W-15799

HYDROGEOLOGY OF THE LOWER PART OF THE HAWTHORN AQUIFER SYSTEM CAPE CORAL, FLORIDA

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Prepared for:

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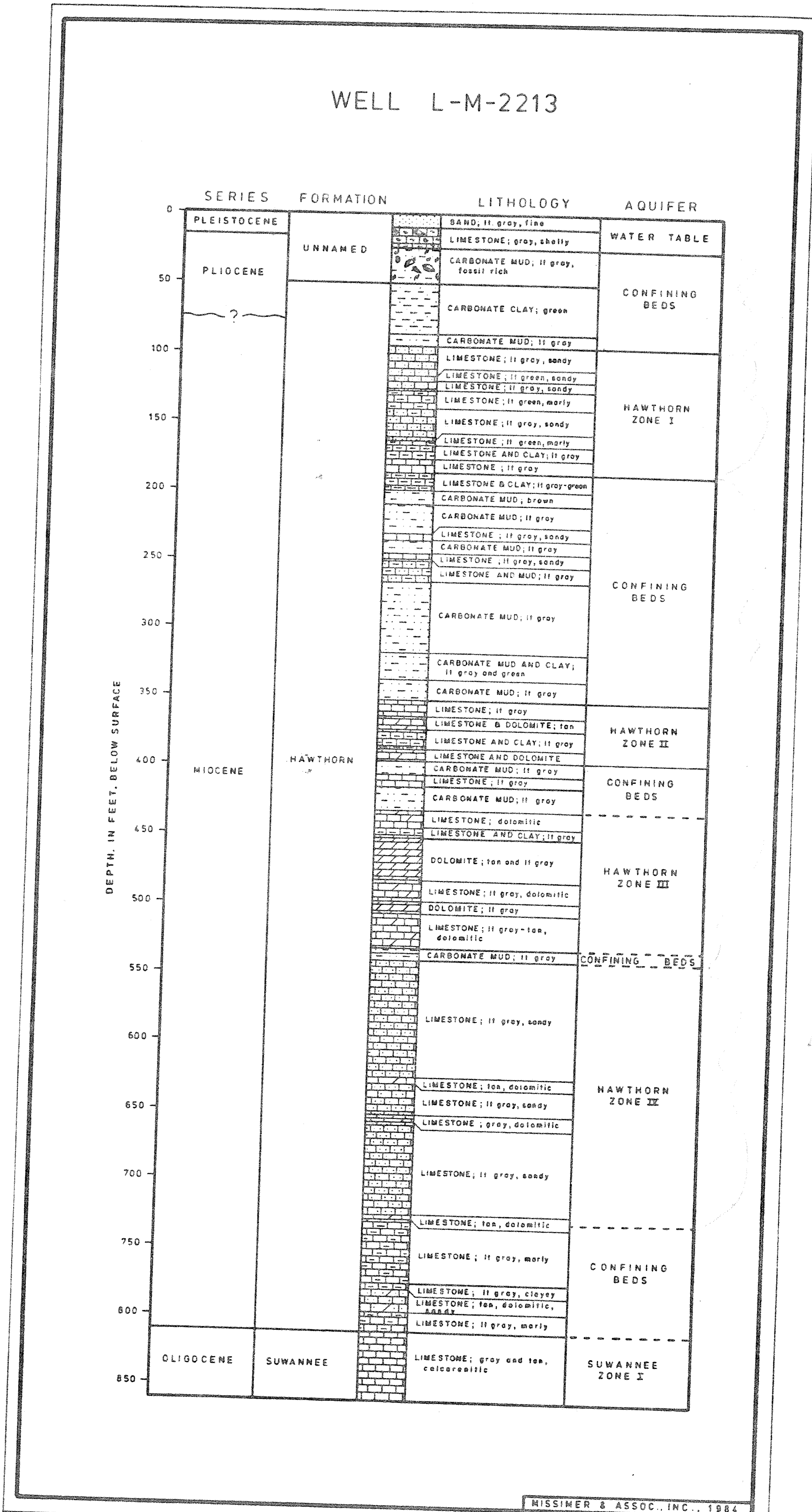

FIGURE 3-1. GEOLOGY AND AQUIFER LOCATIONS IN WELL L-M-2213.

