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Quaternary Fault and Fold Database of the United States

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West Valley fault zone, Granger section (Class A) No. 2386b

Last Review Date: 2004-06-01

Compiled in cooperation with the Utah Geological Survey

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Synopsis	**General:** Intrabasin graben-bounding fault west of the Salt Lake City section of the Wasatch fault zone [2351f] in Salt Lake Valley. The fault zone shows evidence for Holocene surface faulting, but exposures are poor and often lack clear evidence or datable material. Hecker (1993 #642) indicates a composite slip rate of 0.5–0.6 mm/yr, recurrence interval of 1.8–2.2 k.y., and displacement per event of 1.2–1.5 m for the fault zone as a whole. The slip-rate estimates for the West Valley fault zone reflect the consensus values of the Utah Quaternary Fault Parameters

	Working Group (Lund, 2004 #6733). Preferred values of Lund (2004 #6733) approximate mean values based on available paleoseismic-trenching data, and the minimum and maximum values approximate two-sigma (5th and 95th percentile) confidence limits. Confidence limits incorporate both epistemic (*e.g.*, data limitation) and aleatory (*e.g.*, process variability) uncertainty (Lund, 200 #6733). **Sections:** This fault has 2 sections. The southern portion of the WVFZ consists of two subparallel east-dipping faults, each of which are considered as sections herein: the Taylorsville fault [2386a] to the east, and Granger fault [2386b] to the west. The northern part of the WVFZ is broader and characterized by many smaller, east- and west-dipping faults. Seismic-reflection data from an area on-trend with the fault zone at the south end of Great Salt Lake (north of the fault zone) indicate a buried, east-dipping fault that cuts the inferred base of the Quaternary section (Wilson and others, 1986 #185). Movement on the WVFZ may be independent or directly tied to movement on the Salt Lake City section [2351f] of the WFZ. The age of the most recent events on the Taylorsville [2386a] and Granger [2386b] faults are similar to those for the last two events on the Salt Lake City section of the Wasatch fault zone.
Name comments	**General:** **Section:** Hecker's (1993 #642) Granger fault (?) **Fault ID:** Refers to fault number 12-8 of Hecker (1993 #642).
County(s) and State(s)	SALT LAKE COUNTY, UTAH
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:50,000 scale. *Comments:* Fault traces from 1:50,000 scale geologic mapping of Personius and Scott (1992 #4632).
Geologic setting	North- to northwest-trending, approximately 15-km-long, 7-km-wide zone of generally east-dipping faults, which form the western boundary of a fault-bounded basin in the center of the Salt Lake Valley. The Salt Lake Valley is bounded on the east by

	the Wasatch Range and on the west by the Oquirrh Mountains. The Salt Lake City section of the Wasatch fault zone [2351f] traverses the eastern half of the valley, and recent events on the West Valley fault zone appear to be similar in age to known Salt Lake City section surface-faulting earthquakes.
Length (km)	This section is 16 km of a total fault length of 16 km.
Average strike	N21°W
Sense of movement	Normal
Dip	64°E *Comments:* Measured in trenches at the UDOT trench site in West Valley City, in lacustrine sediments (Keaton and others, 1987 #237).
Paleoseismology studies	Two trenches were excavated and eight boreholes were drilled in the mid-1980s at the Utah Department of Transportation facility site (2386-3) at 2700 West Street and about 4500 South Street (Keaton and others, 1987 #237). The fault was expressed as a prominent, discrete, planar trace in both of the trenches. Twenty-four additional boreholes were drilled in the late 1980s at three sites (Keaton and Currey, 1989 #4650). Four boreholes were drilled at the Three Flags locality (site 2386-4), south of the three flags at the southeast corner of the International Center; 12 boreholes were drilled at the Goggin Drain locality (site 2386-5), southwest of the intersection of Interstate 80 and the 4000 West (Bangerter) Highway; and eight boreholes were drilled at the 1300 South locality (site 2386-6], northwest of the intersection of the 2100 South Freeway and the 4000 West (Bangerter) Highway. Stratigraphic relations revealed by the subsurface explorations, including juxtaposition of Cutler Dam and Bonneville lake-cycle deposits, allowed interpretation of the generalized late Quaternary displacement history of the fault, but the timing of individual earthquakes could not be determined. A radiocarbon age estimate on a bulk-soil sample from fault-zone colluvium, obtained by the Utah Geological Survey from a consultant's trench at about 4450 West 1700 South (site 2386-7), provides a close approximation of the age of the most recent surface-faulting event.
Geomorphic expression	Scarps on lacustrine deposits. Geomorphic relations in the northern part of the fault zone suggest post-Bonneville faulting

