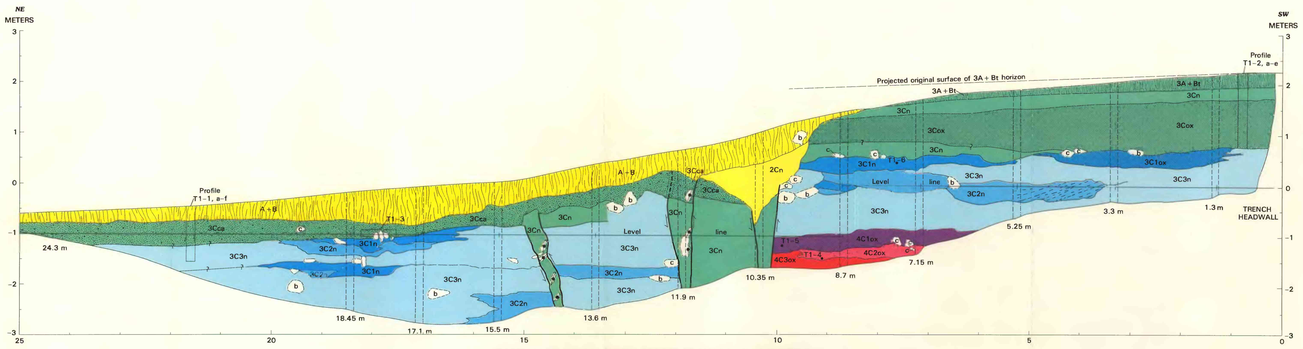
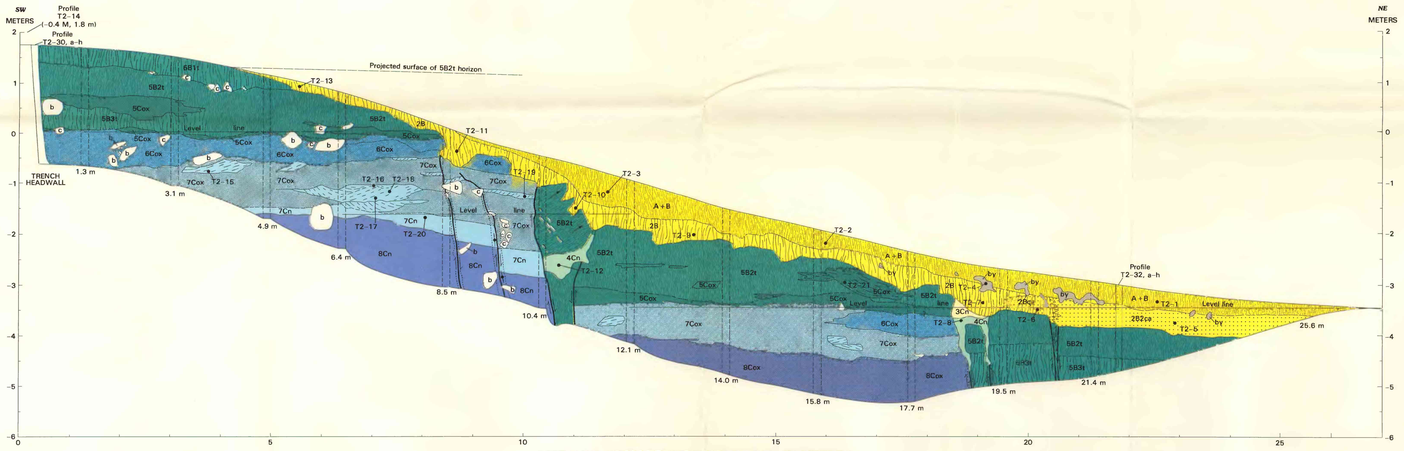
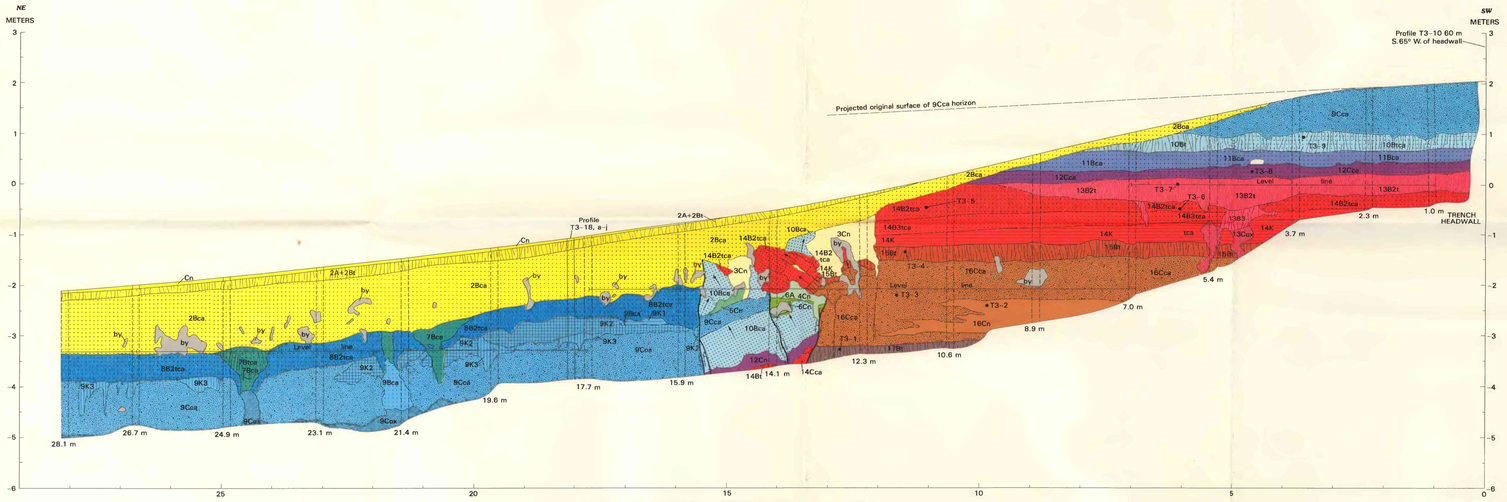


