

SAN GABRIEL FAULTS: NEWHALL AREA, LOS ANGELES COUNTY, CALIFORNIA

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INTRODUCTION

The San Gabriel fault, as mapped by most current workers, extends from the eastern Los Angeles County line northwesterly to the Frazier Mountain area in northeastern Ventura County. It is considered by many to be a major strike-slip system, ancestral to the San Andreas fault, with a cumulative right separation up to 60 km. In the Newhall area, located in the upper reaches of the eastern Ventura basin, the fault trend can be subdivided into three segments (Weber, 1982): the Palomas on the north, the Honor Rancho in the middle, and the Newhall on the south (Figure 1). Early workers mapped the northerly and southerly segments as individual and separate faults: the northerly Palomas (originally called the Palomas Canyon fault) and the southerly Newhall segment, representing the northwesterly end of the San Gabriel fault.

The Palomas segment has generally been restricted to the mappable trace that defines the western border of the Ridge basin and separates crystalline basement on the west from Plio-Miocene sediments on the east. The central or intervening Honor Rancho disturbed zone extends through the Castaic Hills-Honor Rancho oil fields downwarp area (the depocenter of both the Pliocene and Miocene basins) and is the indicated connection between the northern and southern two segments. The fault trace through this area is mostly inferred from a

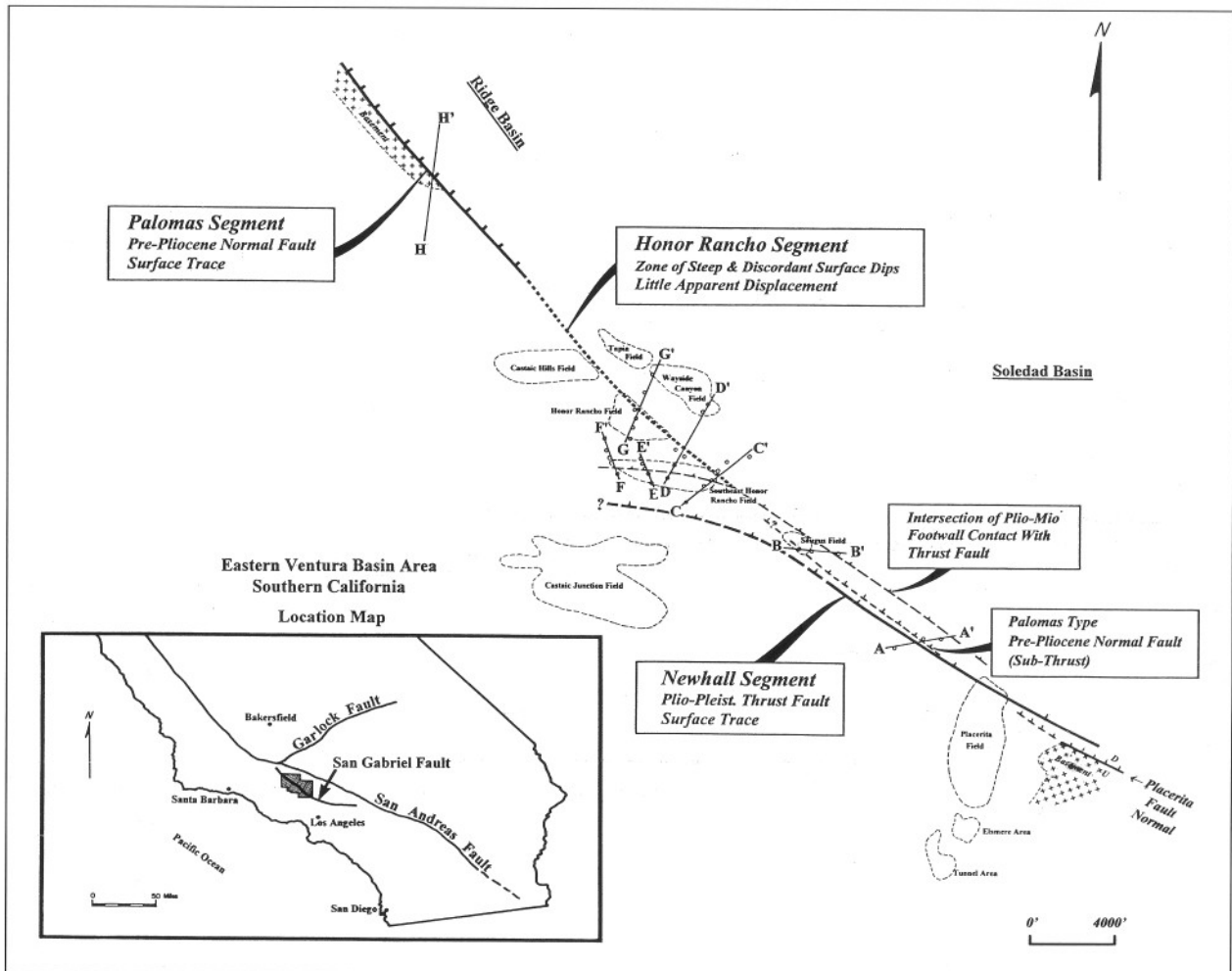


Figure 1. Map showing segments of the northwestern San Gabriel fault system.

zone of steep and discordant Pleistocene surface dips with little or no supporting evidence of either surface or subsurface displacement (Figure 4 [C-C']). The trace of the southerly or Newhall thrust segment is exposed at the surface where it extends northerly from the vicinity of the Placerita oil field to just south of the Saugus oil field.

In spite of the fact that the Palomas and Newhall segments appear to share a common trend throughout the Placerita-Saugus area, and additionally appear to be connected at the surface (weakly) by the Honor Rancho segment, evidence from good well control along the trend strongly suggests that they are genetically unrelated. In this regard, however, other workers (most notably Yeats and others, 1994) note that the San Gabriel fault "changes character in the east Ventura basin. From Honor Rancho oil field northwestward, the fault is straight, striking N40°W and dips steeply northeast with normal stratigraphic separation. Southeast of Honor Rancho, the fault is curved in plan and convex southward. At Saugus oil field, the strike is N55°W; at Placerita oil field, the strike is N70°W. Dip is steeply to the northeast, but with reverse separation rather than normal."

NEWHALL SEGMENT