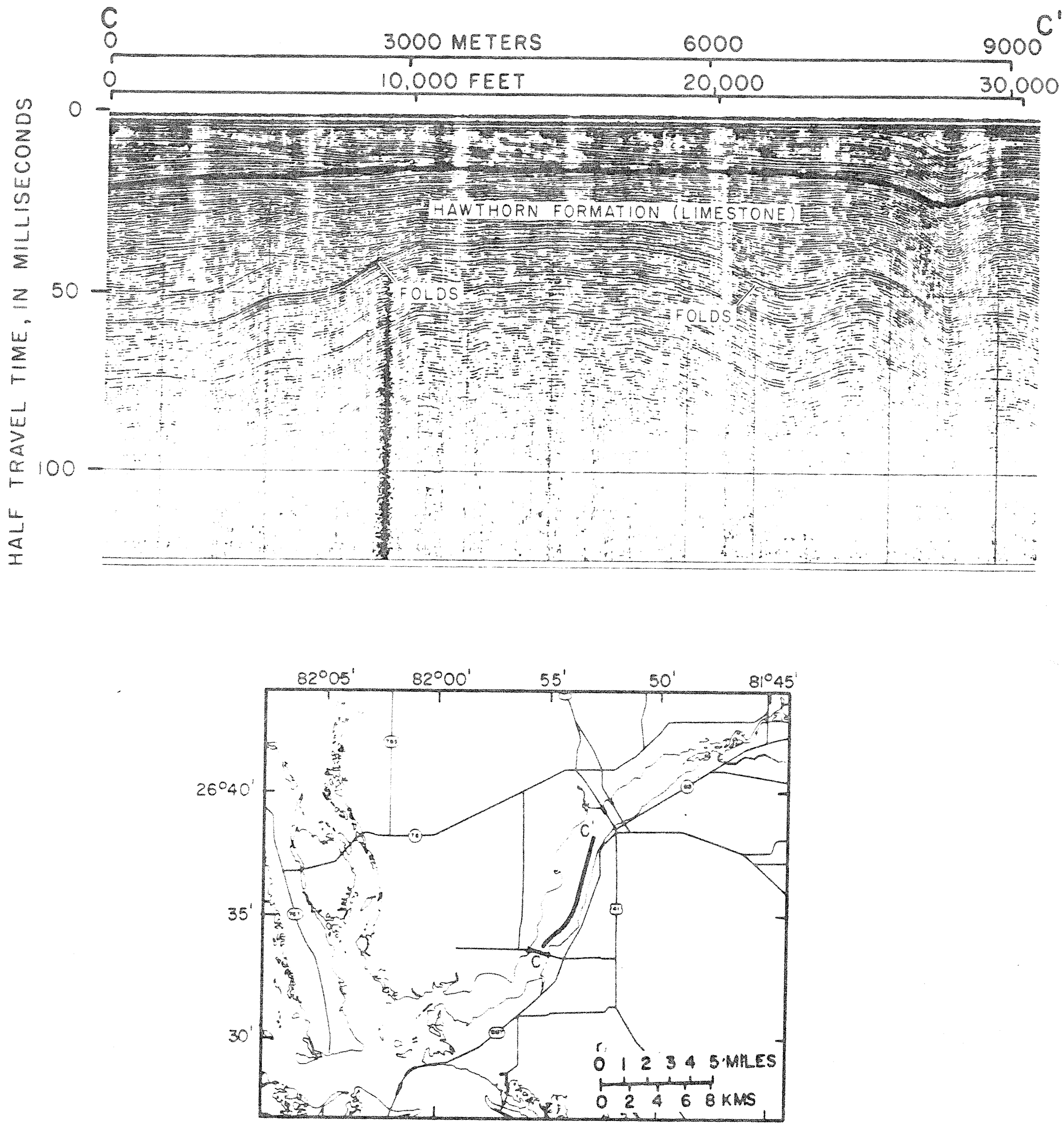

Figure 3-4. -Approximate 6-mile (9.7-kilometer) section of the sparker seismic record showing folds in the Hawthorn Formation.

