U.S. DEPARTMENT OF THE INTERIOR
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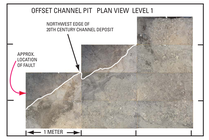
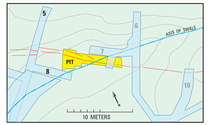


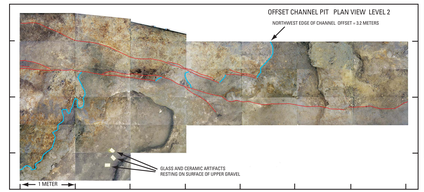


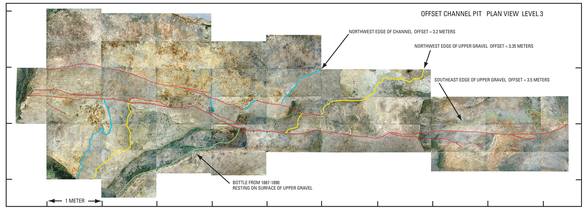
Map showing locations of pit excavation, trenches (light blue) and axis of swale (dashed blue).

ARANO FLAT PIT EXCAVATION

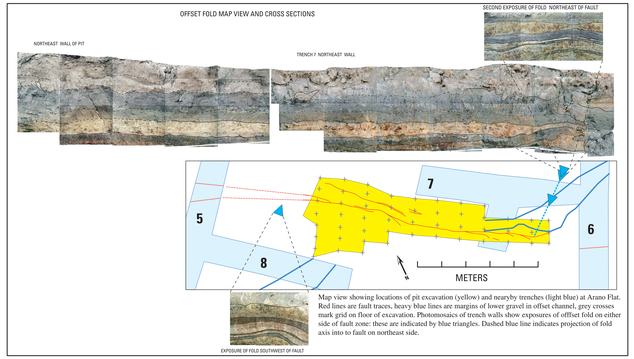
Trench 5 intersected a topographic swale that is partially filled with deposits of a channel that flowed from east to west across the fault zone during the second half of the 19th century as evidenced by artifacts contained within the deposits. This channel appears to have formed as a flood channel from Arano Creek. As exposed in Trench 7, the deposits in this channel consist of a narrow basal gravel and an upper bed of fine gravel and sand separated and overlain by massive, dark greyish brown colluvium. In order to expose the deposits of this channel in the immediate vicinity of the fault zone, we hand-excavated a flat-bottomed pit centered on the fault zone. On the floor of this pit, we exposed the fault traces and piercing lines in plan view. This allowed us to measure offsets very precisely while preserving critical relationships. We began by excavating Trench 6 to locate the fault zone southeast of the channel and Trenches 7 and 8 to locate the channel to the northeast and southwest of the fault zone, respectively. The main channel deposits were exposed at the southeast end of Trench 7 while the deposits of a smaller channel flowing from the northeast and associated with the small alluvial fan, were exposed at the northwest end of Trench 7. Deposits of both channels are stacked at the southeast end of Trench 8. Excavating was done with a hand scraper and garden trowel. Level 1 exposes the northwest edge of the younger channel. It clearly is not faulted and therefore was active post-1906 and flowed across the fault in an existing topographic swale. Level 2 shows the excavation at the end of the 1997 field season. At this stage the fault traces were exposed along with the faulted northwest margin of the older channel. The upper surface of the upper gravel was exposed at the fault on the northeast side but the excavation of this deposit was left incomplete on the southwest side of the fault. During the 1998 field season, we widened the pit to about 3 meters and lengthened it to about 10 meters. We completed excavation of the northwest edge of the upper gravel and excavated a narrow ditch in order to expose the northwest edge of the lower gravel on the southwest side of the fault. The final stage of the excavation is shown as Level 3.

The pit excavation also allowed us to expose a small fold that has been offset by faulting and measure its displacement. This fold was first exposed in both walls of Trench 5. It formed as a result of faulting during two earthquakes: the first occurred when unit 90 was at the ground surface and the second occurred when unit 50 was at the surface. It has been offset by the past five earthquakes. We excavated a portion of the northwest wall of the pit in order to expose the fold within 30 cm of the fault zone on the northwest side. On the southeast side of the fault zone, the fold was exposed on both walls of Trench 7. It was exposed a third time when a portion of the northeast wall of Trench 7 was cut back about 50 cm. The trend of the fold axis in these three exposures was projected about 1.5m to the fault on the southeast side. The fold is offset about 10.5m.



