CHAPTER 3

(3-1) (a) $p_0 = (10)(120)/2000 = 0.600$ ton/ft^2

Eq. (3-1): $C_N = 0.77 \log_{10}(20/0.600) = 1.17$

$N_{corrected} = (1.17)(26) = 30$

(b) 10 ft = 3.048 m and 120 lb/ft^3 = 18.85 kN/m^3

$p_0 = (3.048)(18.85) = 57.45$ kN/m^2

Eq. (3-3): $N_{corrected} = (26)(100/57.45)^{1/2} = 34$

(3-2) (a) $p_0 = [(8)(120) + (2)(120 - 62.4)]/2000 = 0.538$ ton/ft^2

Eq. (3-1): $C_N = 0.77 \log_{10}(20/0.538) = 1.21$

$N_{corrected} = (1.21)(26) = 31$

(b) $p_0 = 1.08$ kips/ft^2 = 51.71 kN/m^2

Eq. (3-3): $N_{corrected} = (26)(100/51.71)^{1/2} = 36$

(3-3) (a) $p_0 = (7)(20.40) = 142.8$ kN/m^2

Eq. (3-2): $C_N = 0.77 \log_{10}(1915/142.8) = 0.868$

$N_{corrected} = (0.868)(22) = 19$

(b) Eq. (3-3): $N_{corrected} = (22)(100/142.8)^{1/2} = 18$

(3-4) (a) $p_0 = (2)(20.40) + (5)(20.40 - 9.81) = 93.75$ kN/m^2

Eq. (3-2): $C_N = 0.77 \log_{10}(1915/93.75) = 1.01$

$N_{corrected} = (1.01)(22) = 22$

(b) Eq. (3-3): $N_{corrected} = (22)(100/93.75)^{1/2} = 23$

(3-5) Eq. (3-4): $c = 61/\{(\pi)[(4/12)^2(8/12)(1/2) + (4/12)^3(1/6)]\} = 449$ lb/ft^2

From Fig. 3-17 with PI = 40%, $\mu = 0.85$. Hence, $c_{corrected} = (0.85)(449) = 382$ lb/ft^2

(3-6) A plot of time versus distance is given on page 8.