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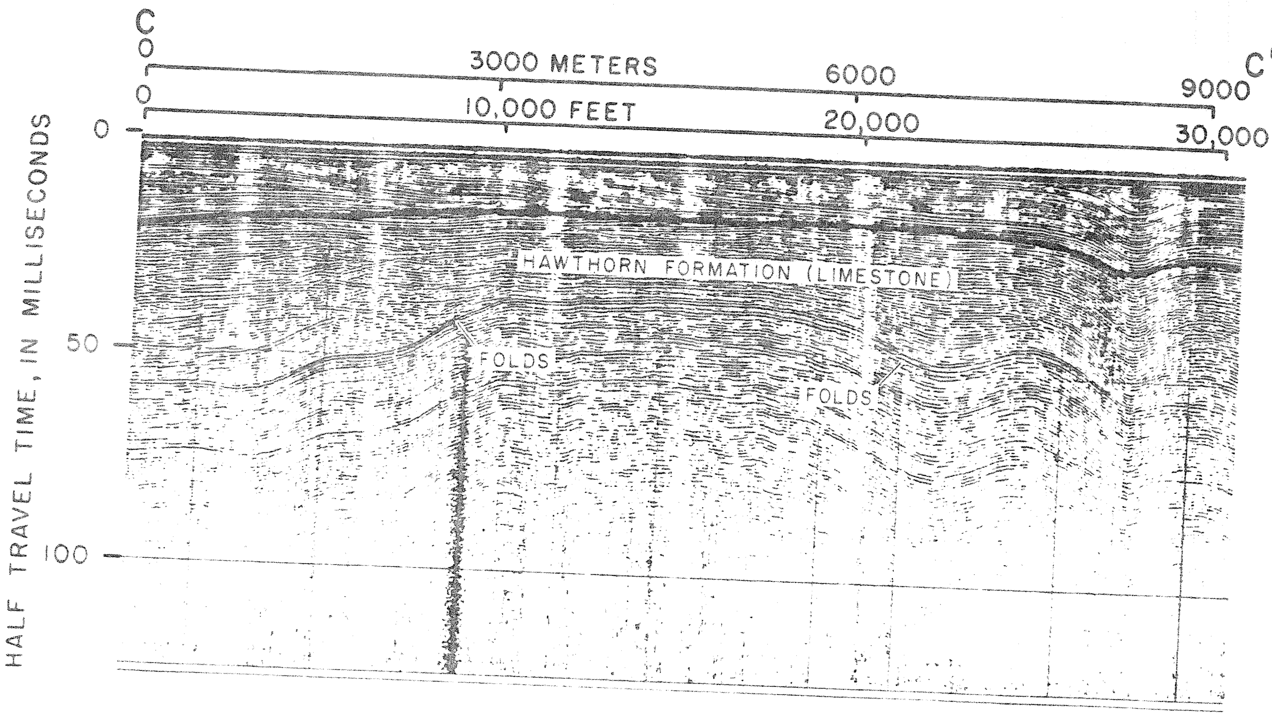

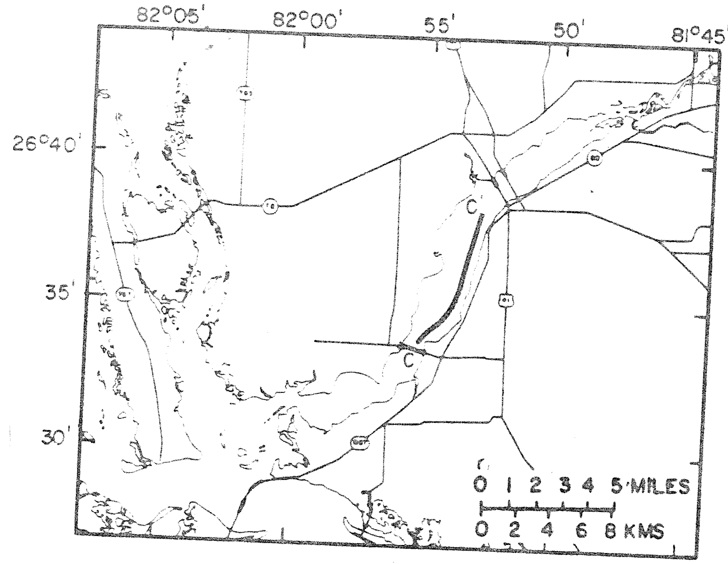

Figure 3-4. -Approximate 6-mile (9.7-kilometer) section of the sparker seismic record showing folds in the Hawthorn Formation.

