Earthquake Hazards Program

Database Search

Complete Report for Frenchman Mountain fault (Class A) No. 1117

Brief Report ||Partial Report

citation for this record: Anderson, R.Ernest, compiler, 1999, Fault number 1117, Frenchman Mountain fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 03/29/2010 03:57 PM.

Synopsis The Frenchman Mountain fault strikes generally north, dips mostly west, is broadly arcuate (convex west), and forms the structural boundary between the basin beneath the part of Las Vegas Valley containing Las Vegas and the Frenchman/Sunrise Mountain blocks to the east. The south part of the fault forms the southwest termination of ridges of east-tilted bedrock. The north-striking parts of the Frenchman Mountain fault are normal dip-slip faults, but the northwest-striking southern part of the fault is approximately parallel to the Las Vegas Valley shear zone and probably has an important component of dextral slip. The main north part of the fault is marked by discontinuous short (<4 km) scarps formed in, and partially buried by, coarse fanglomerate deposits directly adjacent to the precipitous bedrock mountain front. Scarps on Quaternary deposits reveal evidence for multiple episodes of Quaternary displacement with reported surface offsets of 6.6 and 8.9 m and slope angles of 20.5° and 21.5°. The scarps are highly modified by mining activities, roads, landfills, and housing developments. Scarps in surficial deposits are not apparent along the northwest-striking southern part of the fault. Also, a search was made for scarps along the southeast projection of the Frenchman Mountain fault at the southwest margin of the River Mountains, but found none. The last displacement event produced a scarp about 2 m high and is estimated to be late Pleistocene. Neither the recurrence nor the slip rate is known.

Name comments Name taken from Anderson and O'Connell (1993 #1440) who applied it to the west-bounding fault of the Frenchman Mountain and Sunrise Mountain structural blocks directly east of Las Vegas, Nevada. It is about 18 km long and extends from Nellis Air Force Base on the north to directly north of Las Vegas Wash. dePolo (1998 #2845) refers to this as the Frenchman Mountain fault system.

Fault ID Comments:
Referred to as fault FM by Piety (1995 #915) and LV17 by dePolo (1998 #2845).

County(s) and State(s) CLARK COUNTY COUNTY, NEVADA

AMS sheet(s) Las Vegas

Physiographic province(s) BASIN AND RANGE

Reliability of location Good
Compiled at 1:250,000 scale.

Comments: Compiled from 1:250,000-scale mapping by Anderson and O'Connell (1993 #1440) who mapped most of the fault at a scale of 1:24,000. Fault also compiled at 1:250,000 scale as part of a photogeologic compilation of Quaternary faults Dohrenwend and others (1991 #288).

Geologic setting The Frenchman Mountain fault is broadly arcuate (convex west) and strikes generally north. It forms the structural boundary between the basin beneath the part of Las Vegas Valley containing Las Vegas and the Frenchman/Sunrise Mountain blocks to the east. The southern part of the fault forms the southwestern termination of ridges of east-tilted bedrock (Longwell and others, 1965 #4694).

Length (km) 18 km.

Average strike N1°E

Sense of movement Normal

Comments: The north-striking parts of the Frenchman Mountain fault are normal dip-slip faults, but the northwest-striking southern part of the fault is roughly parallel to the Las Vegas Valley shear zone, which has an important component of dextral slip (Campagna and Aydin, 1994 #4706; Peck, 1998 #4711).

Dip 35°-60°W

Comments: Slemmons (1998 #4708) gave the range of dip as 45°-60°. Peck (1998 #4711) reported a dip of 35° along Owens Avenue, east of Hollywood Boulevard. Along the northwest-striking southern part of the fault, R.E. Anderson (compiler) has measured steeper dips ranging from 55° SW through vertical to 65° NE (consistent with a component of reverse faulting). It is uncertain whether the southern part of the fault has been active during the Quaternary.

Paleoseismology studies

Geomorphic expression The main, northern part of the Frenchman Mountain fault was first recognized as a Quaternary structure by Bell (1981 #4697). It bounds the Frenchman and Sunrise Mountain blocks and is marked by discontinuous short (<4 km) scarps formed on, and partially buried by, coarse fanglomerate deposits directly adjacent to the precipitous bedrock mountain front (Anderson and O'Connell, 1993 #1440). On the basis of scarp profiles, Anderson and O'Connell (1993 #1440) estimated surface offsets of 6.6 and 8.9 m with slope angles of 20.5° and 21.5° (respectively). These large offsets, together with a nearby young 2 m high scarp representing the last displacement event, provide evidence for multiple episodes of Quaternary displacement. Peck (1998 #4711) reported "geomorphic offset" of 15 m or more along the fault. The scarps are highly modified by mining activities, roads, landfills, and housing developments. Scarps on surficial deposits are not apparent along the northwest-striking, southern part of the fault. Also, Anderson and O'Connell (1993 #1440) conducted a search for scarps along the southeastern projection of the Frenchman Mountain fault at the southwest margin of the River Mountains, but found none. dePolo (1998 #2845) reports a maximum preferred basal fault facet height of 73 m.

