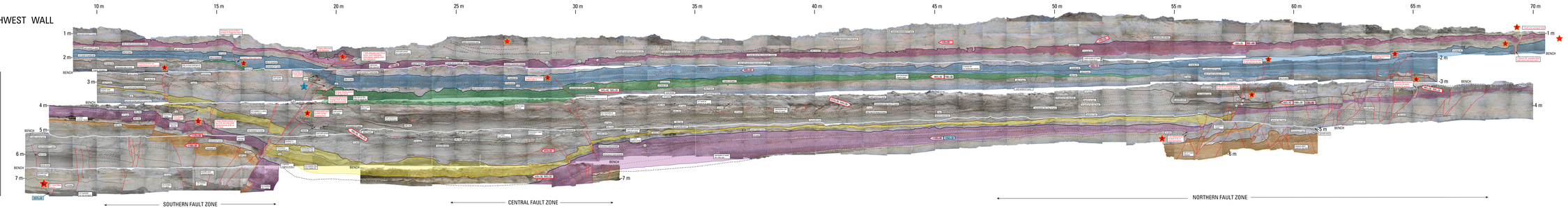
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

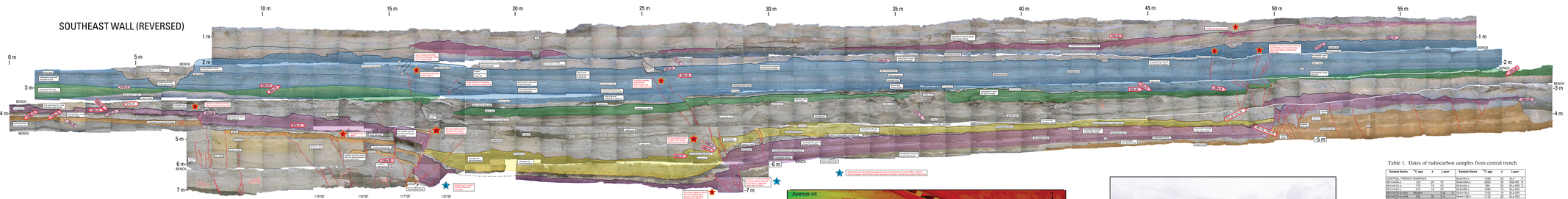
OPEN FILE REPORT 2009-1039
SHEET 1 OF 2

CENTRAL TRENCH

NORTHWEST WALL



SOUTHEAST WALL (REVERSED)



Explanation

- Location of evidence for probable earthquake with sequential event number
- Location of evidence for possible earthquake with sequential event number
- Sequential earthquake number and description of evidence
- Lithologic description. Abbreviations: v, very; vf, very fine; f, fine; m or med, medium; c, coarse; mod, moderately
- Fault- Dashed where inferred
- Contact- Dashed for subunits or where gradational; dotted where inferred; heavy line where erosional
- K Kristovina
- C^{14} samples (dates in C^{14} yr. B.P.):
  - bulk organics
  - charcoal
  - shell
  - Date included in chronologic model using OxCal: radiocarbon calibration program [http://c14.arch.ox.ac.uk/embed.php?file=oxcal.html]

Summary

The Coachella paleoseismic site is located on the San Andreas Fault along the northeast edge of the Coachella Valley in southern California (fig. 1) east of Dillon Road and south of Avenue 44 (fig. 2). Three benched trenches, a total of more than 950 m, were excavated across the fault zone as part of an Alquist-Priolo Fault investigation study (figs. 3, 4). These trenches exposed a thick section of latest Holocene lacustrine, fluvial, and shoreline deposits (fig. 5). Only the central and eastern trenches exposed faulting so we confined our investigations to those two trenches.

In the central trench, we photographed and logged in detail both walls of about 70 m of the trench where it spanned several zones of complex faulting which form a 15-m-wide depression. After carefully cleaning the trench walls, we put up a 1- by 0.5-m string- and nail-grid. We photographed each 1- by 0.5-m panel individually and then photologged features directly on these unrectified photos. The photos were digitally rectified later to remove distortion caused by irregularities in the trench walls and to correct the slight distortion introduced by the camera lens. The rectified photos were spliced together to make photomosaics of the trench walls. Most of the field linework and descriptions were then transferred to the rectified photomosaics.

For the eastern trench, we took a set of overview photographs of the full length (about 200 m) of each wall. These photographs were taken from the top of the trench towards the opposite wall. Because the photographs were taken at a downward angle, there is significant distortion. We logged directly on these photos in the field, recording significant contacts, primarily between lacustrine and subaerial deposits, along with descriptions. For this report, we spliced together these unrectified overview photos and transferred field linework and some descriptions.