A series of detailed cross sections (Figures 2 through 7) were constructed from south to north through available well control (Table 1). These sections clearly demonstrate that the Newhall segment, located between the Placerita and Honor Rancho oil fields, is a low-angle, northeasterly dipping, Pleistocene or younger reverse fault that makes a pronounced westerly swing in the Honor Rancho oil fields vicinity (effecting, in part, the northerly closure of the Southeast Honor Rancho pool) before apparently dying out west of Figure 7 (F-F') in a zone of steep and overturned dips. In the absence of outcrop evidence, subsurface conformation of this westerly swing of the Newhall segment is shown by the trace of the intersection of the Plio-Miocene contact in the footwall with the thrust fault (Figure 1). There is no credible evidence of the thrust extending in a more northerly direction through the central or disturbed zone (Figures 4 [C-C'] and 5 [D-D']), and note where the projected trace of the San Gabriel fault is located on the cross sections).

PALOMAS SEGMENT

The easterly dipping Palomas fault is pre-early Pliocene to late Miocene in age (Figure 7 [H-H']) and (depending on the investigator) has, in addition to the obvious normal northeasterly throw, a right-lateral separation ranging from 3 to 60 km. It is uncertain how far the Palomas segment extends to the south, but continuation is indicated on Figure 4 (C-C') located in the Honor Rancho segment, which shows a possible easterly dipping, Miocene, normal fault; farther south, a Palomas-type fault lying beneath the Newhall segment reverse fault is clearly displayed on Figure 2 (A-A') just north of the Placerita oil field (note the close similarity between Figures 2 [A-A'] and 7 [H-H']). Finally, the Placerita fault, located southeast of the Placerita oil field, trends parallel to and lies just south of the San Gabriel fault. It delineates basement on the south from Pliocene on the north, and could be the southerly end of the Palomas fault.

DISCUSSION

Although the Palomas and Newhall segments are perceived to be united because they have a common trend for a short distance, the compelling subsurface well control along the fault trend shows that the two segments are unrelated both in geometry and age, and, in all likelihood, they terminate locally. The low-angle Newhall thrust segment overrides the older Palomas normal fault for a short distance and dies out to the northwest in the central part of the basin. The older Palomas, possibly represented by the Placerita fault, dies out just south of the Placerita oil field.

Early field workers in the area mapped the Palomas and San Gabriel as two separate faults. Later, on the basis of more detailed paleogeographic and subsurface investigations, a one-fault, large-lateral-displacement concept was advanced (Crowell, 1952); in spite of a few clear and convincing rebuttals (Paschall and Off, 1961) and ongoing field studies advocating relatively small lateral movement (Weber, 1982), the concept has become firmly entrenched in the literature and enjoys wide acceptance in the geologic community today. Although

the concept is based on some compelling evidence, it is in conflict with both the structural and age dichotomy, and the absence of a confirmable connection, between the northerly and southerly segments.