Age of faulted surficial deposits Mapping at scale of 1:24,000 by Anderson and O'Connell (1993 #1440) shows four Quaternary stratigraphic units along the Frenchman Mountain fault. The estimated ages for these deposits are based on correlation to soil chronostratigraphic sequences in the region. Deposits of possible late Pleistocene age are offset, but Holocene deposits are not.

Historic earthquake

Most recent prehistoric deformation Late Quaternary (<130 ka)

Comments: The fault cuts deposits estimated to be late Pleistocene (Anderson and O'Connell, 1993 #1440), and the last displacement event produced a scarp about 2 m high. Late to mid Holocene (<5 ka) deposits are probably not faulted, and, on the basis of the strongly eroded nature of the scarps, the youngest displacement event is inferred by Anderson and O'Connell (1993 #1440) to be much older, probably late Pleistocene (10-130 ka), which is consistent with the late Pleistocene age estimated by Dohrenwend and others (1991 #288) on the basis of photogeologic mapping at scale of 1:250,000.

Recurrence interval

Comments: According to Anderson and O'Connell (1993 #1440), the Frenchman Mountain fault has had multiple Quaternary displacements, but neither the recurrence interval nor the time of last displacement event is known.

Slip-rate category Less than 0.2 mm/yr

Comments: According to Anderson and O'Connell (1993 #1440), the Frenchman Mountain fault has had multiple Quaternary displacements summing to several meters of offset, but age control is insufficient to determine the slip rate. Slemmons (1999 #4708) reported that the slip rate ranges from 0.03-0.1 mm/yr, but the basis for that determination is not reported. dePolo (1998 #2845) calculated a vertical slip rate of 0.015 mm/yr for the fault based on 7.5 m of offset of a deposit estimated to be 500 ka. The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) support a low slip rate. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.

Date and Compiler(s) 1999
R. Ernest Anderson, U.S. Geological Survey

References

#1440 Anderson, L.W., and O'Connell, D.R., 1993, Seismotectonic study of the northern portion of the lower Colorado River, Arizona, California, and Nevada: U.S. Bureau of Reclamation Seismotectonic Report 93-4, 122 p., 3 sheets.

#4697 Bell, J.W., 1981, Subsidence in Las Vegas Valley: Nevada Bureau of Mines and Geology Bulletin 95, 84 p., 1 pl., scale 1:62,500.

#4706 Campagna, D.J., and Aydin, A., 1994, Basin genesis associated with strike-slip faulting in the Basin and Range, southeastern Nevada: Tectonics, v. 13, no. 2, p. 327-341.

#288 Dohrenwend, J.C., Menges, C.M., Schell, B.A., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Las Vegas 1° by 2° quadrangle, Nevada, California, and Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-2182, 1 sheet, scale 1:250,000.

#4694 Longwell, C.R., Pampeyan, E.H., Bowyer, B., and Roberts, R.J., 1965, Geology and mineral deposits of Clark County, Nevada: Nevada Bureau of Mines and Geology Bulletin 62, 218 p., 16 pls.

#4711 Peck, J.H., 1998, Seismic hazard of the Frenchman Mountain fault, Clark County, Nevada, in dePolo,

C.M., ed., Proceedings of a conference on seismic hazards in the Las Vegas region: Nevada Bureau of Mines and Geology Open-File Report 98-6, p. 71-75.

#915 Piety, L.A., 1995, Compilation of known and suspected Quaternary faults within 100 km of Yucca Mountain, Nevada and California: U.S. Geological Survey Open-File Report 94-112, 404 p., 2 pls., scale 1:250,000.

#4708 Slemmons, D.B., 1998, Seismotectonic setting for the Las Vegas basin, Nevada, in dePolo, C.M., ed., Proceedings of a conference on seismic hazards in the Las Vegas region: Nevada Bureau of Mines and Geology Open-File Report 98-6, p. 41.

#2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p.