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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

unnamed West Side faults (Class A) No. 106

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Compiled in cooperation with the California Geological Survey

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Synopsis	This group of poorly studied piedmont faults are preserved on the broad multiple-age alluvial fans that emanate from deep canyons incised into the Panamint Range, on the west side of Death Valley. These faults are distributed widely and extend discontinuously from the Tucki and Blackwater Wash fans on the north to the Warm Springs and Anvil Springs fans on the south, a distance of about 60-65 km. They form east- and west-facing scarps that range from <1 m to 10 m (or more) in height. As a group, they seem to be preferentially developed on older alluvial fans that are probably <130 ka in age, although younger movement may have occurred either locally or on selected individual faults. They are similar to, but generally upslope (west) of the Hanaupah fault

	[68]. Detailed studies have not been made of these faults, nor has morphometric data been collected to better characterize the size or timing of the scarps.
Name comments	None of the individual faults nor the group of faults as a whole appear to have been formally named, although Hunt and Mabey (1966 #1551) were the first to map and discuss them generally as faults on various west side fans in central Death Valley. This group of piedmont faults and less common range-front faults are herein informally named the West Side faults for their location on the alluvial fans that emanate from deep canyons incised into the Panamint Range, on the west side of Death Valley. These faults are distributed widely across the alluvial fans, and extend discontinuously from the Tucki and Blackwater Wash fans on the north to the Warm Springs and Anvil Springs fans on the south, a distance of about 60-65 km.
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:* These faults has been show with various continuities; Hunt and Mabey (1966 #1551) drew there first traces at 1:96,000 scale. Brogan and others (1991 #298) mapped them fairly comprehensively at 1:62,500 scale to their south limit and Reheis and Noller (1991 #1195) showed them down to 36? N. at 1:100,000 scale. A portion of the faults (mainly at north and south ends) were shown by Wills (1989 #1693) at 1:24,000 scale. For digitization, we mainly used the traces shown by Brogan and others (1991 #298) supplemented by some uniquely identified traces of Reheis and Noller (1991 #1195) and traces in the Tucki and Blackwater Wash fans of Reheis and Noller (1991 #1195).
Geologic setting	These piedmont faults are primarily in a mid- to upper-fan position, east of the eastern front of the Panamint Mountains. They are similar to the Hanaupah fault [68], which is in an intrabasin position, just above the floor of Death Valley. All of these faults are basically antithetic to the much larger and more active Black Mountains fault [142]. Their map pattern is relatively discontinuous from fan to fan, owing to dissection or

	burial by young sediments. However, none of the faults appears to be long continuous, well-organized structures, probably owing to their minor (antithetic) nature. In this region, Death Valley has a general half-graben structure as indicated by the large, relatively undeformed fans that emanate from the Panamint Mountains on the west, versus the small, highly deformed fans that emanate from the Black Range on the east.
Length (km)	61 km.
Average strike	N10°W
Sense of movement	Normal *Comments:* Inferred from aspect of scarps in an extensional regime. No sense of slip indicator has been reported.
Dip Direction	E; W
Paleoseismology studies	
Geomorphic expression	These faults forms small (<1 m) to large (<10 m) scarps on relatively coarse grained alluvial-fan deposits that form the large fans on the west side of central Death Valley (Hunt and Mabey, 1966 #1551). These scarps were first noted and mapped by Hunt and Mabey (fig. 76, 1966 #1551), but little was mentioned about neither their size nor appearance. Most of the faults are east-facing, but a significant number of them are either west-facing or form grabens at the base of larger, more dominant east-facing scarps. Some of the scarps and lineations shown by both Brogan and others (1991 #298) and Reheis and Noller (1991 #1195) along the West Side road are in a relatively low topographic position, are parallel to topographic contours, and are mantled by well rounded boulders, suggesting that they are shoreline features (as mentioned by Hunt and Mabey (1966 #1551) rather than fault scarps. No morphometric analyses of this group of faults has been made, probably because the nearby Black Mountains fault [142] is such a more attractive target for study.
Age of faulted surficial deposits	Hunt and Mabey (1966 #1551) reported that their gravel units 2 (late Pleistocene) and 3 (latest Pleistocene) are deformed by the fault. Although these units were undated at the time, Klinger (Table A-12001 #4770) correlates their gravels 2 and 3 with his units Q2b (80-120 ka) and Q3a-c (2-12 ka) respectively. Gravel