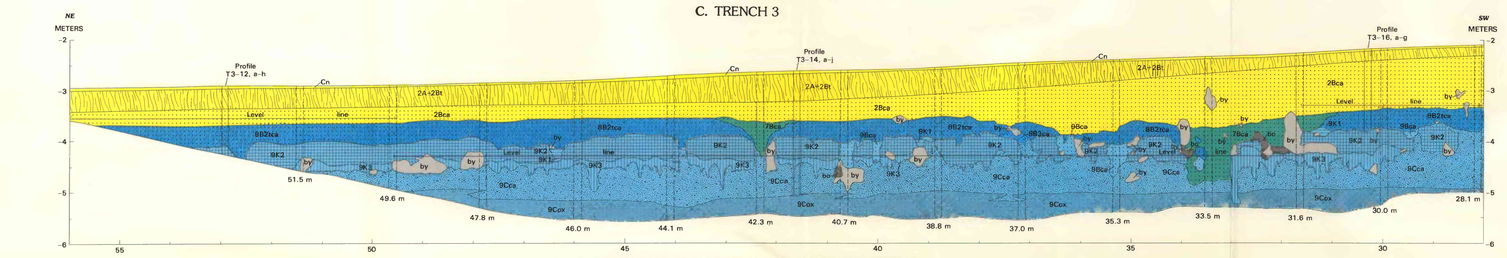
A. TRENCH 1



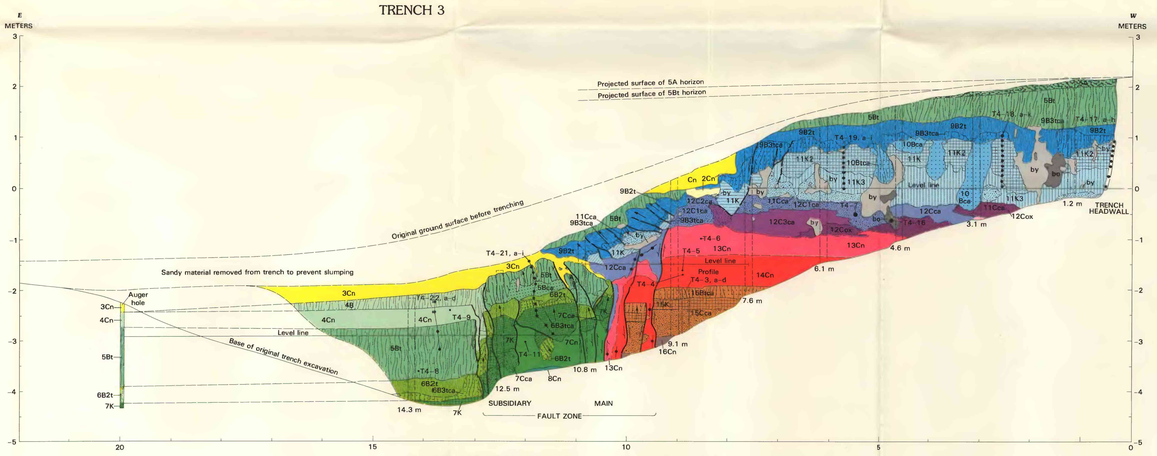
B. TRENCH 2



C. TRENCH 3



TRENCH 3



D. TRENCH 4

INTRODUCTION

This plate contains maps (trench logs) of four exploratory excavations made along the surface trace of the La Jencia fault zone (see pl. 2 for geologic map and location of the fault and trenches). The basic mapping units within the trenches are geologic units; these are parent materials for the superposed soils. Additional stratigraphic and structural data come from systematic description, subdivision, and mapping of individual soils and associated subhorizons. Individual descriptions of the soils and subhorizons are in the text.

The correlations of map units include, from left to right:

1. Position of geologic units in stratigraphic column.
2. Stratigraphic column for parent materials (map units) showing origin (colluvial, alluvial, burrows, or eolian).
3. Soil-profile horizonation.
4. Position of soils (both buried and surface positions) relative to the parent materials.
5. Age assignments for units.

The maps show the south wall of each trench, except for trench 2 (pl. 1B). The following descriptions of soil parent materials are based on field descriptions and laboratory analyses of Cn horizons (or least altered horizon) found in each of the trenches.

EXPLANATION

Contact—Abrupt to clear (less than 6 cm wide) soil-horizon boundary. Dashed where boundary is gradual (6–13 cm wide); dashed and queried where diffuse (more than 13 cm wide)

Fault—Dashed where approximately located. Dotted lines mark boundaries of indistinct or broad fault zone. Arrows show relative movement

Bedding—Shown where prominent

Boundary between zones of clay laminae—Trench 2 only