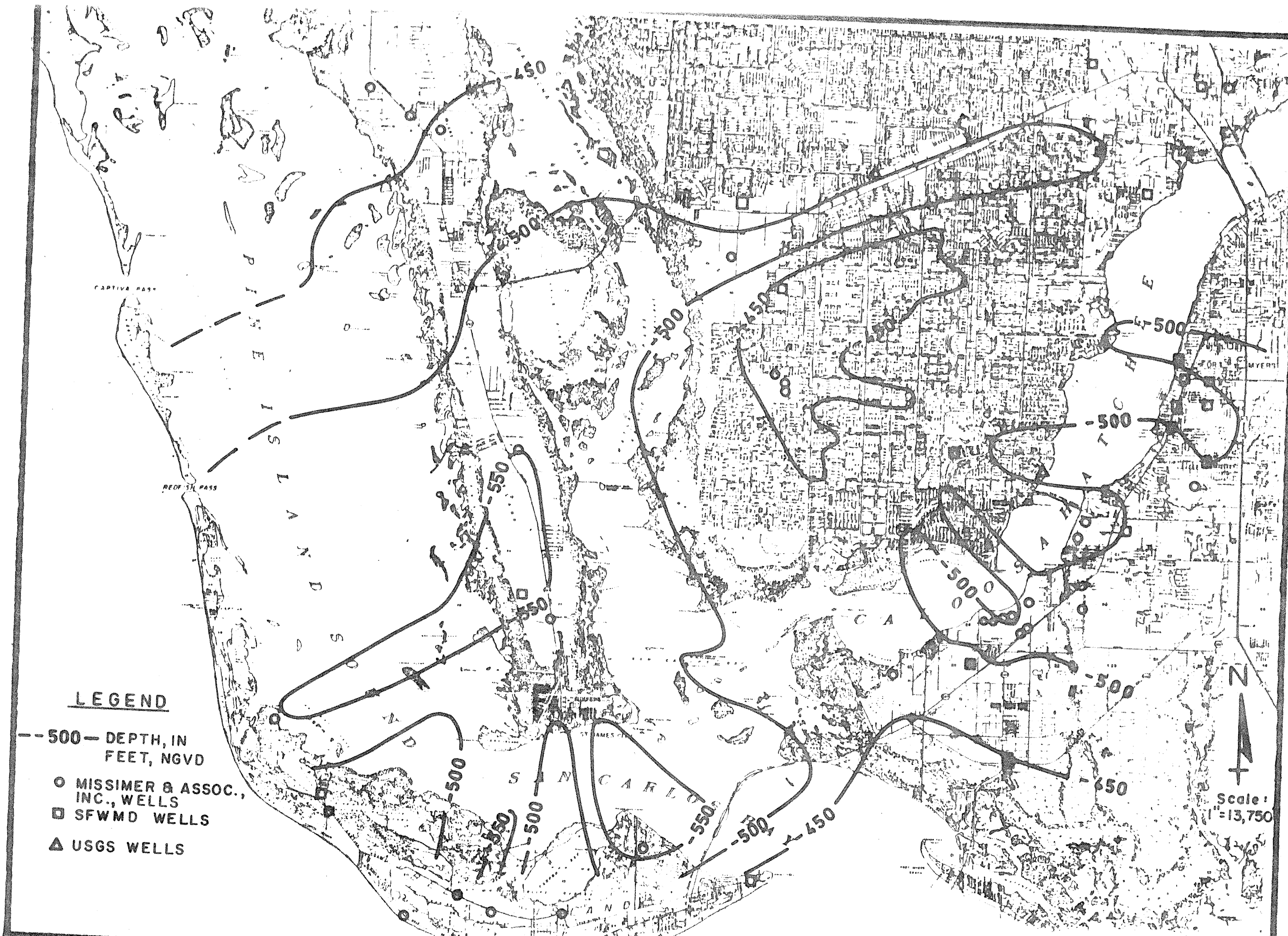

FIGURE 3-5. STRUCTURE CONTOUR MAP SHOWING THE TOP OF THE LOWER HAWTHORN FORMATION LIMESTONE UNIT.