	unit 4 (Recent, probably late Holocene) of Hunt and Mabey (1966 #1551) is not deformed by these faults.
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Although there have been no detailed studies of individual faults, early mapping by Hunt and Mabey (1966 #1551), suggests that their gravel unit 2 (late Quaternary, <130 ka) is clearly displaced by most of these faults, whereas a small fraction of the faults deform gravel unit 3 (latest Quaternary). However, their mapped pattern of faults represents only a small fraction (20-30 percent) of those shown in the more detailed or focused mapping of Brogan and others (1991 #298) and Reheis and Noller (1991 #1195). Most west side faults in the central part of Death Valley are shown by Jennings (1992 #473) as <700 ka, whereas some fault traces are shown as Quaternary, undifferentiated, with displacement since 1.6 Ma. This <700 ka age estimate was based on features that are similar to but less distinct than those suggesting Holocene displacement elsewhere in the valley (Jennings (1992 #473). The timing of the most recent faulting for the whole group is not clear, but most of the faults appear to deform late Quaternary alluvium and some are probably younger. Many of the larger fault scarps on even older (middle? Quaternary) deposits reflect clear evidence of multiple, recurrent faulting, although the youngest movement is difficult to detect in these older deposits. Therefore, we categorize the timing of most recent faulting of the whole group as <130 ka.
Recurrence interval	 *Comments:* Many of these faults have clear evidence for repeated displacement through the late Quaternary (<130 ka) as evidence by 10 m (or larger) scarps on older (late to middle Quaternary) alluvium and smaller (<1 m high) scarps on younger alluvium. However, without better dating of faulted deposits and estimates of offset per event, estimates of recurrence intervals can not be made.
Slip-rate category	Less than 0.2 mm/yr *Comments:* No published information exists on slip rates for the Hanaupah fault. However, the 15-23 m high scarps on Hunt and Mabey's (1966 #1551) gravel 2 (unit Q2b, 80-120 ka, Table A-1

	in Klinger and Sarna-Wojcicki, 2001 #4770) suggest moderate-term rates are probably be <0.2 mm/yr.
Date and Compiler(s)	2002 Michael N. Machette, U.S. Geological Survey, Retired
References	#298 Brogan, G.E., Kellogg, K.S., Slemmons, D.B., and Terhune, C.L., 1991, Late Quaternary faulting along the Death Valley-Furnace Creek fault system, California and Nevada: U.S. Geological Survey Bulletin 1991, 23 p., 4 pls., scale 1:62,500. #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. #473 Jennings, C.J., 1992, Preliminary fault activity map of California: California Division of Mines and Geology Open-File Report 92-03, 76 p., 1 pl., scale 1:750,000. #4770 Klinger, R.E., and Sarna-Wojcicki, A.M., 2001, Field trip guide for Day A, northern 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. A5-A49. #1195 Reheis, M.C., and Noller, J.S., 1991, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the eastern part of the Benton Range 1:100,000 quadrangle and the Goldfield, Last Chance Range, Beatty, and Death Valley Junction 1:100,000 quadrangles, Nevada and California: U.S. Geological Survey Open-File Report 90-41, 9 p., 4 sheets, scale 1:100,000. #1693 Wills, C.J., 1989, Death Valley fault zone, Inyo and San Bernardino Counties, California: California Division of Mines and Geology Fault Evaluation Report FER-204, 17 p., 1 pl., scale 1:62,500.