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Great Valley thrust fault system, Trout Creek (Great Valley 04a) and Gordon Valley (Great Valley 04b) sections (Class A) No. 28d

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Synopsis	**General:** The Great Valley thrust fault system is a seismically active blind thrust fault and fold belt that marks the boundary between the Coast Ranges and the Great Valley. The Great Valley thrust fault system can be described as a complex system of east vergent, shallow-dipping blind thrust faults and associated west-vergent shallow to moderately dipping backthrust faults. Quaternary deformation in the western Sacramento Valley is characterized by uplift, tilting, asymmetric folding, and, locally, by both west and east-vergent thrust faulting (Unruh and Moores, 1992). Significant seismic events associated with the Great Valley thrust fault system include: 1892 earthquake series (up to Mw6.5 based on shaking intensities) that probably occurred along the

	Gordon Valley thrust [28d2] (O'Connell and others 2001); 1982 Mw5.5 New Idria earthquake that occurred along the Great Valley 12 section [28l] (Ekström and others 1992); 1985 Mw6.5 Coalinga earthquake that occurred along the Coalinga section [28m] (Ekström and others 1992); and the 1985 Mw6.1 Kettleman Hills-North Dome earthquake that occurred along the Kettleman Hills-North Dome section [28n] (Ekström and others 1992). Wong and others (1988) summarized these events and additional seismicity along the Great Valley thrust fault system. Slip rate estimates for the thrust fault system generally are based on uplift rates of specific stratigraphic horizons and fault dips, which are sometimes measured from deep seismic reflection lines, and sometimes from structural modeling. A paleoseismic study at the Lone Tree Creek site (403-1) involving trench excavations exposed deformed terraces deposits, but did not expose faulting along the San Joaquin fault [403], which may be the near surface expression of the Orestimba section [28g]. Estimated late Quaternary dip-slip rates along the Great Valley thrust fault system range from about 0.1 mm/yr for the Great Valley 01 section, 1–3 mm/yr for the Mysterious Ridge [28c] section, 0.4–0.6 mm/yr for the Orestimba [28g] section, and about 3 mm/yr for the Kettleman Hills-North Dome [28n] section. **Sections:** This fault has 14 sections. From north to south the section names are: Great Valley 01 [28a], Great Valley 02 [28b], Mysterious Ridge (GV 03) [28c], Trout Creek (GV 04a) [28d1], Gordon Valley (GV 04b [28d2], Orestimba (GV 07) [28g], Quinto (GV 08) [28h], Laguna Seca (GV 09) [28i], Panoche Hills (GV 10) [28j], Great Valley 11 [28k], Great Valley 12 [28l], Coalinga (GV 13) [28m], and Kettleman Hills-North Dome (GV 14) [28n]. The blind Great Valley thrust fault system originally was divided into 14 sections by WGNCEP (Working Group on Northern California Earthquake Potential, 1996) and Petersen and others (1996) in order to model the fault system for purposes of seismic hazard assessment. Subsequent probabilistic seismic hazard assessment models (UCERF 2-Wills and others 2008) revised the sections, replacing GV 05 [028e] with the Mt. Diablo thrust (blind) [353] and GV 06 [028f] with the Midland fault [506] and Pittsburg-Kirby Hills fault zone [246]. Wakabayashi and Smith (1994) first proposed dividing the Great Valley thrust fault system into between 18 and 25 segments, based on structural geology, geomorphology, and historical seismicity.
Name	**General:** Refers to the blind thrust fault and fold belt that is

