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Quaternary Fault and Fold Database of the United States

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County Dump fault (Class A) No. 2038

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Compiled in cooperation with the New Mexico Bureau of Geology & Mineral Resources

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Synopsis	The County Dump fault is a down-to-the-east, north-trending normal fault located in the northern part of the Albuquerque-Belen basin. The fault offsets deposits of the upper Santa Fe Group, well-developed calcic soils of the Llano de Albuquerque, and about 155-ka basalt of the Albuquerque Volcanoes volcanic field. Repeated surface-faulting in the past 1 m.y. is expressed as a subdued, 24-m-high, up to 800-m-wide fault scarp across the Llano de Albuquerque and was first recognized during early geologic work in the region. An exposure of the fault at the now abandoned Bernalillo County landfill (dump) has been described in two detailed studies addressing the history of surface rupture. The most recent study used thermoluminescence (TL) ages and

	detailed soils analyses to constrain the time of the most recent surface-faulting event on the County Dump fault at 24 ka.
Name comments	The County Dump fault was originally mapped and named by Lambert (1968 #1396) for a down-to-the-east normal fault exposed at the now abandoned Bernalillo County landfill site, located about 1.5 km north of Interstate 40. Kelley (1977 #1106) renamed this structure the Nine Mile fault and included a down-to-the west fault south of Interstate 40 that was originally mapped by Lambert (1968 #1396). Machette (1982 #1401) used the name "Bernalillo County Dump fault" for this structure, but most workers since Kelley (1977 #1106) have used either "County Dump fault" (Machette, 1978 #1402; Hawley and Haase, 1992 #1304) or "Nine Mile fault zone" (Hawley and Whitworth, 1996 #1303) when referring to this structure. Cather and others (1997 #1763) called the northern end of the County Dump fault the "Centipede fault" in the Sky Village SE quadrangle. Herein we use the name "County Dump fault" as originally named by Lambert (1968 #1396) for the entire fault zone, because the "Nine mile fault" as mapped by Kelley (1977 #1106) and Hawley and Whitworth (1996 #1303) contains faults with both down-to-the-east and down-to-the-west displacements. **Fault ID:** Fault no. 2 of Machette (1982 #1401), fault no. 1 of Machette and McGimsey (1983 #1024).
County(s) and State(s)	SANDOVAL COUNTY, NEW MEXICO BERNALILLO COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* The trace of the County Dump fault is from Lambert (1968 #1396), Machette (1978 #1402), Cather and others (1997 #1763), air photo mapping by S.F. Personius (unpublished data, 1997), and high-resolution aeromagnetic data (U.S. Geological Survey and SIAL Geosciences Inc., 1997 #1722; Grauch and Millegan, 1998 #1721).
Geologic setting	The County Dump fault is one of several north-trending intrabasin faults in the northern part of the Albuquerque-Belen basin. The fault also forms the western margin of a broad graben

	that confines some basalt flows of the Albuquerque Volcanoes volcanic field. The spatial association of the fault with the volcanic field may suggest a possible relationship with magmatic activity.
Length (km)	35 km.
Average strike	N5°E
Sense of movement	Normal
Dip	75°–85° E. *Comments:* Dip measurements are from near-surface fault exposures at the abandoned Bernalillo County landfill site (Lambert, 1968 #1396; Machette, 1978 #1402; McCalpin, 1997 #1767).
Paleoseismology studies	The fault is well exposed in the northwest corner of the now abandoned Bernallilo County landfill. Here, the exposed County Dump fault offsets sands and gravels assigned to the Upper Buff or Ceja members of the Santa Fe Formation (Bryan and McCann, 1937 #1288; Kelley, 1977 #1106), which are now included in the Sierra Ladrones Formation of the upper Santa Fe Group (Hawley and others, 1991 #1302). The upper part of these rocks may be early Pleistocene in age. The fault also cuts the Llano de Albuquerque, an extensive Pleistocene surface formed on the Santa Fe Group. Site 2038-1. Results from an early study of the natural exposure suggest that buried soils on colluvial deposits as young as 20–120 ka were deposited in response to large offsets (Machette, 1978 #1402). Site 2038-2. The exposure at Bernalillo County landfill was re-excavated to address why previous estimates of displacement were so large and whether artificial exposures of the section might better reveal small scarp-derived colluvial deposits resulting from smaller displacement events. Six backhoe trenches that exposed the hanging wall deposits to a depth of 19–21 m below the surface were excavated for this study (McCalpin, 1997 #1767; McCalpin and others, 2006 #693). Interpretation of the exposures suggest that perhaps as many as 14 earthquakes occurred on the County Dump fault since the abandonment of the Llano de Albuquerque