For both trenches, contacts and lithologic descriptions of stratigraphic units, faults and carbon sample locations are indicated on the photomosaics. Lacustrine deposits are tinted to better show deformation across the fault zones. Evidence for six paleoearthquakes rated as "probable" is indicated with red stars that contain the sequential event number (1 is most recent event). Evidence for two additional "possible" paleoearthquakes is indicated with blue stars. The sedimentary deposits contain abundant dateable material which includes detrital charcoal, lenses of organic material formed in-situ, and shells. Two organic fractions, humic acids and acid-alkali-acid-pretreated (AAA), were dated for 13 of 15 samples taken from organic layers and both dates are shown for these samples on the photomosaics and tables 1 and 2. All radiocarbon dates are in C^{14} years B.P. (considered to be A.D. 1950). Horizontal distance is measured along the trenches from the southwest ends of the logged exposures (marked as 0 m), and depth is measured from the highest points on the ground surface within the logged exposures. Bench locations are indicated by white lines and gaps in the photomosaics. Note that faults and contacts that are somewhat oblique to the trench walls occasionally appear disconnected owing to the approximately 1 m width of the benches.

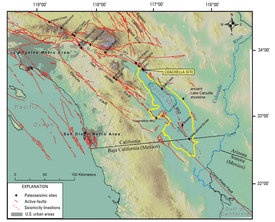


Figure 1. Shaded relief map of southern California showing Quaternary-active faults, paleoseismic sites, and other features of importance to this study. MCF, Mission Creek Fault; BF, Banning Fault; GHF, Garnet Hill Fault; BSZ, Brawley Seismic Zone. Note the exception of the Cerro Prieto Fault and associated structures, active faults in Mexico are not shown. Highstand of Lake Cahuilla shown as yellow line.

Figure 2. Aerial view of a portion of the east-central Coachella Valley showing location of Coachella and Indio (Sieh, 1986) paleoseismic sites and approximate location of traces of San Andreas Fault (red lines).

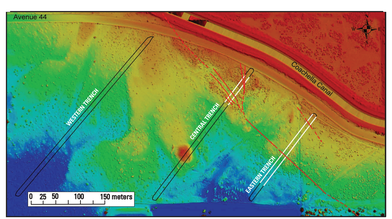


Figure 3. LiDAR topography of the study site showing locations of faults (red lines; dashed where approximated) and trenches (black lines; logged portions outlined in white). Central trench depicted above, see sheet 2 for photomosaics of eastern trench. Western trench did not cross fault zone so we did not photograph it.

PHOTOMOSAICS AND LOGS OF TRENCHES ON THE SAN ANDREAS FAULT NEAR COACHELLA, CALIFORNIA

By

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Figure 4. View looking southwest along the central trench. The benched excavation exposed the deposits to a depth of about 7 meters. The central fault zone, which crosses the trench about where the people are standing, forms a highly effective ground water barrier as evidenced by the ponded water.

Table 1. Dates of radiocarbon samples from central trench

Sample Name	^{14}C age	±	Layer
CENTRAL TRENCH SAMPLES			
10a1A08-1	175	15	10
10a1A08-2	175	15	10
10a1A44-1	2710	15	15
10a1A44-1 horn	2720	15	15
10a1A44-1 AAA	2880	15	15
10b1A07B-2	390	40	10
10b1A07B-2 AAA	390	40	10
10b1A08-2	220	20	4
10b1A08-3	540	15	20
10b1A08-4	540	15	20
10b1A08-5	520	20	21
10b1A08-6	520	20	21
10b1A08-7	520	20	21
10b1A44-1	400	15	21
10b1A44-2	400	15	21
10b1A44-3	400	15	21
10b1A44-4	410	15	21
10b1A44-5	420	20	21
10b1A44-6	430	20	21
10b1A44-7	440	20	21
10b1A44-8	260	15	21
10b1A44-9	260	15	21
10b1A08-9 horn	540	40	5b
10b1A08-9 AAA	540	40	5b
10b1A44-9 horn	550	50	5b
10b1A44-9 AAA	550	50	5b
10b1A08-10 horn	700	50	5b
10b1A08-10 AAA	700	50	5b
10b1A44-10	810	15	5b
10b1A44-10 horn	810	15	5b
10b1A44-10 AAA	810	15	5b
10b1A44-11	840	15	5b
10b1A44-12	880	15	5b
10b1A44-13	880	15	5b
10b1A44-13 horn	1000	20	5b
10b1A44-13 AAA	1000	20	5b
10b1A44-14	1000	20	5b
10b1A44-14 horn	1000	20	5b
10b1A44-14 AAA	1000	20	5b
10b1A44-15	1010	15	5b
10b1A44-15 horn	1010	15	5b
10b1A44-15 AAA	1010	15	5b
10b1A44-16	1020	15	5b
10b1A44-16 horn	1020	15	5b
10b1A44-16 AAA	1020	15	5b
10b1A44-17	1030	15	5b
10b1A44-17 horn	1030	15	5b
10b1A44-17 AAA	1030	15	5b