$slope_{line\ 1} = 0.083/80 = 0.001038$

$slope_{line\ 2} = (0.093 - 0.08675)/(180 - 100) = 0.00007813$

v_1 = reciprocal of $slope_{line\ 1} = 1/0.001038 = 963$ ft/sec

v_2 = reciprocal of $slope_{line\ 2} = 1/0.00007813 = 12{,}800$ ft/sec

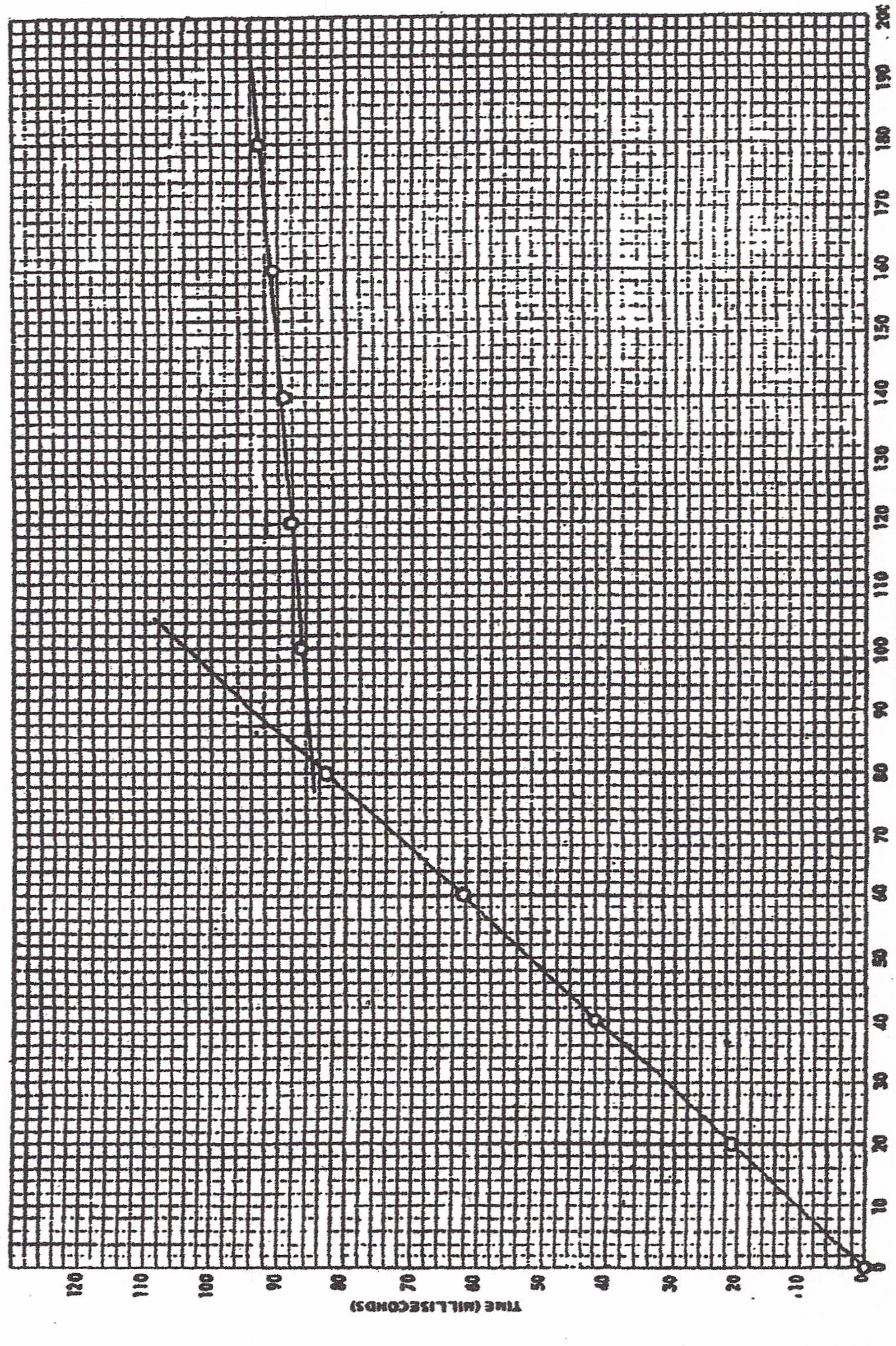
L = 82 ft (from plot on page 8)

Eq. (3-6): $H_1 = (82/2)[(12{,}800 - 963)/(12{,}800 + 963)]^{1/2} = 38$ ft

With v_1 = 963 ft/sec, according to Table 3-3, the subsurface material in the first layer is estimated to be normal sand or loose sand above the water table. With v_2 = 12,800 ft/sec, according to Table 3-3, the subsurface material in the second layer is estimated to be hard limestone, basalt, granite, or unweathered gneiss.

(3-7)

