Canyon eastward generally along the northern side of Cleghorn Canyon and Miller Canyon. The Southern Cleghorn section terminates at the junction with the north-northeast striking Tunnel Ridge fault [327] in the vicinity of Deer Lodge Park.
County(s) and State(s)	SAN BERNARDINO COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Meisling (1984 #6606) and Bryant (1986b) at 1:24,000.
Geologic setting	The Cleghorn fault zone is a 25-km-long sinistral strike-slip fault zone that is part of the San Andreas fault system. Located in the Transverse Ranges geomorphic province, Meisling and Weldon (1989 #6607) reported that the Cleghorn fault zone is the principal fault in the westernmost San Bernardino Mountains. The Cleghorn fault zone extends from the Cajon Pass area eastward to about 3 km west of Lake Arrowhead. Cumulative sinistral strike-slip displacement of 3.5–4.0 km was proposed by Meisling and Weldon (1989 #6607), based on offset eastern limit of the Cajon Formation and western limit of the Pliocene Crowder Formation, offset traces of north-plunging monoclines in the Crowder Formation, and restoration of the pre-existing Cedar Springs fault.
Length (km)	This section is 24 km of a total fault length of 25 km.
Average strike	N82°W
Sense of movement	Left lateral *Comments:* Sinistral offset of fold axes in Miocene-Pliocene Crowder Formation, sinistral offset of steeply dipping contact of basement/Miocene Punchbowl Formation, sinistral offset of strands of the Cedar Springs fault system, sinistral offset of late Quaternary terrace deposit (Meisling, 1984 #6606).
Dip	85°

	Comments: Cross section B–B' of Meisling (1984 #6606) and cross section D–D' of Meisling and Weldon (1989 #6607). Meisling (1984 #6606), Meisling and Weldon (1989 #6607).
Paleoseismology studies	
Geomorphic expression	Moderately to locally well-defined geomorphic features indicating late Pleistocene sinistral offset. Southern Cleghorn section delineated by both dextrally and sinistrally deflected drainages, benches and saddles in bedrock, a sidehill bench, and linear vegetation contrasts (Bryant, 1987 #6603). Meisling (1984 #6606) mapped a 1-km-long part of the Southern Cleghorn section that was delineated by a youthful back-facing scarp and associated sinistrally deflected ridges that was considered to be evidence of Holocene offset. Bryant (1987 #6603) concurred that the back-facing scarp was probably Holocene, but noted that it extended for only about 500 m, was slightly sinuous, did not verify the sinistrally deflected drainages, and reported these features did not extend beyond the boundaries of a larger, older landslide complex. Bryant (1987 #6603) concluded that the back-facing scarp, which is anomalously youthful and well-defined in comparison with the rest of the Cleghorn fault zone, is not tectonic in origin.
Age of faulted surficial deposits	Strands of the Southern Cleghorn section offset Mesozoic crystalline basement rocks, Pliocene Crowder Formation, and late Pleistocene terrace deposits (Bortugno and Spittler, 1986 #6602) estimated to be about 60 ka (12.4–60 ka) by Meisling (1984 #6606). Deflected stream channels incised into the 60 ka terrace surface indicate younger age, but Meisling (1984 #6606) concluded that the stream channels were probably pre Holocene.
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Timing of the most recent paleoevent is poorly constrained. The Cleghorn fault offsets Qt1 terrace deposits estimated to be about 60 ka, based on soil profile development (Meisling, 1984 #6606; Bryant, 1987 #6603). Locally, stream channels incised into Qt1 terraces are sinistrally deflected, indicating that the most recent displacement post-dates the 60 ka

	Qt1 terrace. Meisling (1984 #6606) estimated age of stream channels to be pre-Holocene, but the age is poorly constrained. Meisling (1984 #6606) considered youthful back-facing scarps delineating an approximately 1-km-long part of the Southern Cleghorn section as evidence of Holocene displacement. However, Bryant (1987 #6603) offered an alternative interpretation that the youthful back-facing scarp is landside-related and does not demonstrate Holocene displacement along the Cleghorn fault.
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Meisling (1984 #6606) reported a preferred late Quaternary sinistral slip rate of 2.75 mm/yr, based on 1,100 m displacement of dissected terrace remnants estimated to be 400 ka (60–730 ka) using soil profile development, paleomagnetism, and correlation. A preferred late Pleistocene slip rate of 3.3 mm/yr was estimated by Meisling (1984 #6606), based on 200 m sinistral offset of a stream channel incised into a 60 ka (12.4–60 ka) terrace surface. Clark and others (1984 #2876) estimated a preferred sinistral slip rate of 2.0 to 2.2 mm/yr, based on data presented in Meisling (1984 #6606). Petersen and Wesnousky (1994 #6024) reported slip rate of 3.0 mm/yr, based on Meisling (1984 #6606). Slip rate assigned by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 3.0 mm/yr (with minimum and maximum assigned slip rates of 1.0 mm/yr and 5.0 mm/yr, respectively.
Date and Compiler(s)	2003 William A. Bryant, California Geological Survey
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