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Cleghorn fault zone, Northern Cleghorn section (Class A) No. 108b

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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: Northern Cleghorn section extends from the central part the Southern Cleghorn section [108a] in the vicinity of the western end of Silverwood Lake. Here the Cleghorn fault zone bifurcates to the east as the Cleghorn fault and to the east-northeast as the Silverwood Lake fault (East and West Silverwood Lake fault) and then east as the Grass Valley fault. Traces of the East and West Silverwood Lake and Grass Valley faults were mapped by Dibblee (1965 #4816) and named by Meisling (1984 #6606). The Northern Cleghorn section extends northeastward along the western side of Silverwood Lake to Highway 173, then turns eastward along the northern and southern sides of an east-striking ridge and into Grass Valley. The Northern Cleghorn section ends at a broad, complex junction with the Tunnel Ridge fault [327] about 3 km north of the eastern end of the Southern Cleghorn section [108a].
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).
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 14 km of a total fault length of 25 km.
Average strike	N85°W
Sense of	Left lateral

movement	*Comments:* Meisling (1984 #6606) reported that the Grass Valley fault has geomorphic features indicative of sinistral displacement, based mainly on sinistrally deflected and linear drainages. Weldon and others (1981 #6610) and Meisling (1984 #6606) reported that offsets of the Cedar Springs fault system and a late Miocene erosion surface are suggestive of sinistral offset with a minor component of down-to-southeast vertical displacement along strands of the East and West Silverwood Lake faults.
Dip	70° NW. to vertical *Comments:* Meisling (1984 #6606) mapped 70° NW. to near vertical dips along the East and West Silverwood Lake faults; near vertical dips along the Grass Valley fault, locally as shallow as 50° to the north.
Paleoseismology studies	Site 108-1 by California Department of Water Resources (1968 #6604) involved the excavation of several trenches for site investigation of the Cedar Springs dam. One fault normal trench across trace of the East Silverwood Lake fault exposed Mesozoic crystalline bedrock on the northwest faulted against Plio-Pleistocene Harold Formation. Base of overlying alluvium is offset about 1.5 m southeast side up apparent vertical displacement. Near vertical fault extends into alluvium. Age of alluvium is not well-constrained.
Geomorphic expression	West Silverwood Lake fault delineated by geomorphic features in bedrock such as escarpments, saddles, and linear vegetation contrasts, but systematic deflections of drainages, shutter ridges or offset ridges was not observed by Bryant (1987 #6603). East Silverwood Lake fault delineated by a broad, generally linear valley with subtle linear vegetation contrasts in late Quaternary terrace deposits (Bryant, 1987 #6603). Grass Valley fault delineated by linear ridges, bedrock escarpments, linear ridges in bedrock, and vegetation lineaments in bedrock. Fault traces lack systematically deflected drainages (Bryant, 1987 #6603).
Age of faulted surficial deposits	Fault offsets Mesozoic crystalline basement rocks, Plio-Pleistocene Harold Formation, late Pleistocene alluvium (California Department of Water Resources (CDWR), 1968 #6604; Weldon and others, 1981 #6610; Meisling, 1984 #6606; Bortugno and Spittler, 1986 #6602).

Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Timing of the most recent paleoevent is poorly constrained. Age of faulted alluvium at Cedar Springs dam (site 108-1) is not known. Weldon and others (1981 #6610) estimated age to be late Pleistocene; Stankov (1982 #6609) estimated age to be Holocene. Bryant (1987 #6603) interpreted pre-Silverwood Lake aerial photographs and reported that the East Silverwood Lake fault is delineated by a subtle vegetation contrast across a late Quaternary terrace in the vicinity of site 108-1, but linear tonal contrasts or geomorphic features in Holocene alluvium were not observed.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Association with Southern Cleghorn section and geomorphic expression reported in Bryant (1987 #6603).
Date and Compiler(s)	2003 William A. Bryant, California Geological Survey
References	#6602 Bortugno, E.J., and Spittler, T.W., 1986, Geologic map of the San Bernardino quadrangle: California Division of Mines and Geology Regional Geologic Map Series No. 3, scale 1:250,000. #6603 Bryant, W.A., 1987, Cleghorn and related faults, San Bernardino County: California Division of Mines and Geology Fault Evaluation Report FER-187, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 9 p., scale 1:24,000. #6604 California Department of Water Resources, 1968, Geology and construction materials data, Cedar Springs dam: CDWR, Southern District Design and Construction Branch, Project Geology Report D-102. #2876 Clark, M.M., Harms, K.H., Lienkaemper, J.J., Harwood, D.S., Lajoie, K.R., Matti, J.C., Perkins, J.A., Rymer, M.J., Sarna-Wojcicki, A.M., Sharp, R.V., Sims, J.D., Tinsley, J.C., III, and Ziony, J.I., 1984, Preliminary slip rate table and map of late

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#4816 Dibblee, T.W., Jr., 1965, Geologic map of the Hesperia quadrangle, San Bernardino County, California: U.S. Geological Survey Open-File Report 65-43, scale 1:62,500.

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#6609 Stankov, S., 1982, Cedar Springs dam, San Bernardino County, California-A review of a dam designed against potentially active faults, *in* Fife, D.L., and Minch, L.A., eds., Geology and mineral wealth of the Transverse Ranges: South Coast Geological Society, Annual Symposium and Guidebook Number 10, p. 665-671.

#6610 Weldon, R.J., Meisling, K.E., Sieh, K.E., and Allen, C.R., 1981, Neotectonics of the Silverwood Lake area, San Bernardino County: Technical report to California Department of Water Resources, 22 p., scale 1:24,000.

	#5931 Ziony, J.I., and Yerkes, R.F., 1985, Evaluating earthquake and surface faulting potential, *in* Ziony, J.I., ed., Evaluating earthquake hazards in the Los Angeles region—An earth-science perspective: U.S. Geological Survey Professional Paper 1360, p. 43–91.