17.3 m **Shoring placed along trench walls**—Cross indicates location of surveyed point. Number below shoring indicates horizontal distance of point from trench headwall

T1–2a–d **Locality of channel samples from complete soil description**—Showing sample numbers. Some samples collected from horizons and subhorizons more finely divided than map units

T4–22a–d **Locality of channel samples from incomplete soil description**—Showing sample numbers in trench 4. Samples are spot collections; number descends alphabetically

T1–6 **Locality of sample collected solely for laboratory analysis**—Showing number

T4–7 **Locality of sample collected from equivalent unit on opposite trench wall**—Showing number

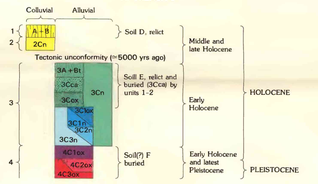
Soil orientation (vertical) before slumping—Orientation determined from bedding, pebble imbrications, soil ped structures, or horizon boundaries

Long axis of reoriented, elongate pebbles and cobbles—Shown locally to note rotated clasts in zones of fault disturbance

Large clasts—Shows shape and size of large clasts exposed in trench walls. Useful for orientation during mapping; clasts shown mainly near faults. c, cobble; b, boulder

CORRELATION OF UNITS

A. TRENCH 1



DESCRIPTION OF SOIL PARENT MATERIALS

A. Trench 1

1 **Unit 1 (upper Holocene)**—Brown, loose, noncalcareous pebble sand, unbedded and poorly sorted. Contains significant amount of silt-size particles. Younger of two colluvial units derived mainly from erosion of fault scarp. This unit represents later phase of scarp erosion by wash-controlled processes. Material was derived from uppermost part of unit 3 and its soil horizons. Thickness 0–75 cm; present mainly on downthrown fault block