Considering the forgoing and cross-section evidence, this area has a more complex history than that advocated by most modern workers. In addition, remembering that with any scientific concept the door is seldom closed, it might be reasonable to keep an open mind to the possibility that the early Palomas-San Gabriel distinction was correct.

REFERENCES CITED

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- Weber, F.H., Jr., 1982, Geology and Geomorphology along the San Gabriel Fault Zone, Los Angeles and Ventura Counties, California: California Division of Mines and Geology Open File Report 82-2 LA, 157 p.
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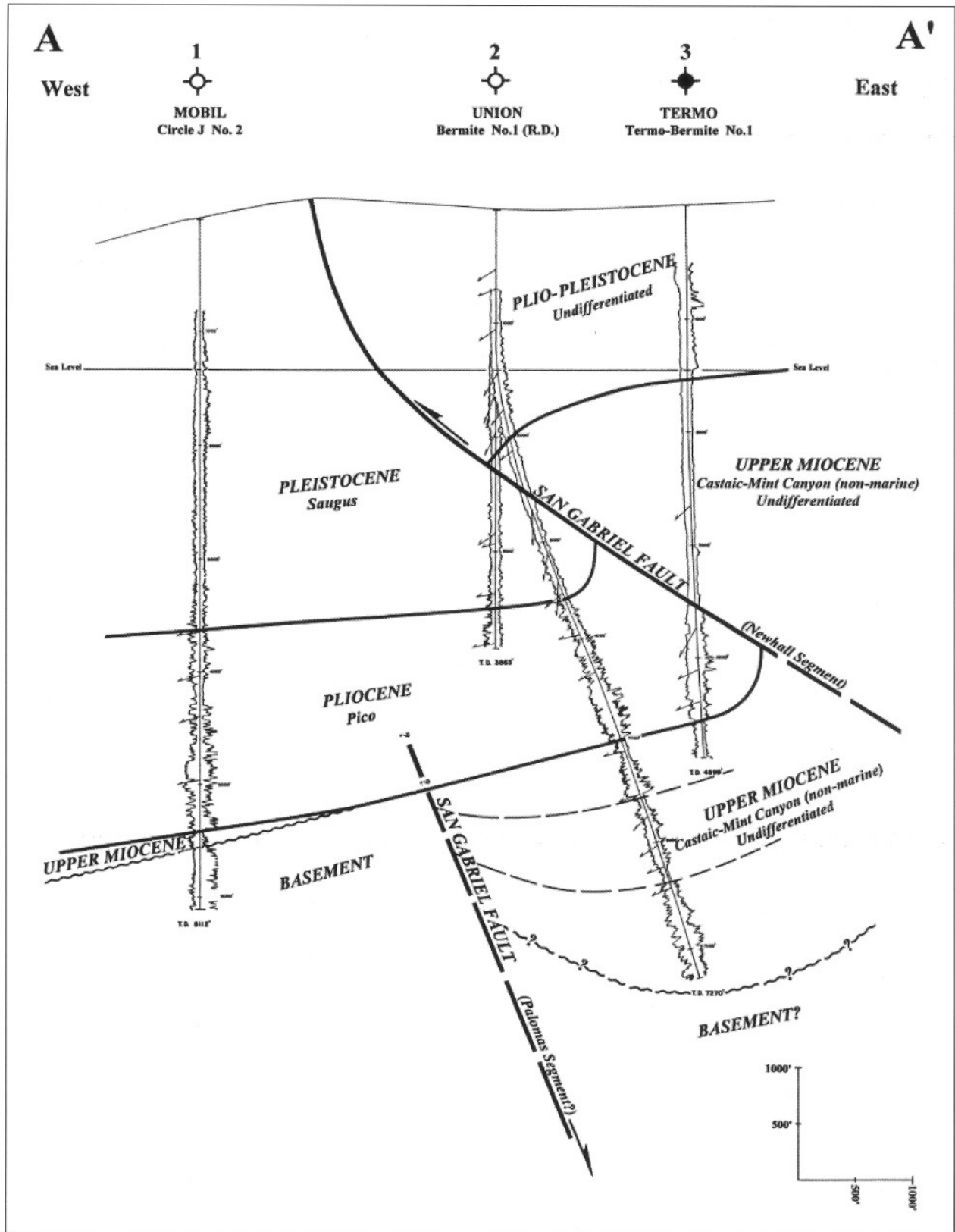


