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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.**

## Washington fault zone, Mokaac section (Class A) No. 1004b

**Last Review Date: 1997-04-26**

## Compiled in cooperation with the Arizona Geological Survey

***citation for this record:*** **Pearthree, P.A., compiler, 1997, Fault number 1004b, Washington fault zone, Mokaac section, 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 02:19 PM.**

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| **Synopsis** | **General:** The Washington fault is a long, north- to northeast-trending fault zone with substantial Cenozoic normal displacement that straddles the western margin of the Colorado Plateaus province. It extends from the Shivwitz Plateau into the St. George basin in southern Utah. The fault zone has generated two prominent, west-facing bedrock escarpments in the southern St. George basin as a result of several hundred meters of normal displacement. The high, linear escarpments are formed by the two faults and its morphology suggests that this part of the fault zone has been fairly active during the Quaternary. Pleistocene deposits |

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| | are faulted in a few places, but no definitive evidence of Holocene faulting has been discovered. Farther south, the Washington fault zone forms the westernmost of several grabens that cut the Shivwitz Plateau. The fault zone has a moderately high, west-facing escarpment and a narrow, shallow graben on the plateau; vertical displacement across the fault zone is less than 100 m. Along this part of the fault zone, upper Pleistocene deposits are displaced by a few meters, and Holocene deposits are not faulted.<br><br>**Sections:** This fault has 3 sections. The sections (northern, Mokaac, and Sullivan Draw) are defined on the basis of structural geometry and geomorphic expression of the fault zone. The northern section encompasses the main Washington fault zone from the pass between Seegmiller and Wolf Hole Mountains north to the Utah border; this section was called the Washington fault by Billingsley (1990 #2079; 1992 #2077). The Mokaac section is subparallel with and northwest of the Washington section in the southern St. George basin. It was called the Mokaac Wash segment by Menges and Pearthree (1983 #2073) and the Mokaac fault by Billingsley 1990 #2079; 1992 #2077). It merges with the Washington section about 5 km south of the Utah border. The Sullivan Draw section is farther south on the Shivwitz Plateau, and total displacement across the fault is much less. Along much of this section, there is a companion, east-dipping fault to the west of the Washington fault. Together, they form the Sullivan graben of Billingsley (1991 #2081; 1991 #2082). |
| **Name comments** | **General:**<br><br>**Section:** This name applies to the northwestern strand of the Washington fault zone in the southern St. George basin. This strand was called the Mokaac fault by Billingsley and the Mokaac Wash fault by Menges and Pearthree. It merges with the main Washington fault [1004a] about 5 km south of the Utah border. |
| **County(s) and State(s)** | MOHAVE COUNTY, ARIZONA |
| **Physiographic province(s)** | BASIN AND RANGE<br>COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:250,000 scale.<br><br>*Comments:* Mapped at 1:24,000 scale; the traces were transferred to 1:250,000-scale topographic base map for digitization. |

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| **Geologic setting** | The north- to northeast-trending Washington fault zone straddles the margin of the Colorado Plateaus province in northwestern Arizona. Paleozoic rocks are displaced vertically by several hundred meters across each of the two major fault strands in the southern St. George basin. Tertiary basalt is also displaced by substantial amounts across these fault strands, and upper Quaternary alluvium is displaced several meters (Billingsley, 1990 #2079; 1992 #2077). Vertical displacement of Paleozoic rocks is less than about 100 m across the southern section of the fault on the Shivwitz Plateau; upper Pleistocene to Holocene (?) alluvial deposits are displaced by as much as 3 m along this section of the fault. The fault has an estimated maximum throw of 750 m in Arizona, but displacement decreases northward in Utah. The fault displaces pre-existing geologic structures and has normal-drag and reverse-drag folding genetically associated with it (Anderson and Christenson, 1989 #828). |
| **Length (km)** | This section is 11 km of a total fault length of 72 km. |
| **Average strike** | N39°E (for section) versus N23°E,N11°E,N11°E (for whole fault) |
| **Sense of movement** | Normal<br><br>*Comments:* Based on regional relations and normal displacement of bedrock and alluvium across the fault zone. |
| **Dip Direction** | NW<br><br>*Comments:* Based on topographic expression of the fault and structural relations. |
| **Paleoseismology studies** | |
| **Geomorphic expression** | Faulting has generated a moderately high, steep, linear, northwest-facing escarpment on Paleozoic bedrock in the southern St. George basin. Upper Quaternary talus and landslide deposits are probably faulted near the northern end of this section. Alluvial scarps have been documented along the southern part of this section; a late Pleistocene age of youngest rupture is suggested (Pearthree and others, 1983 #2083) on the basis of morphologic analysis of a single scarp profile. The Washington fault in Arizona has been studied by Petersen (1983 #2084) and Menges and Pearthree (1983 #2073). |

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| **Age of faulted surficial deposits** | Paleozoic, Mesozoic, late Pleistocene. The geology of the fault zone was mapped by Billingsley (1990 #2079; 1990 #2080; 1991 #2081; 1991 #2082; 1992 #2077). |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | late Quaternary (<130 ka)<br><br>*Comments:* Based on the estimated age of faulted alluvium and one scarp profile. |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr |
| **Date and Compiler(s)** | 1997<br>Philip A. Pearthree, Arizona Geological Survey |
| **References** | #828 Anderson, R.E., and Christenson, G.E., 1989, Quaternary faults, folds, and selected volcanic features in the Cedar City 1° x 2° quadrangle, Utah: Utah Geological and Mineral Survey Miscellaneous Publication 89-6, 29 p., 1 pl., scale 1:250,000.<br><br>#2079 Billingsley, G.H., 1990, Geologic map of the Lizard Point quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 90-643, 1 sheet, scale 1:24,000.<br><br>#2080 Billingsley, G.H., 1990, Geologic map of the Wolf Hole Mountain East quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 90-644, 1 sheet, scale 1:24,000.<br><br>#2081 Billingsley, G.H., 1991, Geologic map of the Sullivan Draw North quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 91-558, 10 p., 1 pl., scale 1:24,000.<br><br>#2082 Billingsley, G.H., 1991, Geologic map of the Sullivan Draw South quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 91-559, 9 p., 1 pl., scale 1:24,000.<br><br>#2077 Billingsley, G.H., 1992, Geologic map of the Yellowhorse |

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| | Flat quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 92-442, 17 p., 1 pl., scale 1:24,000.<br><br>#2073 Menges, C.M., and Pearthree, P.A., 1983, Map of neotectonic (latest Pliocene-Quaternary) deformation in Arizona: Arizona Geological Survey Open-File Report 83-22, 48 p., scale 1:500,000.<br><br>#2083 Pearthree, P.A., Menges, C.M., and Mayer, L., 1983, Distribution, recurrence, and possible tectonic implications of late Quaternary faulting in Arizona: Arizona Geological Survey Open-File Report 83-20, 51 p.<br><br>#2084 Petersen, S.M., 1983, The tectonics of the Washington fault zone, northern Mohave County, Arizona: Brigham Young University Geology Studies, v. 30, no. 1, p. 83-94. |