comments	located along the west side of the Great Valley. Has been referred to as the Coast Range-Sierra Nevada boundary zone by Wong and others (1988), Coast Range-Central Valley boundary zone by Wakabayashi and Smith (1994) (they also refer to this structure as the Coast Range-Central Valley thrust system in their Figure 1), and the Great Valley thrust fault system by WGNCEP (Working Group on Northern California Earthquake Potential, 1996). Great Valley thrust fault system will be used in this compilation. **Section:** Trout Creek and Gordon Valley sections are comparable to Wakabayashi and Smith's (1994) segments 5 and 6. O'Connell and Unruh (2000) subdivided the GV 04 section into what they termed the Trout Creek (GV 04a) and Gordon Valley (GV 04b) thrusts. The Trout Creek section, underlying the northern English Hills, is a fault-propagation fold with the top of the fault plane extending to within 8–10 km of the ground surface. The Gordon Valley thrust underlies the southern extent of the English Hills and is delineated by the top of the fault plane extending to within 4-6 km of the ground surface (O'Connell and Unruh, 2000). O'Connell and others (2001) reported that the April 1892 Winters earthquake sequence likely was initiated by rupture along the Gordon Valley thrust. **Fault ID:** Refers to numbers GV 01 to GV 14 of WGNEP (Working Group on Northern California Earthquake Potential, 1996).
County(s) and State(s)	YOLO COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Poor Compiled at 1: scale. *Comments:* Location of fault from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to 1:508,150-scale map (O'Connell and Unruh, 2000).
Geologic setting	The Great Valley thrust fault system delineates the boundary between the Coast Ranges and the Great Valley (also referred to as the Central Valley). The Great Valley thrust fault system as defined in this compilation extends for about 475 km along the

	west side of the Great Valley. The fault system is complex and consists of both shallow west-dipping blind thrust faults and associated east-dipping shallow to moderate dipping thrust and reverse faults. Both fault-bend folding and fault-propagation folding have been hypothesized for the Great Valley thrust fault system and it is likely that one or the other model best explains the data for any specific fault section. For example, the Coalinga section [28m] is best explained by the fault-bend fold model (Namson and Davis, 1990; Guzofski and others 2007), while O'Connell and others (2001) consider that the fault-propagation fold model best explains deformation along the Mysterious Ridge [28c], Trout Creek [28d1], and Gordon Valley [28d2] sections. Maximum structural relief is about 7–10 km for the fault sections along the west side of the Sacramento Valley (sections [28c], [28d1 and 28d2]; O'Connell and others 2001).
Length (km)	This section is 61 km of a total fault length of km.
Average strike	153
Sense of movement	Thrust
Dip	20–30° W. *Comments:* Trout Creek fault dips 20° and Gordon Valley thrust dips 30° (O'Connell and Unruh, 2000; O'Connell and others 2001), based on elastic deformation modeling.
Paleoseismology studies	
Geomorphic expression	Fault propagation fold delineated by easternmost anticline in the English Hills. Remnants of an alluvial fan complex from Putah Creek that overlie the Plio-Pleistocene Tehama Formation are uplifted, tilted, and incised by Putah Creek
Age of faulted surficial deposits	Blind thrust ramp offsets Mesozoic sedimentary rocks. Surface deformation is expressed by tilting and folding of Plio-Pleistocene deposits. O'Connell and others (2001) noted that inset fluvial terraces east of the English Hills indicate ongoing uplift in late Quaternary time, based on soil profile development and comparison of soil chronosequence developed by Munk (1993) in the Dunnigan Hills.
Historic	

earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Timing of the most recent paleoevent is not well-constrained. O'Connell and others (2001) noted that inset fluvial terraces east of the English Hills indicate ongoing uplift in late Quaternary time, based on soil profile development and comparison of soil chronosequence developed by Munk (1993) in the Dunnigan Hills.
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Dip slip rate for Gordon Valley section is based on uplift of Plio-Pleistocene Tehama Formation and ranges from 0.5 to 1.2 mm/yr. Amount of structural relief of Tehama Formation, accounting for uncertainties, ranges from 520 m to 760 m, allowing a dip slip displacement of 800 to 1200m, assuming a 20–30° dip. O'Connell and Unruh (2000) report a preferred dip slip rate ranging from 0.5–2.0 mm/yr.
Date and Compiler(s)	2017 William A. Bryant, California Geological Survey
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