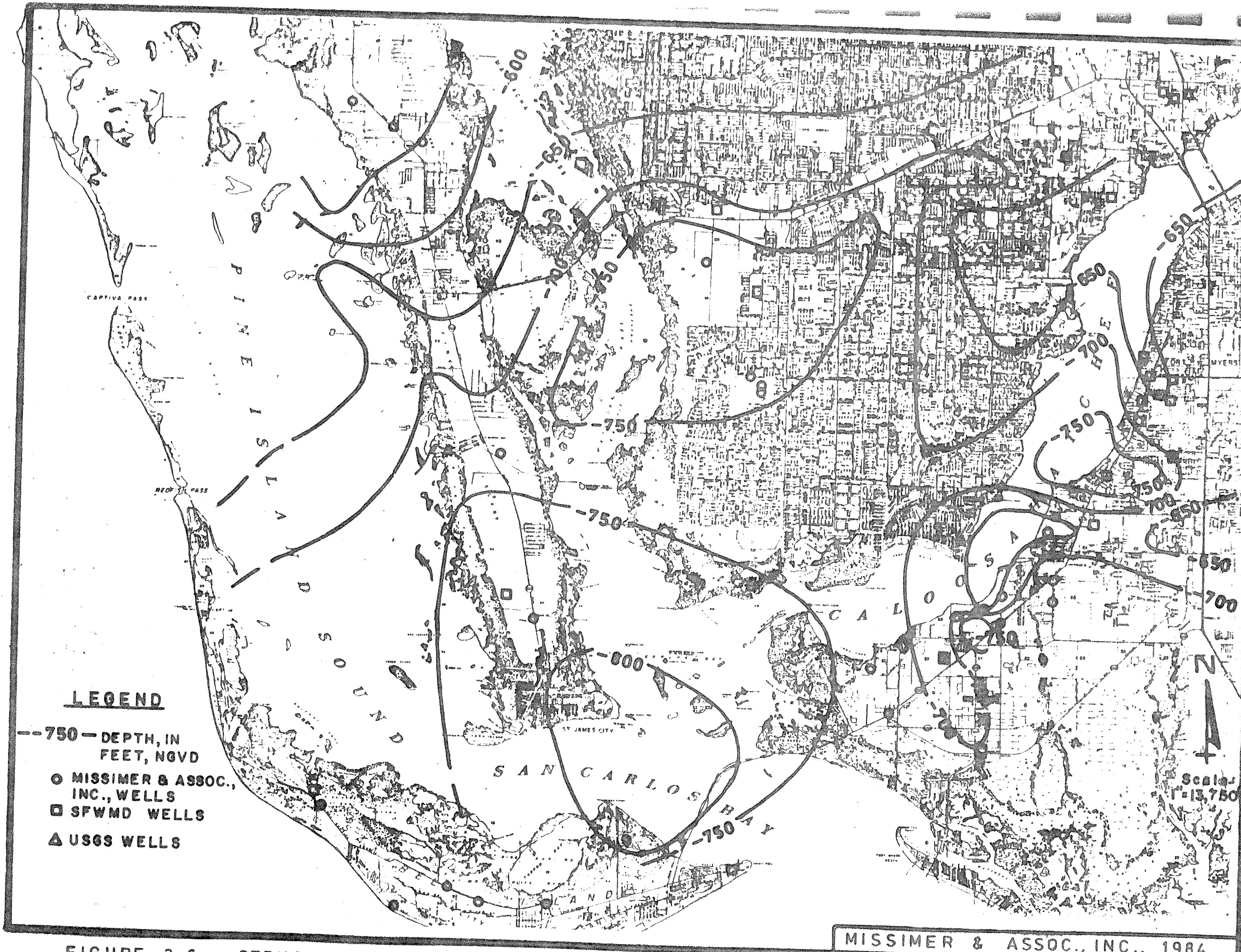

FIGURE 3-6. STRUCTURE CONTOUR MAP SHOWING THE TOP OF THE SUWANNEE LIMESTONE.

TABLE 4-1. HYDRAULIC CHARACTERISTCIS OF DIFFERENT WATER BEARING ZONES IN THE HAWTHORN AND SUWANNEE AQUIFER SYSTEMS

Location	Aquifer	Transmissivity (gpd/ft)	Storage Coefficient	Leakance (gpd/ft^3)
City of Cape Coral (Chiquita)	Composite - Hawthorn-Zone II, III, IV, and Suwannee-Zone I	110,000[1]	2×10^{-4}	2×10^{-4}
Royal Tee Golf Course	Composite - Hawthorn-Zone II, III, IV, and Suwannee-Zone I	104,000	3.3×10^{-4}	4.6×10^{-4}
Sanibel	Hawthorn-Zone III	15,600	8.5×10^{-5}	5.0×10^{-5}
Sanibel	Hawthorn-Zone IV and Suwannee-Zone I	80,000	1×10^{-4}	3×10^{-3}
Sanibel	Hawthorn-Zone IV isolated	74,000	2×10^{-4}	3×10^{-3}
City of Cape Coral (R.O. Plant)	Composite - Hawthorn-Zone II, III, IV, and Suwannee-Zone I	80,000 350,000	--	--