Figure 2. Cross section A-A'. This section is the most important of the series because it clearly shows that 1) the San Gabriel fault just north of the Placerita oil field is a young, north-dipping thrust and 2) of equal importance, the interpretation of an underlying, older, pre-Pliocene normal fault justifies extending the Palomas fault (matching in both age and movement) at least this far south of its mapped area to the north. The combination of juxtaposition and shared trend of the two faults, in spite of their obvious differences, could explain the interpretation of a one-fault system.

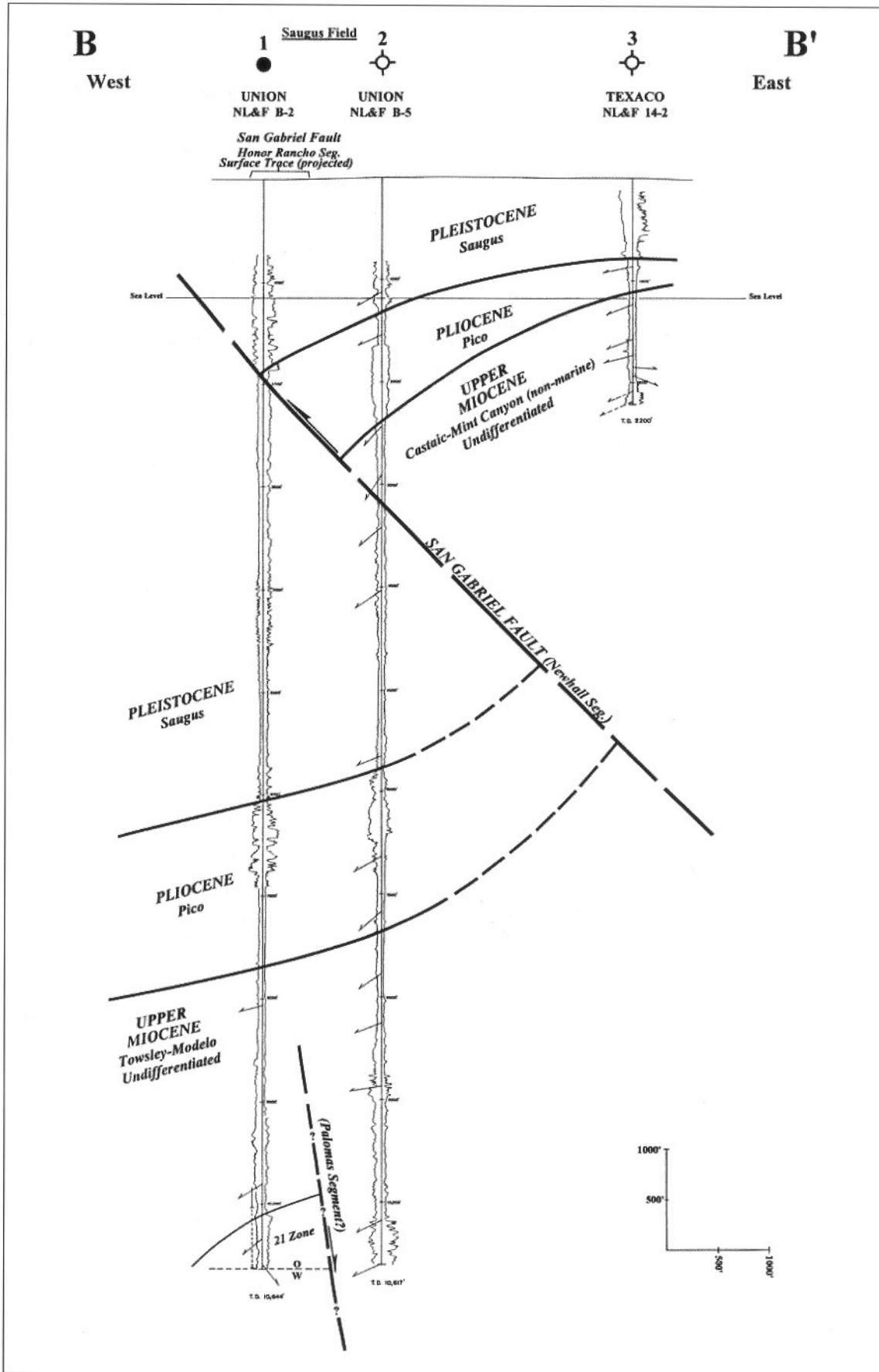


Figure 3. Cross section B-B'.