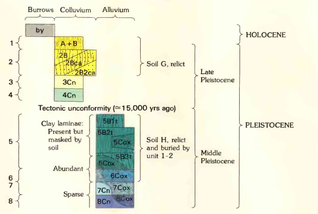
2 **Unit 2 (upper Holocene)**—Light-brown, loose, noncalcareous pebble sand to cobble gravel, unbedded and unsorted. Older of two colluvial units that form wedge of debris deposited by gravational collapse of scarp free face. Unit infills small graben developed over western faults of main fault zone. Thickness 0–110 cm

3 **Unit 3 (lower Holocene)**—Light-brown to brown, loose to friable, noncalcareous pebble sand to cobble gravel, unbedded and poorly sorted in upper 1 m to moderately bedded and sorted in the lower part. Map subdivision of unit 3 based on grain size, bedding style, and sorting. Numerical subdivision within C horizons denotes lithologic changes and not soil development as in the solum (A and B horizons). First subdivision, 3C1, is very slightly clayey pebble sand, well bedded and sorted and fining upwards. The second subdivision, 3C2, is slightly clayey, open-work (framework-supported) pebble gravel, crossbedded and well sorted. The third subdivision, 3C3, is most of the unit and consists of slightly clayey sand to cobble gravel. Unit 3 consists of multiple sedimentation units that are poorly sorted and unbedded or poorly bedded. Total thickness of unit is about 3 m; individual sedimentation units are 5–50 cm thick

4 **Unit 4 (lower Holocene or upper Pleistocene)**—Very similar to unit 3 except contains more clay and is more oxidized (reddish-brown). These two features may be either pedogenic or products of postdepositional infiltration of clay and subsequent oxidation. As for unit 3, this unit was subdivided for mapping. The 4C1 subhorizon is moderately clayey cobble gravel, moderately bedded and poorly sorted. The 4C2 subhorizon is lenses of clayey, open-work pebble gravel, moderately sorted and well bedded, fining upwards. The basal subhorizon, 4C3, is moderately clayey pebble to cobble gravel, poorly sorted and bedded. Exposed thickness of unit 4 is about 60 cm

CORRELATION OF UNITS

B. TRENCH 2



DESCRIPTION OF SOIL PARENT MATERIALS

B. Trench 2

by **Young burrows (Holocene)**—Light-brown loose sand infills animal burrows (crotovinas). Burrows in units having poorly consolidated soil horizons or at boundaries of differential consolidation

1 **Unit 1 (Holocene)**—Brown to dark-brown gravelly mud, poorly bedded and poorly sorted. Consists mainly of reworked deposits exposed on scarp slope (units 2 and 9). Thickness 0–10 cm

bo **Old burrows (Holocene? or upper Pleistocene)**—Light-reddish-brown, friable, silty to clayey sand infills ancient animal burrows. Burrows postdate unit 7 and probably are near age of unit 2. Young burrows intrude old burrows

2 **Unit 2 (Holocene? and upper Pleistocene)**—Light-yellowish-brown to light-brown pebbly, sandy silt to pebbly, silty sand, nonbedded (bedding destroyed) and poorly sorted; reworked mainly from units 9–14. Unit is main body of scarp colluvium and was deposited during scarp-wash phase of fault-scarp degradation. Thickness 0–55 cm above fault zone, 70–130 cm below fault zone

3 4 5 **Units 3, 4, and 5 (upper Pleistocene)**—These units are physically and lithologically similar but are separated by slump blocks and (or) unconformities. All three units are light-brown, pebbly, sandy silt to gravelly, mud, unsorted and unbedded. Units deposited soon after faulting, mainly during gravity-controlled scarp-degradation processes such as slumping and raveling of the scarp's free face. Thickness variable, commonly 20–100 cm

6 **Unit 6 (upper Pleistocene)**—Light-yellowish-brown to brown, pebbly, silty sand, slightly organic in upper part (6A horizon), moderately well bedded and sorted. Oldest phase of colluvium, interpreted as filling irregularities in a downdropped fault graben. Thickness 0–35 cm