	at 1.8-0.8 Ma (Connell and others, 2013 #7235); the timing of surface ruptures were constrained by thermoluminescence (TL) ages and quantitative analysis of soil properties developed on colluvial deposits deposited adjacent to the County Dump fault. Based on a number of assumptions, the mean vertical displacement in the past 14 events at this location is 1.2±0.6 m; it is not known if mean displacement at this location is a representative average for the fault or not (McCalpin and others, 2006 #693).
Geomorphic expression	The County Dump fault is discontinuously exposed in upper Santa Fe Group sediment along the eastern Llano de Albuquerque. A broad, sand-covered, 24-m-high fault scarp, which is 800 m wide with maximum scarp-slope angle of 3.5° (McCalpin and others, 2006 #6931), marks the trace of the fault where it crosses the Llano de Albuquerque north of the Bernalillo County landfill exposure. The scarp is asymmetrical; the upper (erosional) part between the fault and scarp crest comprises only 25 percent of total scarp width. This asymmetry is used to substantiate the interpretation that large amount of deposition has occurred on the hanging wall since active fluvial deposition on the Llano de Albuquerque ceased. Further north, the County Dump fault skirts the western margin of the Albuquerque Volcanoes volcanic field, and extends northward as a broad escarpment on upper Santa Fe Group sediment and eroded remnants of the Llano de Albuquerque. South of the Bernalillo County dump exposure, the fault is exposed in upper Santa Fe Group sediment before ending a few kilometers south of Interstate Highway 40.
Age of faulted surficial deposits	At the surface, the County Dump fault is in sands and gravels assigned to the Upper Buff or Ceja members of the Santa Fe Formation (Bryan and McCann, 1937 #1288; Kelley, 1977 #1106), which are now included in the Sierra Ladrones Formation of the upper Santa Fe Group (Hawley and others, 1991 #1302). Fault scarps are on the Llano de Albuquerque (1.8 Ma based on 40Ar/39Ar dating, Connell and others, 2013 #7235), an extensive early Pleistocene surface formed at the top of the Santa Fe Group and basalts dated at about155 ka of the Albuquerque Volcanoes volcanic field (Geissman and others, 1990 #1297; Peate and others, 1996 #1411).
Historic earthquake	
Most recent	late Quaternary (<130 ka)

prehistoric deformation	*Comments:* McCalpin and others (2006 #6931) report evidence of a possible 24-ka earthquake that only produced warping of near-surface sand deposits. In addition, thermoluminescence (TL) ages suggest that the additional surface-rupturing earthquakes occurred at 39 ka and 59 ka. Therefore, two and possibly three earthquakes have occurred in the late Quaternary. Machette (1978 #1402) suggested a similar time of 20 ka for the latest significant earthquake on the County Dump fault based on regional rate of pedogenic calcium carbonate accumulation.
Recurrence interval	41 k.y. (<300 ka) *Comments:* McCalpin and others (2006 #6931) used thermoluminescence (TL) ages and quantitative soils analysis to estimate the timing of 14 earthquakes. Six thermoluminescence (TL) samples ranging from 4 ka (at the surface) to greater than 293 ka (8.3 m below the surface) constrain the age of the uppermost colluvial wedges; the age of older soils (8.3–17.3 m below the surface) was estimated based on accumulation rate of pedogenic calcium carbonate of 0.26 g $CaCO^3$ per thousand years, based on data from the upper part of the section. Recurrence intervals range from 4 to 202 k.y. and average 40.8 k.y.; a better constrained average of 29.5±11 k.y. is indicated if the longest and shortest intervals are not considered. The three most recent faulting events can be reconstructed from relationships in the highest trench and yielded ages of about 24 ka (0.4 m vertical displacement), 40–45 ka (0.35 m vertical displacement), and 75–80 ka (< 3.5 m vertical displacement). The earlier investigation by Machette (1978 #1402) provided average recurrence intervals of 90–190 ka because fewer faulting events were identified.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low slip-rate category assigned based on vertical-displacement rates from trenching at site 2038-2 described in McCalpin and others (2006 #6931), who suggest the vertical-displacement rate has not been constant over the past 1.6 m.y. However, the long-term and short-term (from the past two earthquakes) vertical-displacement rates are similar. Vertical-displacement rate for the County Dump fault at the Bernalillo County landfill can be constrained by the 24 m of far-field surface offset and the estimated 1–1.6 Ma age of the Llano de

	Albuquerque, resulting in a possible range in vertical-displacement rate of 0.015–0.024 mm/yr (McCalpin and others, 2006 #6931). The vertical-displacement rate would be lower and better constrained if the age for the Llano based on Connell and others (2013 #7235) were considered. McCalpin and others (2006 #6931) present a similar short-term vertical rate of 0.018 mm/yr based on cumulative offset in the past two earthquakes of 0.75 m.
Date and Compiler(s)	2015 Kathleen M. Haller, U.S. Geological Survey Stephen F. Personius, U.S. Geological Survey Susan S. Olig, URS Corporation James P. McCalpin, GEO-HAZ Consulting, Inc.
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