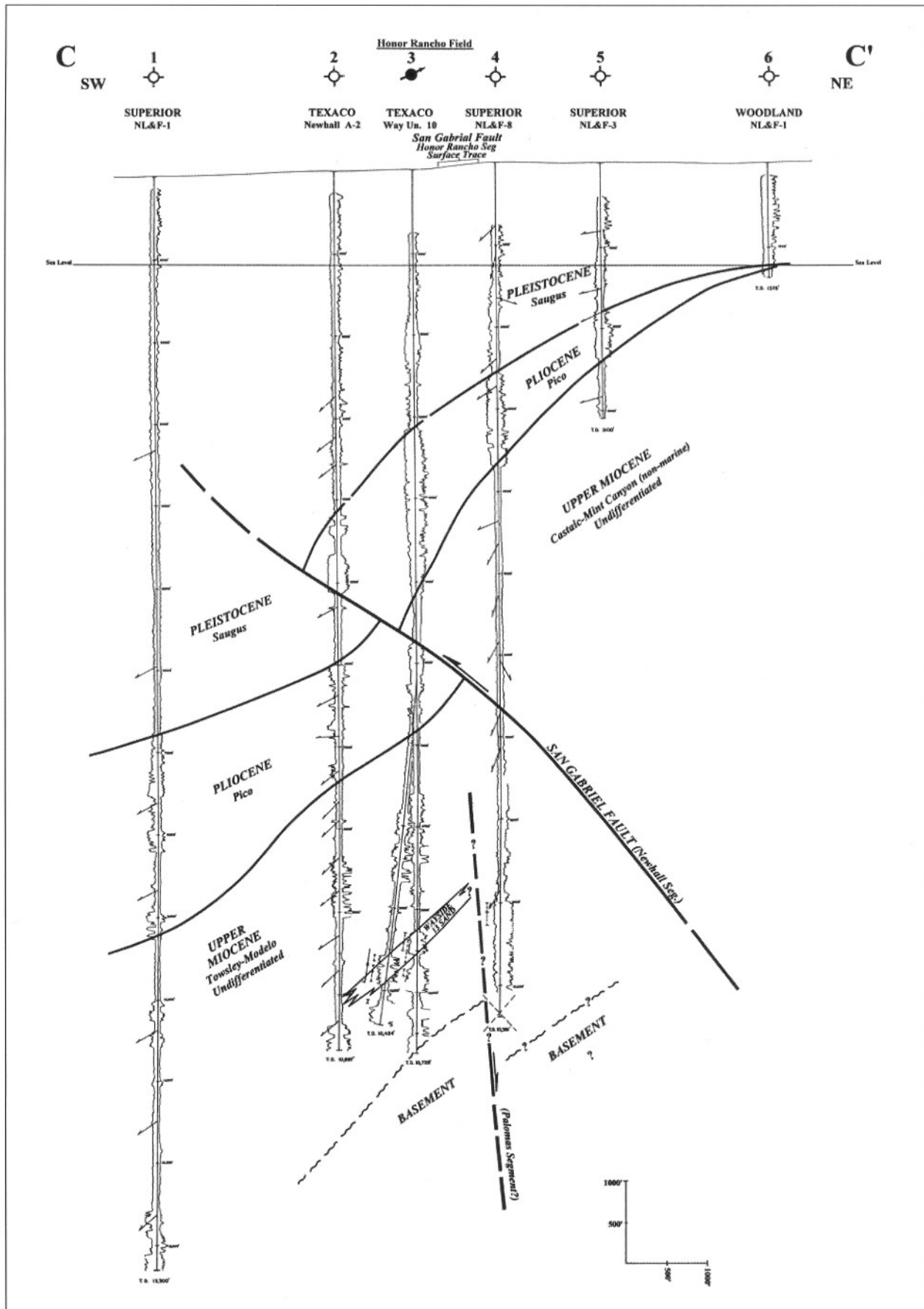


Figure 4. Cross section C-C'.