7 **Unit 7 (upper and middle Pleistocene)**—Light-yellowish-brown to light-brown, pebbly, sandy silt to silty gravel, nonbedded and poorly sorted. Unit consists mostly of material deposited in depressions on the top of unit 8 during formation of soil O. Depressions are either old burrows or erosional and collapse pipes. Significantly predates units 2–6 and postdates unit 8. Thickness variable, 20–100 cm

8 **Unit 8 (middle Pleistocene)**—Light-brown silty sand to sandy silt, nonbedded and moderately well sorted. Original texture has been highly altered by formation of argillic B horizon. Deposited as thin but widespread mantle of desert loess(?) on older units. Unit eroded from upper surface of scarp but preserved about 60 m west on stable surface. Thickness 30–75 cm where preserved

9 **Unit 9 (middle Pleistocene)**—Light-brown to brown, pebbly, medium- to coarse-grained sand and sandy pebble gravel, nonbedded in upper part, poorly bedded below. Contains channels and lenses of gravel cemented by calcium carbonate of nonpedogenic origin. Thickness 1.5–2 m

10 **Unit 10 (middle Pleistocene)**—Light-brown pebble sand to sand. Original color and texture obscured by soil development. Upper fine-grained layer of alluvial sequence consisting of units 10–12. Thickness 40 cm, top eroded. In fault zone, unit 10 also contains unit 11 as part of thick, undivided mass

11 **Unit 11 (middle Pleistocene)**—Light-brown sand to pebble and cobble gravel, poorly bedded (except for moderately well bedded sandy lenses), and moderately to well sorted. Contains clasts as large as 25 cm in diameter along basal contact. Middle layer of alluvial sequence. Thickness 20–40 cm

12 **Unit 12 (middle Pleistocene)**—Light-brown pebble sand to sand, moderately well bedded and moderately well sorted. Most clasts are less than 4 cm in diameter, markedly finer grained than unit 11. Lower part of alluvial sequence. Thickness 20–30 cm

13 **Unit 13 (middle or lower Pleistocene)**—Light-brown, coarse-grained sand grading down into pebble gravel. Upper part consists of alluvium filling an east-trending channel cut in unit 14. Basal part poorly sorted and bedded. Unit fills burrows (crotovinas) and (or) pipes in units 14–16. Channel thickness 0–60 cm

14 **Unit 14 (middle or lower Pleistocene)**—Light-brown silty sand to sand. Bedding and original color obscured by soil development. Gravel content and overall grain size decreases upward, suggesting unit is either a fining upwards alluvial deposit or an alluvial deposit having a loess cap. Thickness 120 cm

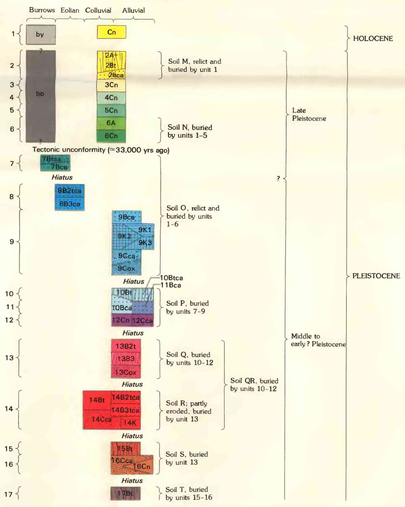
15 **Unit 15 (middle or lower Pleistocene)**—Light-brown pebble sand to silty sand. Bedding and original color obscured by soil development. Unit is upper thin layer of laterally variable alluvial deposit (units 15, 16). May represent late-phase over-bank alluvium. Only exposed on upthrown side of fault. Thickness 30–40 cm

16 **Unit 16 (middle or lower Pleistocene)**—Light-brown to light-grayish-brown sand to pebble sand and a coarse lens of pebble gravel. Gravel is moderately well bedded and sorted; other material is poorly bedded and sorted. Unit is basal part of fining upwards alluvial deposit. Thickness about 1.6 m

17 **Unit 17 (middle or lower Pleistocene)**—Light-brown silty sand. Exposed in basal 20–30 cm of trench. Grain-size distribution suggests it is much like unit 15, but original color and bedding probably have been obscured by soil development. Thickness unknown