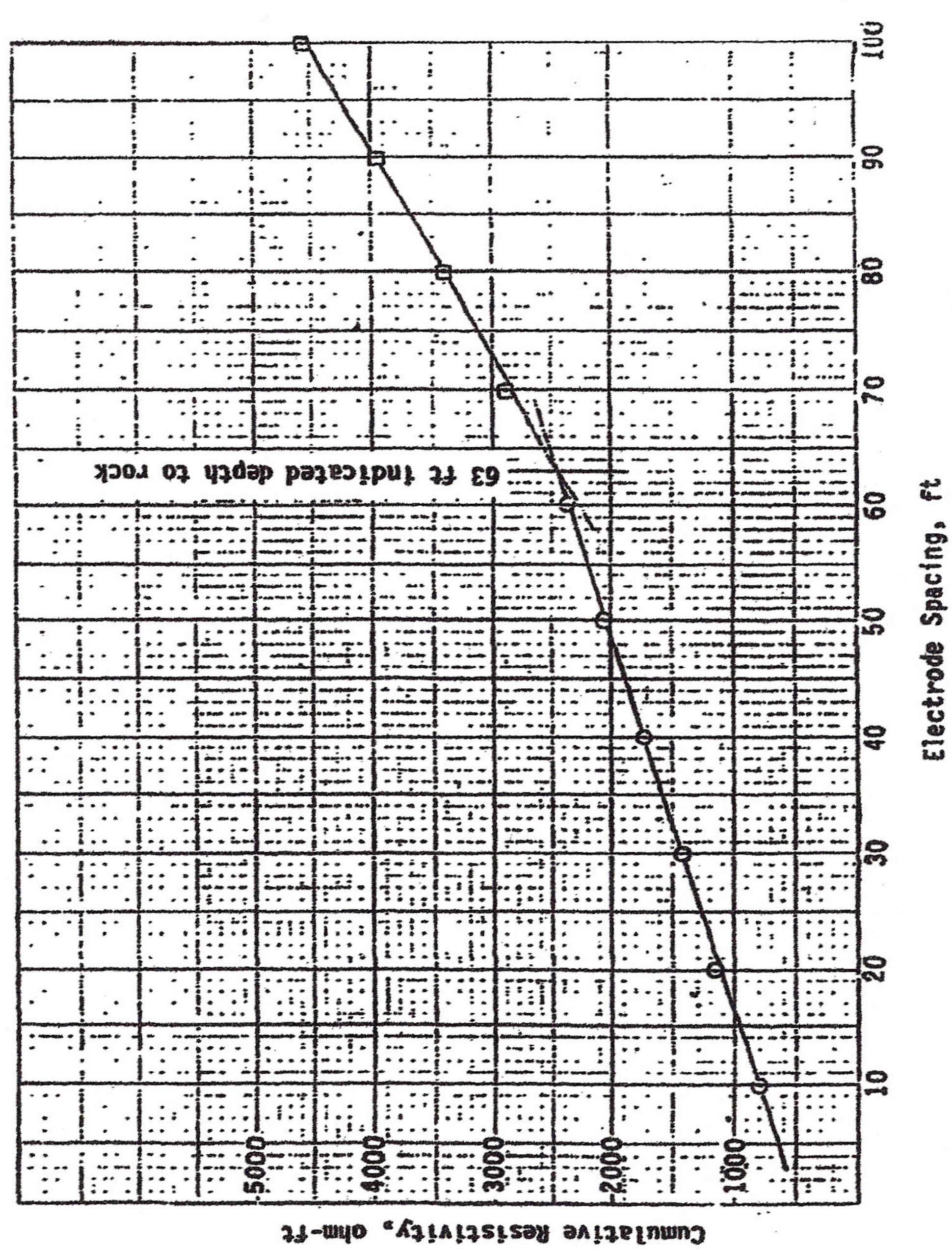
Electrode Spacing (ft)	**Resistance (ohms)**	**Resistivity (ohm-ft)**	**Cumulative Resistivity (ohm-ft)**
10	12.73	800	800
20	2.79	351	1151
30	1.46	275	1426
40	1.15	289	1715
50	1.05	330	2045
60	0.84	317	2362
70	1.21	532	2894
80	1.00	503	3397
90	0.97	549	3946
100	0.95	597	4543


DISTANCE (FEET)
TIME (MILLISECONDS)

Electrode spacing (column 1 in the preceding table) gives the approximate depth of subsurface material included in a given measurement. Resistivity (column 3 in the table) is computed from Eq. (3-7), where D is electrode spacing (column 1) and R is resistance (column 2). Hence, for the first row in the table,

$\rho = (2)(\pi)(10)(12.73) = 800$ ohm-ft

Values in column 4 are cumulative resistivity values. A plot of electrode spacing versus cumulative resistivity is shown on page 10. From this plot, the thickness of the first soil layer is determined to be approximately 63 ft. Because the resistivity of the upper layer is in the range from 50 to 500 ohm-ft, according to Table 3-4, the subsurface material in this layer is estimated to be moist to dry silty and sandy soils. Because the resistivity of the lower layer is in the range from 500 to 1000 ohm-ft, according to Table 3-4, the subsurface material in this layer is estimated to be well-fractured to slightly fractured bedrock with moist-soil-filled cracks.


Cumulative Resistivity, ohm-ft
Electrode Spacing, ft
63 ft indicated depth to rock
1000
2000
3000
4000
5000
10
20
30
40
50
60
70
80
90
100