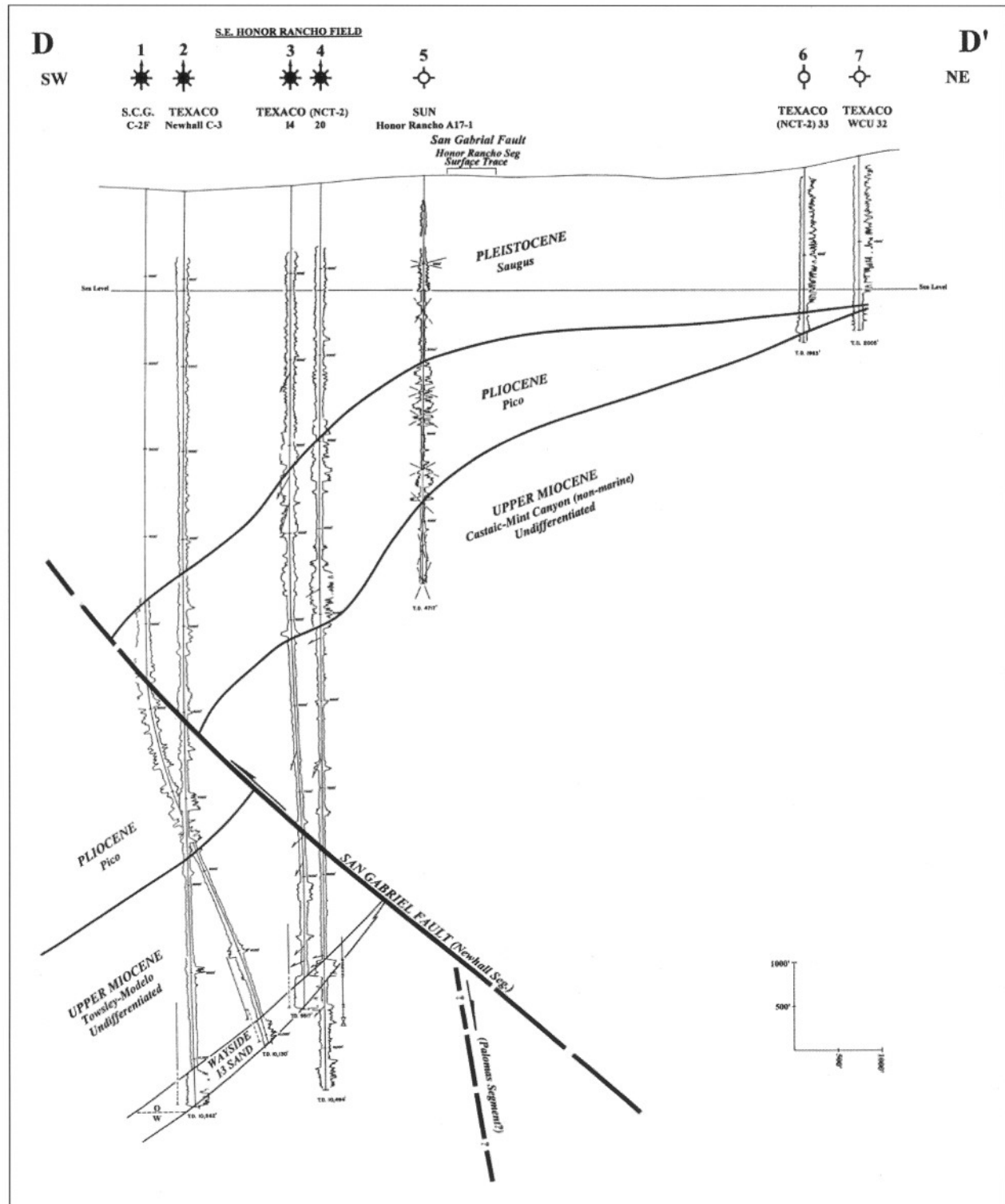


Figure 5. Cross section D-D'.

