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Quaternary Fault and Fold Database of the United States

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Cross Valley fault (Class A) No. 183

Last Review Date: 2002-02-19

Compiled in cooperation with the California Geological Survey

citation for this record: **Machette, M.N., Klinger, R.E., and Piety, L.A., compilers, 2002, Fault number 183, Cross Valley fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:25 PM.**

Synopsis	This northeast-trending normal fault is expressed by relatively small (1-5 m high) scarps on late Quaternary gravels, larger eroded scarps on gravels of early to middle Quaternary age (Funeral Formation), and alignment of travertine springs and mounds on the southeast margin of the Texas Springs syncline [181]. The Cross Valley fault has repeated movement in the Pliocene to Pleistocene and it divides the Furnace Creek basin into time-progressive sedimentary subbasins. It is anomalous in that it is normal to most faults and folds in this part of central Death Valley. The fault terminates the southeastern end of the Texas Springs syncline [181] and may provide a structural link between the northwest-trending Furnace Creek fault [144] on the

	east and the Gran View fault (pre-Quaternary) on the west.
Name comments	This feature was first mapped and named the Monte Blanco fault by Hunt and Mabey (1966 #1551) for the fault's association with the Monte Blanco borax workings. The pre Quaternary part of the fault extends southwest into Miocene rocks of the Artists Drive Formation (McAllister, 1970 #1572). However, the northeast portion of Hunt and Mabey's (1966 #1551) Monte Blanco fault is described herein as the Cross Valley fault as first mapped by McAllister (1970 #1572) who referred to it informally as the valley-crossing fault. It was later named the Cross Valley fault by Cemen and others (1985 #1478). According to mapping of McAllister (1970 #1572), the Cross Valley and Monte Blanco (faults appear to be offset (?) across a northwest-trending fault that is referred to as the Gran View fault (pre Quaternary) by McAllister (1970 #1572). The Cross Valley fault trends about 5 km northeast across the valley of Furnace Creek, and probably terminates against the Wall fault, a part of the larger Furnace Creek fault zone [144] at the base of the Funeral Range (fig. K-5 in Klinger and Piety, 2001 #4774).
County(s) and State(s)	INYO COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* This feature was first (partially) mapped by Hunt and Mabey (1966 #1551) at 1:96,000 scale. Soon thereafter, McAllister (1970 #1572) mapped the entire length of the fault at 1:24,000 scale. It was most recently shown by Klinger and Piety (1996 #3873; and in subsequent publications such as Machette and others, 2001 #4771; Klinger and Piety, 2001 #4774) as a regional (page-size) figure at varying but small scales. Trace used herein is from McAllister (1970 #1572), transferred to 100,000 scale topographic map for digitization.
Geologic setting	The Cross Valley fault is a Pliocene to Pleistocene fault that strikes northeast, almost perpendicular to the dominant direction of regional faulting and folding (faults [141, 142, 182] and fold [182]). It offsets coarse gravels (locally conglomerate) of the late Pliocene to early Quaternary Funeral Formation down about 300

	m to the northwest (Klinger and Piety, 2001 #4774). There has been repeated movement on the Cross Valley fault during Pliocene to Pleistocene time, and Wright and others (1999 #5117) reported that this movement has divided the Furnace Creek basin into time-progressive sedimentary subbasins that become progressively younger to the northwest. The Cross Valley fault terminates the southeastern end of the Texas Springs syncline [181] and may provide a structural link between the northwest-trending Furnace Creek fault [144] on the east and the Gran View fault (pre-Quaternary) on the west (Klinger and Piety, 2001 #4774). Normal extension across the Cross Valley fault, which is perpendicular to the axis of the Texas Springs syncline [181 is consistent with northeast-southwest compression of the fold, and thus suggests that the fold and fault deformation may be temporally related (p. 29,Klinger and Piety, 2001 #4774).
Length (km)	5 km.
Average strike	N26°E
Sense of movement	Normal *Comments:* The fault has been mapped as having normal slip by Hunt and Mabey (1966 #1551), McAllister (1970 #1572), and Klinger and Piety (1996 #3873), although no natural exposures of the actual slip plan have been reported.
Dip Direction	NW *Comments:* No dips have been reported, but the trace of the fault as mapped by McAllister (1970 #1572) suggests a moderate to high angle dip.
Paleoseismology studies	
Geomorphic expression	Pronounced scarps mark the surface trace of the Cross Valley fault. Fault scarps were first mentioned explicitly by McAllister (1970 #1572), who reported that they are several feet (<1 m) high. Klinger and Piety (1996 #3873) conducted the first detailed mapping and analysis of the scarps, and reported that they are 2 to 12 m high on late Pleistocene gravel surfaces. In addition, a l-m-high scarp on a surface with Holocene morphology (p. 49, Klinger and Piety, 1996 #3873) suggested young displacement. A later report by Klinger and Piety (2001 #4774) further clarified