[1]Ra-analyzed

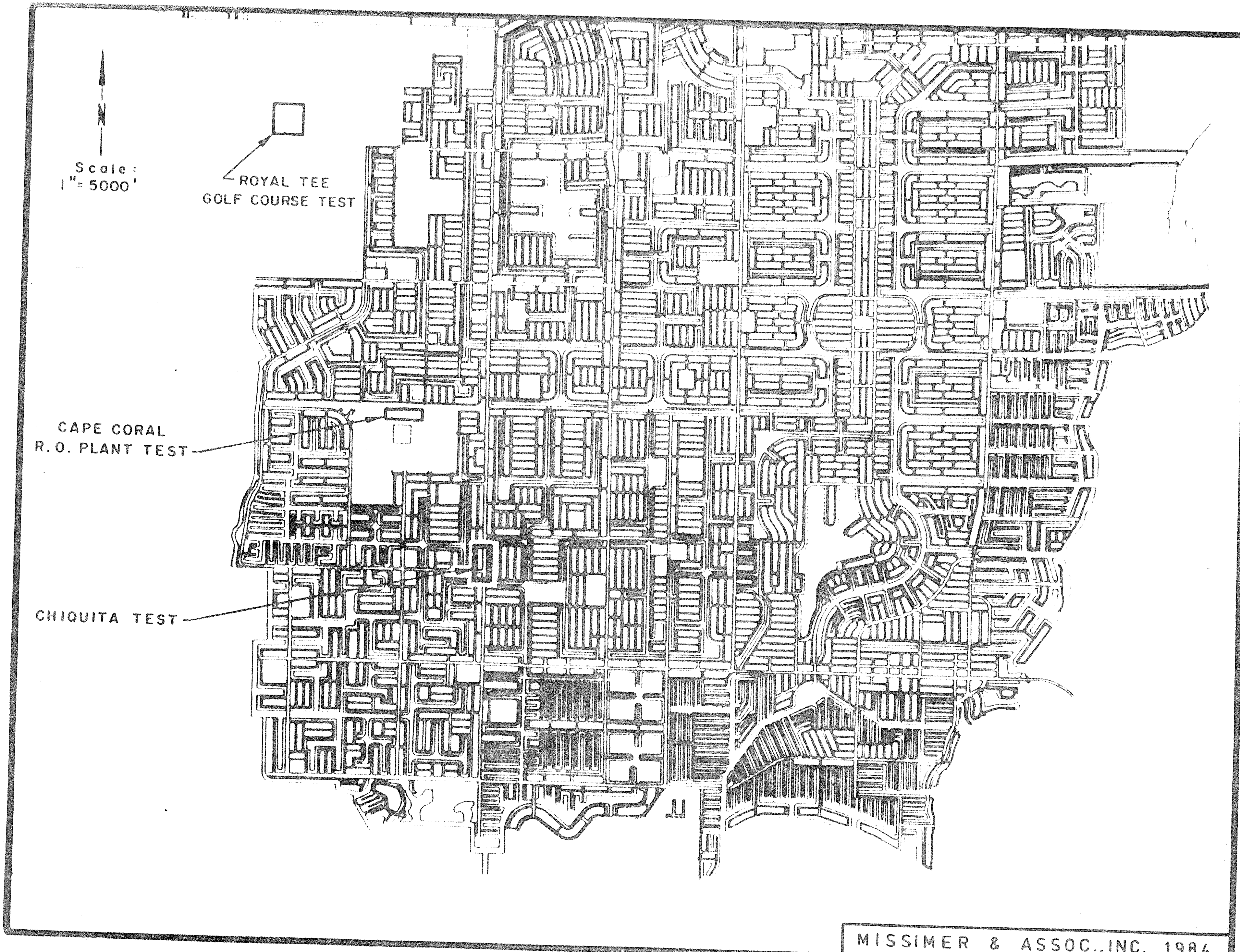

FIGURE 4-1. MAP SHOWING THE LOCATIONS OF AQUIFER TESTS PERFORMED IN CAPE CORAL.

k'/b' = leakance, in 1/days

v = Hantush curve function

Unit Conversions:

$(7.48\ g/ft^3)(ft^2/day) = 1\ gpd/ft$
$(7.48\ g/ft^3)(1/days) = 1\ gpd/ft^3$

The coefficients obtained from this analysis were: transmissivity = 110,000 gpd/ft, storage coefficient = 2×10^{-4}, and leakance = 2×10^{-4} gpd/ft^3. In order to confirm these numbers, an analysis was performed on data from well RO-8, a distance of 2,468 feet from the production well. The analysis was problematical but yielded a transmissivity of 175,000 gpd/ft, and a leakance of 3×10^{-4} gpd/ft^3. Attempts to perform a valid distance-drawdown analysis were unsuccessful because of the hydraulic problems in the vicinity of the pumped well.

Royal Tee Golf Course Test

A long-term aquifer test was performed at the Royal Tee Golf Course. Production well L-M-2213 was allowed to flow for a period of 9 days. Flow rate was monitored by using an orifice plate and a manometer tube. Drawdowns were monitored in two observation wells, located 300 and 1,550 feet respectively from the production wells. A diagram showing the aquifer test set-up is given in Figure 4-4 and a full description of the test is given in Missimer and Associates, Inc. (1983).