CORRELATION OF UNITS

C. TRENCH 3



DESCRIPTION OF SOIL PARENT MATERIALS

C. Trench 3

by **Young burrows (Holocene)**—Light-brown loose sand infills animal burrows (crotovinas). Burrows in units having poorly consolidated soil horizons or at boundaries of differential consolidation

1 **Unit 1 (Holocene)**—Brown to dark-brown gravelly mud, poorly bedded and poorly sorted. Consists mainly of reworked deposits exposed on scarp slope (units 2 and 9). Thickness 0–10 cm

bo **Old burrows (Holocene? or upper Pleistocene)**—Light-reddish-brown, friable, silty to clayey sand infills ancient animal burrows. Burrows postdate unit 7 and probably are near age of unit 2. Young burrows intrude old burrows

2 **Unit 2 (Holocene? and upper Pleistocene)**—Light-yellowish-brown to light-brown pebbly, sandy silt to pebbly, silty sand, nonbedded (bedding destroyed) and poorly sorted; reworked mainly from units 9–14. Unit is main body of scarp colluvium and was deposited during scarp-wash phase of fault-scarp degradation. Thickness 0–55 cm above fault zone, 70–130 cm below fault zone

3 4 5 **Units 3, 4, and 5 (upper Pleistocene)**—These units are physically and lithologically similar but are separated by slump blocks and (or) unconformities. All three units are light-brown, pebbly, sandy silt to gravelly, mud, unsorted and unbedded. Units deposited soon after faulting, mainly during gravity-controlled scarp-degradation processes such as slumping and raveling of the scarp's free face. Thickness variable, commonly 20–100 cm

6 **Unit 6 (upper Pleistocene)**—Light-yellowish-brown to brown, pebbly, silty sand, slightly organic in upper part (6A horizon), moderately well bedded and sorted. Oldest phase of colluvium, interpreted as filling irregularities in a downdropped fault graben. Thickness 0–35 cm

7 **Unit 7 (upper and middle Pleistocene)**—Light-yellowish-brown to light-brown, pebbly, sandy silt to silty gravel, nonbedded and poorly sorted. Unit consists mostly of material deposited in depressions on the top of unit 8 during formation of soil O. Depressions are either old burrows or erosional and collapse pipes. Significantly predates units 2–6 and postdates unit 8. Thickness variable, 20–100 cm

8 **Unit 8 (middle Pleistocene)**—Light-brown silty sand to sandy silt, nonbedded and moderately well sorted. Original texture has been highly altered by formation of argillic B horizon. Deposited as thin but widespread mantle of desert loess(?) on older units. Unit eroded from upper surface of scarp but preserved about 60 m west on stable surface. Thickness 30–75 cm where preserved

9 **Unit 9 (middle Pleistocene)**—Light-brown to brown, pebbly, medium- to coarse-grained sand and sandy pebble gravel, nonbedded in upper part, poorly bedded below. Contains channels and lenses of gravel cemented by calcium carbonate of nonpedogenic origin. Thickness 1.5–2 m

10 **Unit 10 (middle Pleistocene)**—Light-brown pebble sand to sand. Original color and texture obscured by soil development. Upper fine-grained layer of alluvial sequence consisting of units 10–12. Thickness 40 cm, top eroded. In fault zone, unit 10 also contains unit 11 as part of thick, undivided mass

11 **Unit 11 (middle Pleistocene)**—Light-brown sand to pebble and cobble gravel, poorly bedded (except for moderately well bedded sandy lenses), and moderately to well sorted. Contains clasts as large as 25 cm in diameter along basal contact. Middle layer of alluvial sequence. Thickness 20–40 cm

12 **Unit 12 (middle Pleistocene)**—Light-brown pebble sand to sand, moderately well bedded and moderately well sorted. Most clasts are less than 4 cm in diameter, markedly finer grained than unit 11. Lower part of alluvial sequence. Thickness 20–30 cm