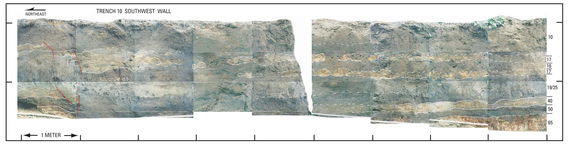


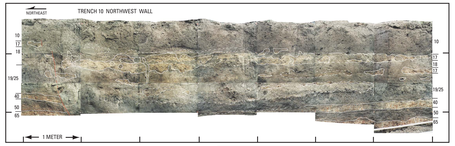
Pit excavation at Arano Flat. View is to northwest.

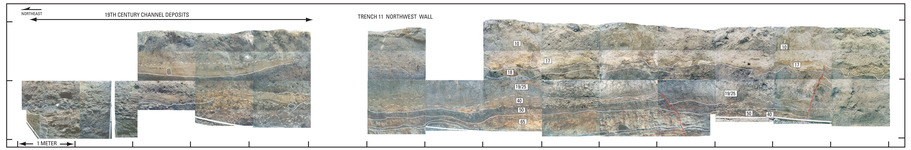


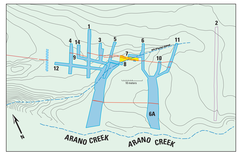
Map view showing locations of pit excavation (yellow) and nearby trenches (light blue) at Arano Flat. Red lines are fault traces, heavy blue lines are margins of lower gravel in offset channel, grey crosses mark grid on floor of excavation. Photomosaics of trench walls show exposures of offset fold on either side of fault zone: these are indicated by blue triangles. Dashed blue line indicates projection of fold axis into to fault on northeast side.

FAULT PERPENDICULAR TRENCHES

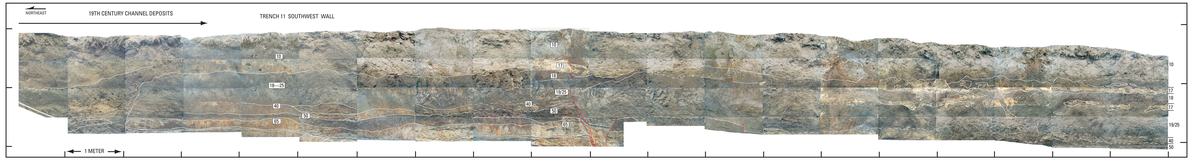




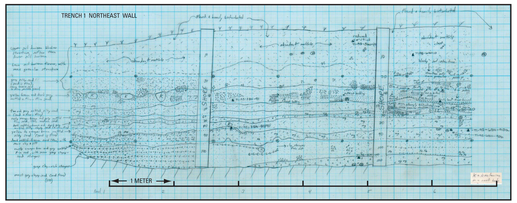


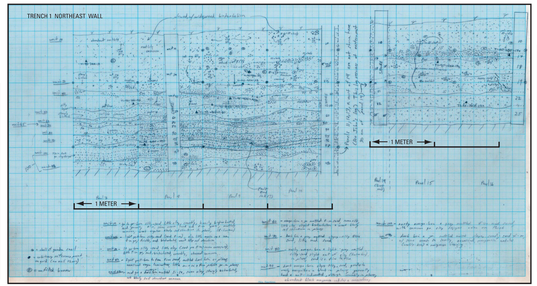


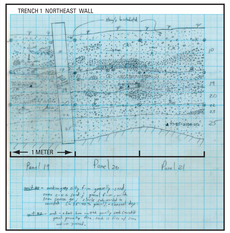
Topographic map showing location of trenches (light blue) and pit (yellow). Fault traces indicated by red lines. Contour interval 20 cm.

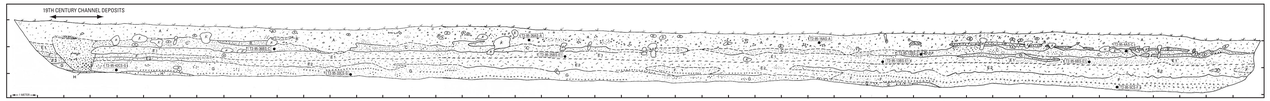


FAULT PARALLEL TRENCHES









PHOTOMOSAICS AND LOGS OF TRENCHES ON THE SAN ANDREAS FAULT AT ARANO FLAT NEAR WATSONVILLE, CALIFORNIA

by
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2003

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