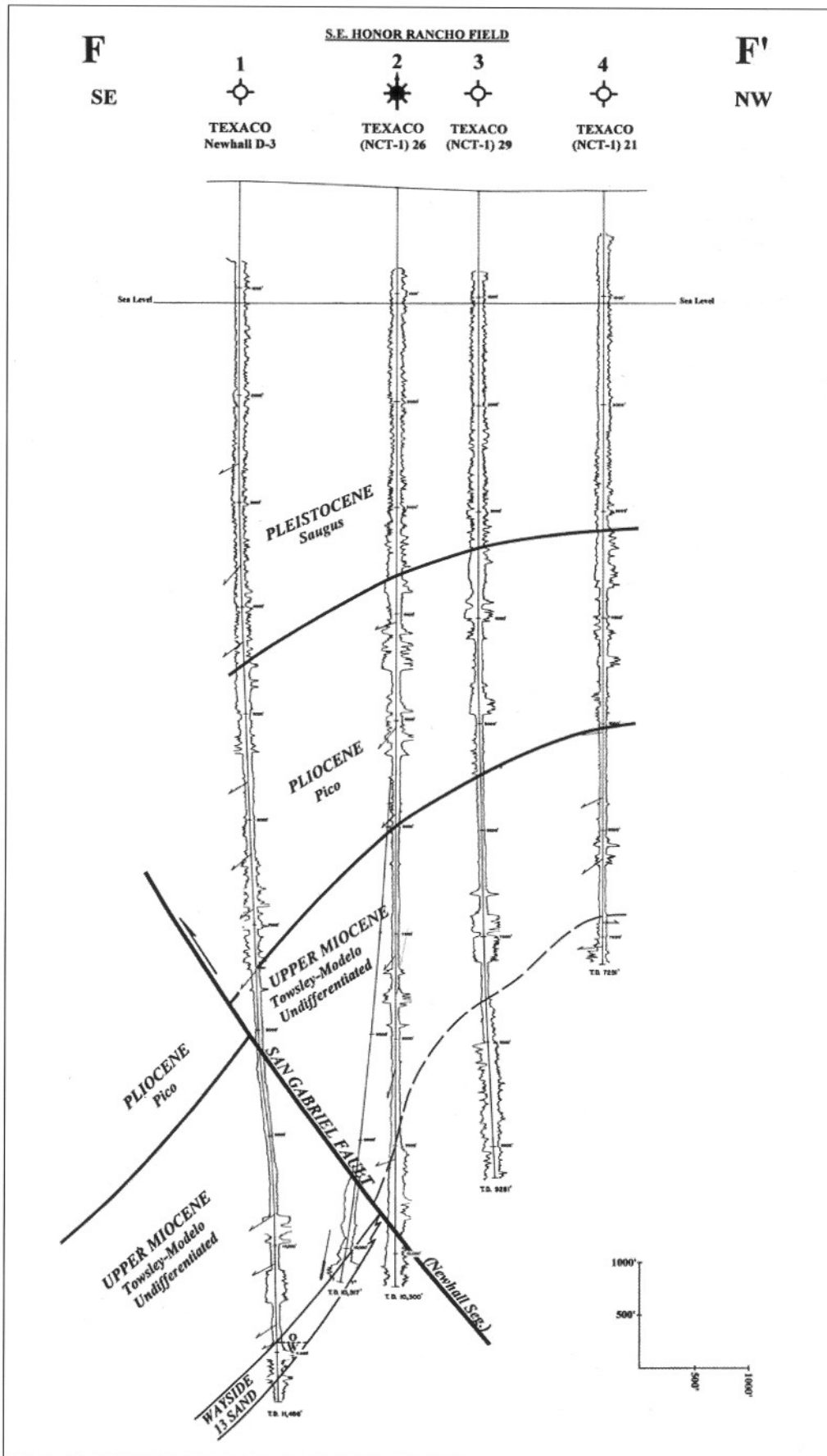


Figure 6. Cross section F-F'.