13 **Unit 13 (middle or lower Pleistocene)**—Light-brown, coarse-grained sand grading down into pebble gravel. Upper part consists of alluvium filling an east-trending channel cut in unit 14. Basal part poorly sorted and bedded. Unit fills burrows (crotovinas) and (or) pipes in units 14–16. Channel thickness 0–60 cm

14 **Unit 14 (middle or lower Pleistocene)**—Light-brown silty sand to sand. Bedding and original color obscured by soil development. Gravel content and overall grain size decreases upward, suggesting unit is either a fining upwards alluvial deposit or an alluvial deposit having a loess cap. Thickness 120 cm

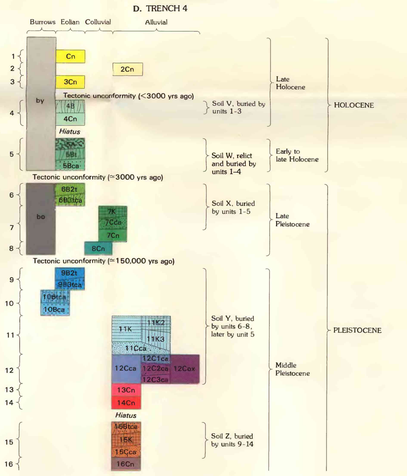
15 **Unit 15 (middle or lower Pleistocene)**—Light-brown pebble sand to silty sand. Bedding and original color obscured by soil development. Unit is upper thin layer of laterally variable alluvial deposit (units 15, 16). May represent late-phase over-bank alluvium. Only exposed on upthrown side of fault. Thickness 30–40 cm

16 **Unit 16 (middle or lower Pleistocene)**—Light-brown to light-grayish-brown sand to pebble sand and a coarse lens of pebble gravel. Gravel is moderately well bedded and sorted; other material is poorly bedded and sorted. Unit is basal part of fining upwards alluvial deposit. Thickness about 1.6 m

17 **Unit 17 (middle or lower Pleistocene)**—Light-brown silty sand. Exposed in basal 20–30 cm of trench. Grain-size distribution suggests it is much like unit 15, but original color and bedding probably have been obscured by soil development. Thickness unknown

CORRELATION OF UNITS

D. TRENCH 4



DESCRIPTION OF SOIL PARENT MATERIALS

D. Trench 4

by **Young burrows (Holocene)**—Light-brown loose sand infills animal burrows (crotovinas). Burrows in units having poorly consolidated soil horizons or at boundaries of differential consolidation

1 **Unit 1 (upper Holocene)**—Light-brown to yellowish-brown, loose, noncalcareous sand, nonbedded but well sorted. Deposited as youngest of several eolian sand blankets on leeward side of fault scarp. Contains minor amounts of scarp colluvium derived from unit 5 on upthrown fault block. Locally as thick as 1–1.5 m; unit largely removed from trench during excavation

2 **Unit 2 (upper Holocene)**—Light-brown to light-reddish-brown, noncalcareous pebble sand and sand, parallel bedded and poorly sorted. Forms thin discontinuous lenses and pods of fluvially transported debris derived from erosion of units 5 and 9 on upthrown block of fault. Thickness 0–20 cm

3 **Unit 3 (upper Holocene)**—Same as unit 1, eolian sand, except older than most recent episode of faulting; buried by unit 1 and slump blocks of older deposits. Unit is younger than faulting at east end of trench. Thickness at least 40 cm, upper contact not preserved

4 **Unit 4 (upper Holocene)**—Same as unit 3, except contains weak soil (soil V) in upper part, signifying a hiatus in eolian deposition. Only present on leeward side of fault scarp. Thickness 60 cm, thinning to 30 cm in auger hole east of trench

5 **Unit 5 (lower Holocene and uppermost Pleistocene?)**—Light-grayish-brown to light-brown, loose, noncalcareous eolian sand, moderately well sorted. May have contained a significant amount of sand- and (or) silt-size agglomerates of silty clay, inasmuch as basal part of unit contains 6–8 percent clay. Original bedding destroyed. East of upthrown block, about 5 percent of units' volume consists of colluvium derived from soil on unit 9. Unit 5, which is on unit 9 and older deposits, is derived from desiccation of San Agustin lakes, 35–50 km west, and probably was deposited between 11 and 9 ka ago. Thickness 1–2 m