	prior to formation of the Gilbert shoreline and four or more events since 13 ka. Borehole evidence associated with several traces of the fault suggests two to three events after 22–28 ka, and stratigraphic evidence on the main Granger fault suggests two events since 13 ka and an absence of faulting during the Bonneville lake cycle (13–26 ka). Apparent single-event scarps of the Granger fault [2386a] have inferred displacement consistent with that from monoclinal flexures on the Taylorsville fault [2386a].
Age of faulted surficial deposits	Holocene
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Borehole evidence suggests the most recent event on the Granger fault occurred 6–9 ka. However, one radiocarbon age estimate from fault-zone colluvium in a trench across the fault indicates the most recent event occurred much later, slightly after 1.3–1.7 ka (Utah Geological Survey unpublished data), which is similar to mean timing for the most recent event (1.2 ka) on the Salt Lake City section of the Wasatch fault zone [2351f].
Recurrence interval	2.6–6.5 k.y. (<13 ka). *Comments:* Keaton and others (1987 #237) report a mean recurrence of 2.6 k.y. based on stratigraphic and geomorphic evidence for five earthquakes in 13 k.y.; however, the timing of the earthquakes, and thus the interevent times, are unknown. However, Lund (2004 #6733) considers the available paleoseismic data insufficient to make a recurrence-interval estimate.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Keaton and others (1987 #237) indicate a vertical displacement rate of 0.4–0.5 mm/yr for the past 13 k.y. (post-Bonneville), 0.2–0.4 mm/yr for the past 60 k.y., and 0.1 mm/yr for the past 140 k.y. Lund (2004 #6733) indicates a geologic vertical rate for the entire West Valley fault zone of 0.4 mm/yr (preferred), and a consensus minimum-maximum range of 0.1–

	0.6 mm/yr, based on available fault-trench, scarp-profile, and drill-hole data. The reported rates are poorly constrained estimates, and may not reflect the actual fault slip rate due to the lack of closed seismic cycles.
Date and Compiler(s)	2004 Bill D. Black, Utah Geological Survey Christopher B. DuRoss, Utah Geological Survey Michael D. Hylland, Utah Geological Survey Suzanne Hecker, U.S. Geological Survey
References	#7822 DuRoss, C.B., and Hylland, M.D., 2014, Evaluating surface faulting chronologies of graben-bounding faults in Salt Lake Valley, Utah—New paleoseismic data from the Salt Lake City segment of the Wasatch fault zone and the West Valley fault zone: Utah Geological Survey Special Study 149, 76 p., http://ugspub.nr.utah.gov/publications/special_studies/ss-149/ss-149_PenroseDrive_report.pdf. #642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000. #8532 Hylland, M.D., uRoss, C.B., and McDonald, G.N., 2012, Evaluating the seismic relation between the West Valley fault zone and Salt Lake City segment of the Wasatch fault zone, Salt Lake Valley, Utah: Utah Geological Survey, Survey Notes, v. 44, no. 2, p. 1–3 and 7. #4650 Keaton, J.R., and Currey, D.R., 1989, Earthquake hazard evaluation of the West Valley fault zone in the Salt Lake City urban area, Utah: Technical report to U.S. Geological Survey, Salt Lake City, under Contract 14-08-001-G1397, 69 p. #237 Keaton, J.R., Currey, D.R., and Olig, S.J., 1987, Paleoseismicity and earthquake hazards evaluation of the West Valley fault zone, Salt Lake urban area: Technical report to U.S. Geological Survey, under Contract 14-08-0001-22048, April 1986 (Draft), 18 p. #6733 Lund, W.R., 2005, Consensus preferred recurrence interval and vertical slip rate estimates—Review of Utah paleoseismic-trenching data by the Utah Quaternary Fault Parameters Working Group: Utah Geological Survey Bulletin 134, compact disk.

	#4632 Personius, S.F., and Scott, W.E., 1992, Surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Map I-2106, scale 1:50,000. #185 Wilson, E.A., Saugy, L., and Zimmermann, M.A., 1986, Cenozoic tectonics and sedimentation of the eastern Great Salt Lake area, Utah: Bulletin de la Societe Geologique de France, v. 2, no. 5, p. 777-782.