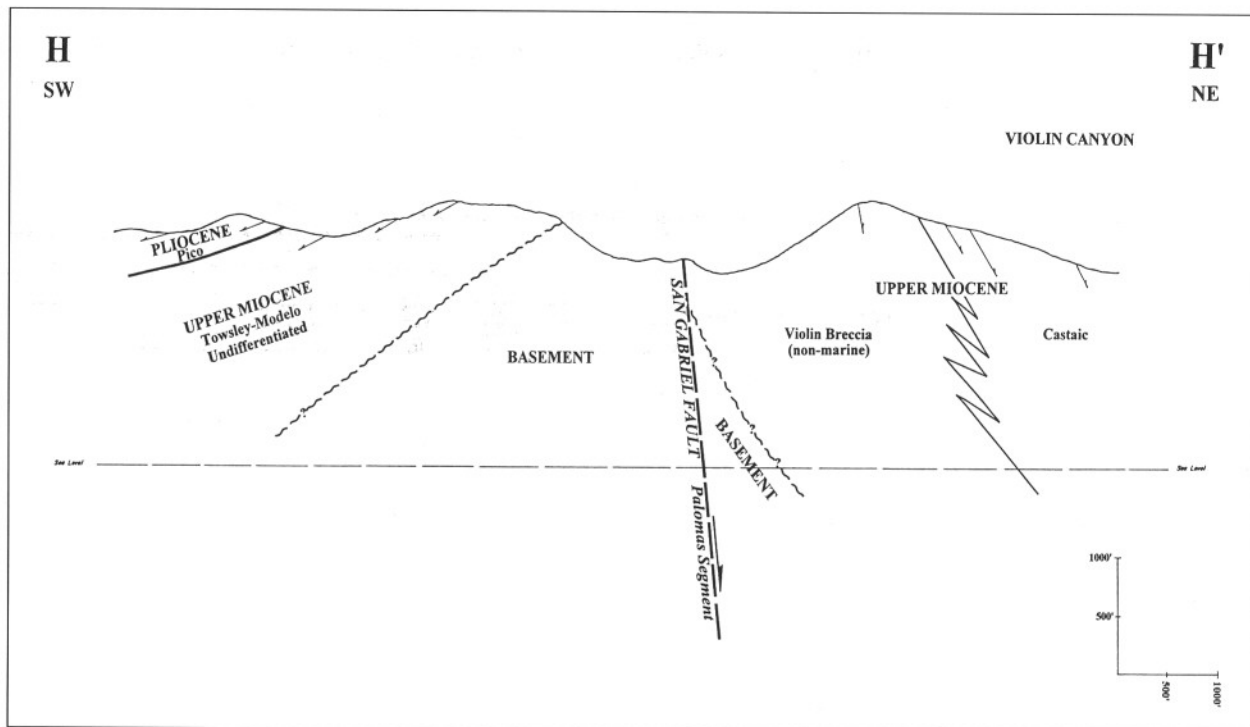


Figure 7. Cross section H-H'.

Table 1. Names, locations, and total depths of wells in cross sections.

Section	Well	Name	Location (all in SBB&M)	T.D. (ft)
A-A'	1	MOBIL Circle J. No. 2	T. 4 N R. 16 W Sec. 25	6,112
A-A'	2	UNION Bermite No. 1	T. 4 N R. 16 W Sec. 25	3,863
A-A'	3	TERMO Bermite No. 1	T. 4 N R. 16 W Sec. 25	4,899
B-B'	1	UNION NL&F No. B-2	T. 4 N R. 16 W Sec. 15	10,644
B-B'	2	UNION NL&F No. B-5	T. 4 N R. 16 W Sec. 15	10,617
B-B'	3	TEXACO NL&F No. 14-2	T. 4 N R. 16 W Sec. 15	2,200
C-C'	1	SUPERIOR NL&F No.1	T. 4 N R. 16 W Sec. 8	13,300
C-C'	2	TEXACO Newhall No. A-2	T. 4 N R. 16 W Sec. 8	10,697
C-C'	3	TEXACO Way. Unit No.10	T. 4 N R. 16 W Sec. 8	10,725
C-C'	4	SUPERIOR NL&F 8	T. 4 N R. 16 W Sec. 8	10,391
C-C'	5	SUPERIOR NL&F 3	T. 4 N R. 16 W Sec. 9	3,100
C-C'	6	WOODLAND NL&F 1	T. 4 N R. 16 W Sec. 4	1,375
D-D'	1	S.C.G. C-2F	T. 4 N R. 16 W Sec. 8	10,130
D-D'	2	TEXACO Newhall C-3	T. 4 N R. 16 W Sec. 8	10,562
D-D'	3	TEXACO (NCT-2) 14	T. 4 N R. 16 W Sec. 8	9,517
D-D'	4	TEXACO (NCT-2) 20	T. 4 N R. 16 W Sec. 8	10,494
D-D'	5	SUNRAY Honor Rancho A17-1	T. 4 N R. 16 W Sec. 5	4,717
D-D'	6	TEXACO (NCT-2) 33	T. 4 N R. 16 W Sec. 5	1,963
D-D'	7	TEXACO WCU 32	T. 4 N R. 16 W Sec. 5	2,005
F-F'	1	TEXACO Newhall D-3	T. 4 N R. 16 W Sec. 7	11,456
F-F'	2	TEXACO (NCT-1) 26	T. 4 N R. 17 W Sec. 12	10,317
F-F'	3	TEXACO (NCT-1) 29	T. 4 N R. 17 W Sec. 1	9,281
F-F'	4	TEXACO (NCT-1) 21	T. 4 N R. 17 W Sec. 1	7,251