6 **Unit 6 (upper Pleistocene)**—Light-brown(?) noncalcareous(?) eolian sand. Original texture, bedding, and sorting obscured by soil formation. Deposited on leeward side of old fault scarp. Thickness 25–45 cm

7 **Unit 7 (upper Pleistocene)**—Light-brown calcareous sand, nonbedded and poorly sorted. Forms scarp colluvium about 1.5 m thick that contains material reworked from units 9–12 that were exposed by faulting. Fragments of weakly developed argillic and calcareous horizons of soil Y suggest that soil Y was partly developed when unit 7 was deposited. Unit is about 120–130 cm thick; thickness indicates minimum throw of fault event prior to deposition of unit 7

8 **Unit 8 (middle Pleistocene)**—Light-brown sand, poorly exposed. Contains pebble- to cobble-size clasts of argillic B horizon developed in unit 9. Unit is pebbly and represents an accumulation of both eolian sand and scarp colluvium. Thickness unknown; base covered

bo **Older burrows (upper and middle? Pleistocene)**—Light-reddish-brown, friable, slightly calcareous sand. Nonbedded and poorly sorted; forms irregular-shaped inclusions in units 11 and 12. Interpreted as old animal burrows (paleocrotovinas) that have become reddened and consolidated with time. Age poorly known; probably younger than unit 9 and older than unit 6(?). Thickness variable

9 **Unit 9 (middle Pleistocene)**—Light-brown, noncalcareous(?) eolian sand. Original texture, bedding, and sorting obscured by soil formation. Unit is widespread and marries alluvial deposits that form old parts of piedmont slope, east of Bear Mountains. Fills pipes and burrows(?) formed in unit 10. May correlate with unit 8 in trench 3. Thickness 40–60 cm

10 **Unit 10 (middle Pleistocene)**—Light-brown pebble sand to sand, poorly sorted and nonbedded. Generally noncalcareous but contains pebble-size pieces of calcareous soil (unit 11). Consists of mixed eolian sand and materials filling animal burrows. Locally developed in upthrown fault block. Thickness 50–130 cm

11 **Unit 11 (middle Pleistocene)**—Light-gray to light-brown, noncalcareous sand to pebble sand, poorly bedded and moderately well sorted. Bedding destroyed in upper part by soil formation. Unit is youngest major alluvial deposit in trench 4. Thickness 85–125 cm

12 **Unit 12 (middle Pleistocene)**—Light-gray to light-brown, interbedded, noncalcareous pebble sand, pebble gravel and cobble gravel, moderately well bedded and sorted. Unit contains abundant lenses and generally fines upward into unit 11. Underlain by coarser unit (13). Thickness 60–75 cm

13 **Unit 13 (middle Pleistocene)**—Light-gray, interbedded, noncalcareous pebble and cobble gravel, poorly bedded and moderately well sorted. May represent basal unit of upward-fining alluvial sequence consisting of units 13–11. Thickness 40–60 cm

14 **Unit 14 (middle Pleistocene)**—Light-gray, noncalcareous pebble sand to pebble gravel, well bedded and well sorted. Gravel-size material consists entirely of granules and small pebbles. Unit is significantly better sorted and bedded than any of the other mapped alluvial units. West-trending fluvial channels cut into unit 15 and filled by unit 14 have as much as 0.5 m relief. Thickness 60 cm; 75 cm in north wall of trench 4

15 **Unit 15 (middle or lower Pleistocene)**—Light-gray to light-brown, noncalcareous(?) silty sand to sand, pebbly. Bedding, sorting, and original texture obscured by soil formation. Unit is older analog of presently stable piedmont slope formed by units 10–14. Gravel content decreases upward in unit. Thickness 75–100 cm

16 **Unit 16 (middle or lower Pleistocene)**—Light-gray, loose, noncalcareous pebble sand, poorly exposed at base of trench. This is oldest alluvial deposit in trench 4. Thickness unknown, base covered

GEOLOGIC UNITS AND SOIL HORIZONS EXPOSED IN WALLS OF TRENCHES 1–4 ACROSS THE LA JENCIA FAULT, CENTRAL NEW MEXICO