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Great Salt Lake fault zone, Antelope Island section (Class A) No. 2369c

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Compiled in cooperation with the Utah Geological Survey

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Synopsis	**General:** This is a zone of Holocene faulting beneath Great Salt Lake that was identified from seismic-reflection profiling. Subsidiary faulting is common in the hanging wall west of the main fault in the southern Great Salt Lake. The faults may step to the west and connect with the Oquirrh fault zone [2398] to the south. The entire fault zone appears to have been active in the latest Pleistocene or Holocene (<15 ka). **Sections:** This fault has 3 sections. Dinter and Pechmann (1999

	#4526; 1999 #4645; 2000 #4646) indicate the active East Great Salt Lake fault trace west of Antelope Island shows a 2-km-wide step to the west, suggesting the fault may form two north-northwest trending sections south of Promontory Point: a 35-km-long Antelope Island section and a 30-km-long Fremont Island section. A right step west of Promontory Point suggests that a northern Promontory section probably exists north of the Fremont Island section, although no high-resolution seismic profiles exist for the Promontory section. High-resolution seismic profiles show a sharp westward bend in the southern end of the fault indicating a step-over to the Oquirrh fault zone [2398].
Name comments	**General:** **Section:** The Great Salt Lake fault zone is referred to as the East Lake fault by Colman and others (2002 #7327). **Fault ID:** Refers to fault number 6-8 of Hecker (1993 #642).
County(s) and State(s)	DAVIS COUNTY, UTAH SALT LAKE COUNTY, UTAH TOOELE COUNTY, UTAH
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:89,700 scale. *Comments:* The mapped traces are from high-resolution seismic reflection lines located using GPS by Dinter and Pechmann (1999 #4526; 1999 #4645; 2000 #4646; unpublished mapping, 1:89,700 scale).
Geologic setting	Generally north-trending normal faults beneath Great Salt Lake identified from seismic reflection data. Subsidiary faulting is common in the hanging wall west of the main fault in the southern Great Salt Lake.
Length (km)	This section is 35 km of a total fault length of 103 km.
Average strike	N11°W (for section) versus N29°W (for whole fault)
Sense of movement	Normal *Comments:* A steeply west-dipping fault is evident on seismic reflection profiles, but dips are not reported. Interpretation of

	reflection data suggests the fault may flatten with depth (Smith and Bruhn, 1984 #4561) and merge into a horizontal detachment at a depth of about 6 km (Viveiros, 1986 #4649). However, the evidence is equivocal.
Dip Direction	W
Paleoseismology studies	
Geomorphic expression	Subaqueous. Evidence of repeated displacements in Holocene time (Dinter and Pechmann, 1999 #4526, 1999 #4645; 2000 #4646; Colman and others, 2002 #7327). A 3-m-high scarp is preserved on the lakebed along the Antelope Island section, indicating a relatively recent displacement.
Age of faulted surficial deposits	Holocene. Cores collected in August 2000 by Dinter and Pechmann (2000 #4646) may yield dates and improve the geologic interpretation.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* High-resolution seismic data show stratigraphic and structural anomalies, including auxiliary faults and tectonically produced angular unconformities and on-lap surfaces, that indicate three surface-faulting earthquakes on the Antelope Island section since the disappearance of Lake Bonneville (Dinter and Pechmann, 2000 #4646; Colman and others, 2002 #7327). A 1.5-km-long zone of ten or more en-echelon fractures, beneath the lake west of Antelope Island, appears unmodified by coastal processes and to have slight down-to-the-west displacement on aerial photos, and may date from the latest Holocene (Currey, 1980 #4490).
Recurrence interval	3.8-5.6 ky (<9.2-9.3 ka). *Comments:* Dinter and Pechmann (2000 #4646) indicate three events since 9.2-9.3 ka. Section lengths are comparable to those of the Wasatch fault zone [2351] and suggest comparable earthquake magnitudes. In a subsequent study, Colman and others (2002 #7327) conclude that the last three episodes of significant faulting occurred since lake level fell from its Pleistocene high

	about 13.5 ka; however, they do not report any recurrence intervals.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* A preliminary vertical displacement rate of 0.67+0.06 mm/yr and a fault-parallel slip rate of 0.9+0.2 mm/yr are estimated by Dinter and Pechmann (2000 #4646). Colman and others (2002 #7327) report vertical displacement of 12 m that have occurred in the past 13.5 k.y.
Date and Compiler(s)	2016 Bill D. Black, Utah Geological Survey Suzanne Hecker, U.S. Geological Survey Gary E. Christenson, Utah Geological Survey Kathleen M. Haller, U.S. Geological Survey
References	#7327 Colman, S.M., Kelts, K.R., Dinter, D.A., 2002, Depositional history and neotectonics in Great Salt Lake, Utah, from high-resolution seismic stratigraphy: Sedimentary Geology, v. 148 p. 61–78, doi:10.1016/S0037-0738(01)00210-X. #4490 Currey, D.R., 1980, Coastal geomorphology of Great Salt Lake and vicinity, *in* Gwynn, J.W., ed., Great Salt Lake—A scientific, historical, and economic overview: Utah Geological and Mineral Survey Bulletin 116, p. 69-82. #4526 Dinter, D.A., and Pechmann, J.C., 1999, Sublacustrine paleoseismology—Evidence for recent earthquakes on the East Great Salt Lake fault, Utah: Association of Engineering Geologists, 42nd Annual Meeting Abstracts with Program, p. 62-63. #4645 Dinter, D.A., and Pechmann, J.C., 1999, Multiple Holocene earthquakes on the East Great Salt Lake fault, Utah—Evidence from high-resolution seismic reflection data: Eos, Transactions of the American Geophysical Union, v. 80, no. 46, supplement, p. F734. #4646 Dinter, D.A., and Pechmann, J.C., 2000, Late Quaternary slip rates and recurrence intervals of large earthquakes on the East Great Salt fault, Utah—Estimates from high-resolution seismic reflection data: Geological Society of America, Abstracts with Programs, 2000 Annual Meeting, v. 32. #8527 Dinter, D.A., and Pechmann, J.C., 2005, Segmentation and

	Holocene displacement history of the Great Salt Lake fault, Utah, *in* Lund, W.L. (ed.), Proceedings, Basin and Range Province Seismic Hazard Summit II: Utah Geological Survey Miscellaneous Publication MP05-2 5 pp. (extended abs.). #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. #1042 Morrison, R.B., 1965, Geologic map of the Duncan and Canador Peak quadrangles Arizona and New Mexico: U.S. Geological Survey Miscellaneous Geologic Investigations I-442, 7 p. pamphlet, 1 sheet, scale 1:48,000. #4561 Smith, R.B., and Bruhn, R.L., 1984, Intraplate extensional tectonics of the western U.S. Cordillera-Inferences on structural style from seismic-reflection data, regional tectonics and thermal-mechanical models of brittle-ductile deformation: Journal of Geophysical Research, v. 89, no. B7, p. 5733-5762. #4649 Viveiros, J.J., 1986, Cenozoic tectonics of Great Salt Lake from seismic-reflection data: Salt Lake City, University of Utah, unpublished M.S. thesis, 81 p.