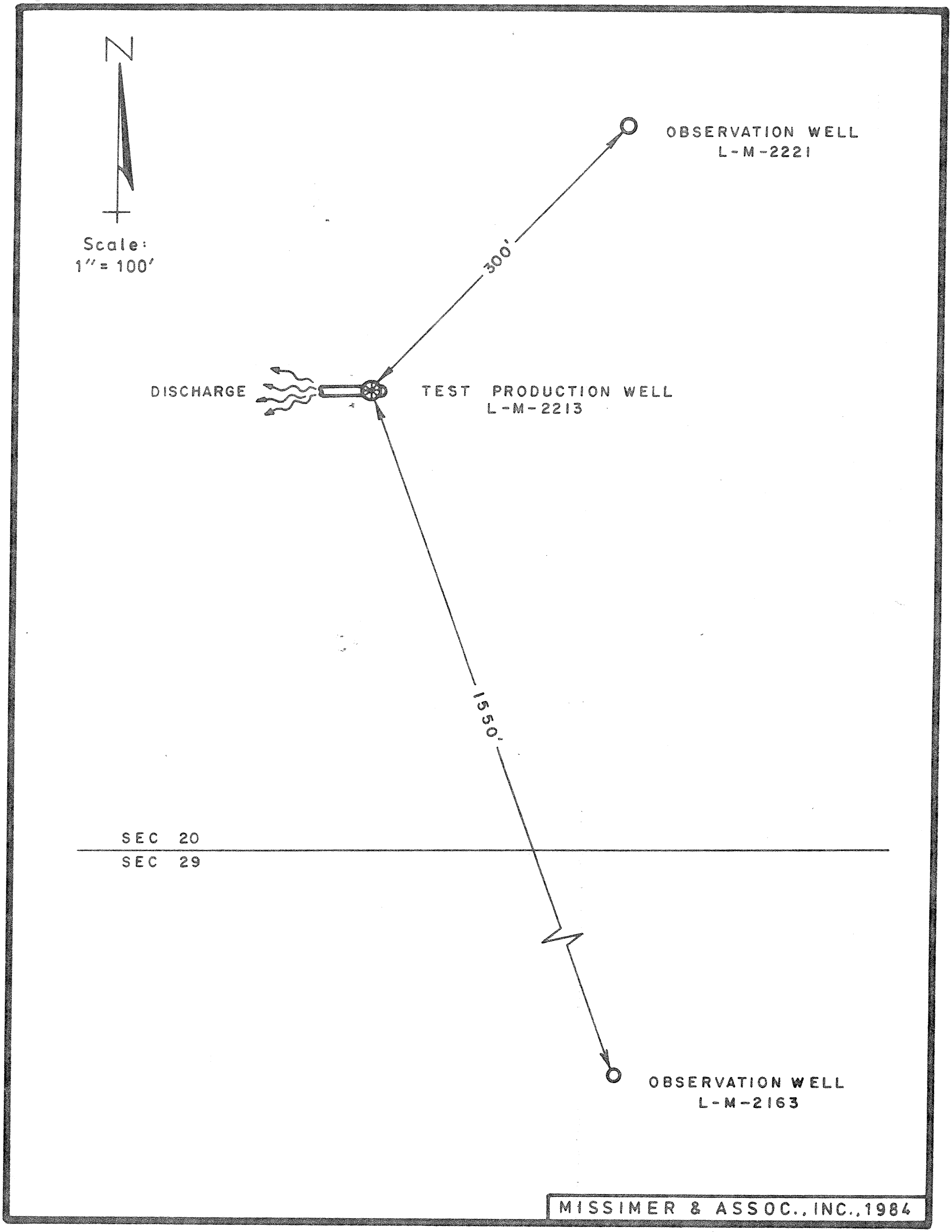

FIGURE 4-4. DIAGRAM SHOWING AQUIFER TEST SET-UP.

Drawdowns measured in well L-M-2221 showed a consistent trend with little effect from outside pumpage (Pine Island and Cape Coral wellfields). Therefore, a log plot of time vs. drawdown from well L-M-2221 was used to perform the primary analysis on the aquifer system (Figure 4-5). The resultant plotted curve was matched to the appropriate Hantush-Jacob type curves for semi-confined aquifers (Jacob, 1950; Hantush, 1956, 1960) as presented by Lohman (1979). The corresponding type curve and plotted curve match point numbers were substituted into Equations 1, 2 and 3 previously presented.

