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Complete Report for Las Vegas Valley faults (Class B) No. 1120

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Synopsis The alluvial-fan and basin-fill deposits that form the floor of Las Vegas Valley contain several gently sloping scarps as much as 30 m high in a zone about 27 km long and varying from 6 km wide in the south to 12 km wide in the north. The scarps form a broadly arcuate pattern (convex west) extending through metropolitan Las Vegas. There is a contemporary debate as to whether these scarps are tectonic, or of polygenetic origin that would include major enhancement by processes of dissolution and/or hydrocompaction. Little is known about the offset of the basin-floor bedrock units beneath these scarps or of their structural significance in the development of the Las Vegas basin. Most of the scarps are not known to be located over intrabasin faults, but the northeast-striking Eglinton scarp [1733] at the north margin of the group is apparently situated over a large basement offset (about 200 m) buried beneath about 2 km of basin-fill sediment. Inasmuch as the faults in this group have an uncertain origin, they are herein considered to be Class B features.

Name comments Name given here to a group of scarps of uncertain origin in the southern part of Las Vegas Valley in the vicinity of Las Vegas, Nev. Referred to as Las Vegas Valley faults I-IV by dePolo (1998 #2845).

Fault ID Comments:

Refers to fault number LV13-16 (Las Vegas Valley faults I-IV) of 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 Good

location Compiled at 1:100,000 scale.

Comments: The scarps were mapped at 1:250,000 by Bell and Price (1992 #2419; 1993 #4703). Some were also mapped at that scale by Dohrenwend and others (1991 #288) as part of a photogeologic compilation of Quaternary faults. They are compiled from an unpublished geologic map of the Las Vegas 1°x1/2° quadrangle (scale 1:100,000) in preparation by the U. S. Geological Survey (R. Page, written commun, 1998).

Geologic setting The alluvial fan and basin-fill deposits that form the floor of Las Vegas Valley contain several high, but gently sloping, scarps in a zone about 27 km long and varying from 6 km wide in the south to 12 km wide in the north (Mifflin, 1998 #4709). The scarps in the south strike mostly north-northwest and, as traced north, curve to the northeast suggesting a broadly arcuate shape (convex west) extending through metropolitan Las Vegas. This shape is similar to that of the Frenchman Mountain fault [1117] (Bell and dePolo, 1998 #4710). There is a contemporary debate as to whether these scarps are tectonic or of polygenetic origin that would include major enhancement by processes of dissolution and/or hydrocompaction (dePolo and Ramell, 1998 #4707; Mifflin, 1998 #4709; Zuckerman, 1998 #4713). Little is known of the offset of the basin floor beneath these scarps or of their structural significance in the development of the Las Vegas basin. Most are not known to be located over intrabasin faults, but the northeast-striking Eglinton scarp [1733] at the north margin of the group is apparently situated over a large basement offset (about 200 m) buried beneath about 2 km of basin-fill sediments (Slemmons, 1998 #4708, Bell, 1998 #4710).

Length (km) 25 km.

Average strike N6°W

Sense of Normal

movement

Comments: Bell and dePolo (1998 #4710) noted that faults in Las Vegas Valley parallel to those in and adjacent to the marginal mountain ranges have both normal and strike slip.

Dip

Comments: Probably steep to moderate, typical of Basin-Range faults. Displacements across the broad zone are generally down to the east and southeast.

Paleoseismology studies

Geomorphic expression Most scarps in Las Vegas Valley are highly modified by urbanization. There was no systematic effort to describe them prior to their modification. In general, they are formed on alluvial-fan and basin-fill sediments and are broad gentle features with heights of as much as 30 m.

Age of faulted surficial deposits Recent unpublished geologic mapping at 1:100,000 (R. Page, written commun. 1998) shows most scarps formed on deposits of Pliocene and Quaternary age, Pleistocene age, or as forming the boundary between deposits of those ages and deposits of late Pleistocene and Holocene age. According to Mifflin (1998 #4709), Holocene deposits that extend across the scarps are unfaulted. However, detailed mapping has not been done, and the possibility exists that Holocene deposits are deformed by these faults. Deposits with an estimated age of 14-30 ka are offset by the northeast-trending Eglington scarp [1733] at the north margin of the scarp area (Bell and dePolo, 1998 #4710).

Historic earthquake

Most recent Late Quaternary (<130 ka)

prehistoric deformation

Comments: If the Eglington scarp is associated with paleoearthquakes, the last displacement event probably occurred 14-30 ka (Bell and dePolo, 1998 #4710). For all other scarps, the last faulting event is probably much older, perhaps Pliocene along some scarps. Geodetic monitoring of subsidence caused by overdrifting of groundwater in Las Vegas Valley is interpreted (Bell and dePolo, 1998 #4710) as having reactivated faults.

Recurrence interval

Comments: According to Slemmons (1998 #4708) recurrence intervals are unconstrained, but for the Eglington scarp [1733], a few thousand years is possible. For other scarps it would probably be much longer. DePolo and Ramelli (1998 #4707) suggested that the recurrence intervals of the Las Vegas Valley faults are probably measured in tens of thousands to hundreds of thousands of years.

Slip-rate category Less than 0.2 mm/yr

Comments: There are no data from which to estimate of slip rate. 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 1999

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

References #2419 Bell, J.W., Price, J.G., and Mifflin, M.D., 1992, Subsidence-induced fissuring along pre-existing faults in Las Vegas Valley, Nevada, in Stout, M.L., ed., Proceedings of the 35th annual meeting of the Association of Engineering Geologists: Association of Engineering Geologists, 35th Annual meeting, October 2-9, 1992, p. 66-75.

#4703 Bell, J.W., and Price, J.G., 1993, Subsidence in Las Vegas Valley, 1980-91 Final project report: Nevada Bureau of Mines and Geology Open-File Report 93-4, 30 p., 9, scale 1:62,000.

#4710 Bell, J.W., and dePolo, C.M., 1998, On the origin of Quaternary fault scarps in Las Vegas valley, 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. 70.

#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.

#4709 Mifflin, M.D., 1998, Observations on the origin of Las Vegas compaction scarps, 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. 44-69.

#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.

#4713 Zuckerman, J.M., 1998, The controversy over the origin of the Eglington fault, 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. 197-204.

#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.

#4707 dePolo, C.M., and Ramelli, A.R., 1998, Quaternary and suspected Quaternary faults in Nevada south of 37° N. Latitude, 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. 25.