	the nature of the scarps. They measured topographic profiles that have maximum slope angles of 9? on a 1.8 m high scarp to as much as 26? on a 7.2-m-high scarp. In general, the scarp height (and offset) increases to the northeast along the fault, reaching about 12 m probably owing to increasingly older alluvial terraces and piedmont slope deposits away from the active stream channels near Hole in the Wall road.
Age of faulted surficial deposits	Klinger and Piety (fig. K-5 1996 #3873) reported that a 5.4 m high (primary) scarp is formed on their unit Q2c (late Pleistocene; 12-70 ka). In addition, near the Hole in the Wall road they measured a 0.5-m-high main scarp and 0.2-m-high antithetic (graben-forming) scarp on deposits that they suspect are late Holocene (unit Q4a). McAllister (1970 #1572) mapped the fault as in older (Pleistocene) alluvium as well as juxtaposing sedimentary rocks of the Funeral Formation (on the north) and Furnace Creek Formation (on the south). Hunt and Mabey (1966 #1551) showed the fault in depositional contact with late Pleistocene (gravel 2) alluvium, whereas these gravels are clearly in fault contact (fig. K-5, Klinger and Piety, 1996 #3873).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Klinger and Piety (1996 #3873) show evidence of clear deformation of late Pleistocene (unit Q2c, 12-70 ka) gravels and suspect that younger movement is by about 0.3 m of net displacement of a late Holocene debris flow deposits (unit Q4a), although they cannot be positive that the younger scarp is of tectonic origin.
Recurrence interval	 *Comments:* There are no individually dated events along the Cross Valley fault from which recurrence intervals can be determined.
Slip-rate category	Less than 0.2 mm/yr *Comments:* The slip rate for the Cross Valley fault north of the Hole in the Wall road is generally constrained by 2-12 m scarps (lesser offset) in deposits that are 12-70 ka (unit Q2c) and probably older (Klinger and Piety, 2001 #4774). Although these

	data has been published, none of the authors has chosen to calculate a slip rate for the fault. The 5.4 m high scarp (ca. 4 m displacement) on Q2c gravels suggest a probable slip rate of <0.2 mm/yr.
Date and Compiler(s)	2002 Michael N. Machette, U.S. Geological Survey, Retired Ralph E. Klinger, U.S. Bureau of Reclamation Lucy A. Piety, U.S. Bureau of Reclamation
References	#1478 Cemen, I., Wright, L.A., Drake, R.E., and Johnson, F.C., 1985, Cenozoic sedimentation and sequence of deformational events at the southeastern end of the Furnace Creek strike-slip fault zone, Death Valley region, California, *in* Biddle, K.T., and Christie-Blick, N., eds., Strike-slip deformation, basin formation, and sedimentation: Society of Economic Paleontologists and Mineralogists Special Publication 37, p. 127-141. #1551 Hunt, C.B., and Mabey, D.R., 1966, Stratigraphy and structure, Death Valley, California: U.S. Geological Survey Professional Paper 494-A, 162 p., 3 pls., scale 1:96,000. #3873 Klinger, R.E., and Piety, L.A., 1996, Evaluation and characterization of Quaternary faulting on the Death Valley and Furnace Creek faults, Death Valley, California: U.S. Bureau of Reclamation Seismotectonic Report 96-10, 97 p. #4774 Klinger, R.E., and Piety, L.A., 2001, Late Quaternary flexural-slip folding and faulting in the Texas Spring syncline, Death Valley, *in* Machette, M.N., Johnson, M.L., and Slate, J.L., eds., eds., Quaternary and late Pliocene geology of the Death Valley region—Recent observations on tectonics, stratigraphy, and lake cycles (Guidebook for the 2001 Pacific Cell, Friends of the Pleistocene Fieldtrip): U.S. Geological Survey Open-File Report 01-51, p. K185-K192. #4771 Machette, M.N., Menges, C., Slate, J.L., Crone, A.J., Klinger, R.E., Piety, L.A., Sarna-Wojcicki, A.M., and Thompson, R.A., 2001, Field trip guide for Day B, Furnace Creek area, *in* Machette, M.N., Johnson, M.L., and Slate, J.L., eds., eds., Quaternary and late Pliocene geology of the Death Valley region—Recent observations on tectonics, stratigraphy, and lake cycles—Guidebook for the 2001 Pacific Cell, Friends of the Pleistocene Fieldtrip: U.S. Geological Survey Open-File Report 01-51, p. B51–B88.

#1572 McAllister, J.F., 1970, Geology of the Furnace Creek borate area, Death Valley, Inyo County, California: California Division of Mines and Geology Map Sheet 14, 9 p. pamphlet, 1 sheet, scale 1:24,000.

#5117 Wright, L.A., Greene, R.C., Cemen, I., Johnson, F.C., and Prave, A.R., 1999, Tectonostratigraphic development of the Miocene-Pliocene Furnace Creek basin and related features, Death Valley region, California, *in* Wright, L.A., and Troxel, B.W., eds., Cenozoic basins of the Death Valley region: Geological Society of America Special Paper 333, p. 87-114.