Well L-M-2221 yielded the following aquifer coefficients:

Transmissivity	=	104,000 gpd/ft
Storage Coefficient	=	3.3×10^{-4}
Leakance	=	4.6×10^{-4} gpd/ft^3

Analysis of Aquifer Hydraulic Coefficients

All three aquifer tests conducted in Cape Coral were performed on a composite of several water-bearing zones. The aquifer coefficients calculated from the test data were relatively consistent in observation wells located at least 200 feet from the respective production wells. This rather peculiar effect has been observed in most aquifer tests conducted in southwest Florida and is the result of a mathematical problem with the Hantush equations as applied to these aquifers. It is also possible that the large

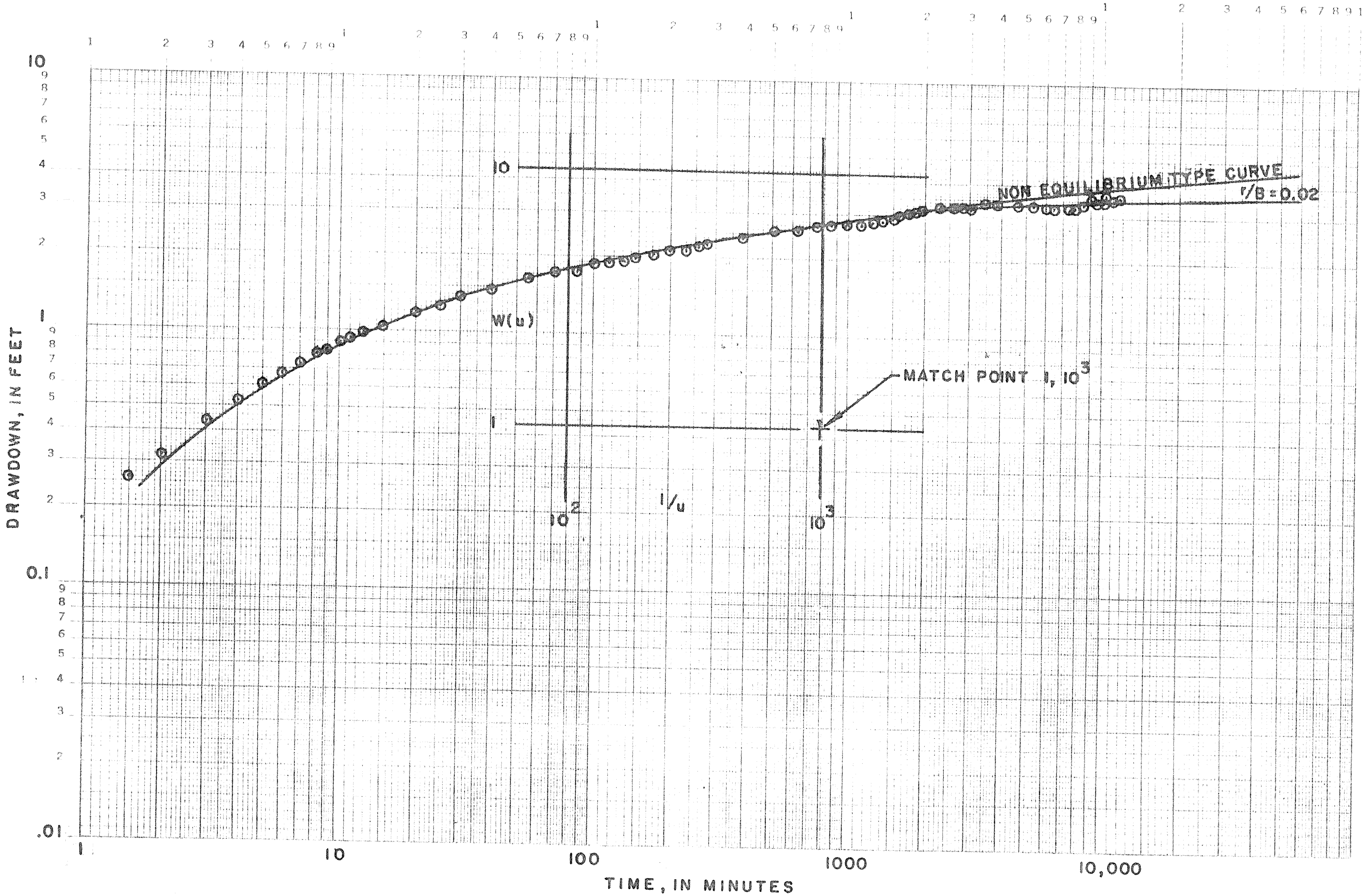

FIGURE 4-5. LOG LOG PLOT OF DRAWDOWN VS. TIME FOR MONITOR WELL L-M-2221 AND COMPARISON TO APPROPRIATE TYPE CURVE.