A GEOPHYSICAL STUDY OF WATER TABLE ELEVATIONS, GREAT POND AREA, HATFIELD, MASSACHUSETTS

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INTRODUCTION

During August, 1988, a geophysical survey was undertaken to determine water table elevations in the region east of Great Pond, Connecticut River Valley. This study region is located on the flood plain of the Connecticut River within the Mount Toby 7 1/2 " quadrangle, Massachusetts. The survey utilized electrical resistivity and seismic refraction methods. Nine resistivity profiles, averaging 200 meters in length, were taken using the Wenner and Lee-partition configurations. Seismic refraction soundings were taken at three of the nine sites (Figure 1). Well logs, soil maps, and other geologic information was also obtained to assist in the interpretation of the geophysical results.

RESULTS

Analysis of Lee-partition data demonstrates that no significant lateral variations are present within the study area. Interpretation of Wenner data and comparison with soil, well, and seismic information suggests that the subsurface sediments of the area consist of an unsaturated silty soil and sand or a saturated silty soil layer at the surface underlain by layers of unsaturated coarse glacial sand and gravel or saturated silty sand, and finally, saturated coarse glacial sand and gravel interbedded with saturated clay. The water table in this region occurs in either a saturated coarse glacial sand and gravel or a saturated silty soil. The water table elevation varies between 31.6 and 34.8 meters.

DISCUSSION

Cross-sections A-B and G-B (Figures 2 and 3), which are located in the central part of the study area, show that the elevation of the water table decreases eastward from 34.8 m to 31.3 m and 33.1 m to 32.2 m respectively. This relation would be predicted as the water table should decrease in elevation as it drains from the Great Pond to the Connecticut River. The other cross-sections were either not consistent with the expected areal hydrogeology or considered questionable due to the lack of exact surface elevations.

Problems in the acquisition of the field data such as the lack of good ground contact for the resistivity and refraction readings might be a cause for the lack of consistency between the geophysical results and the areal hydrogeology. The manner of interpretation of the resistivity data, which involved the elimination of certain readings and not completely solving curves, might also be another source of error in the results of this study.

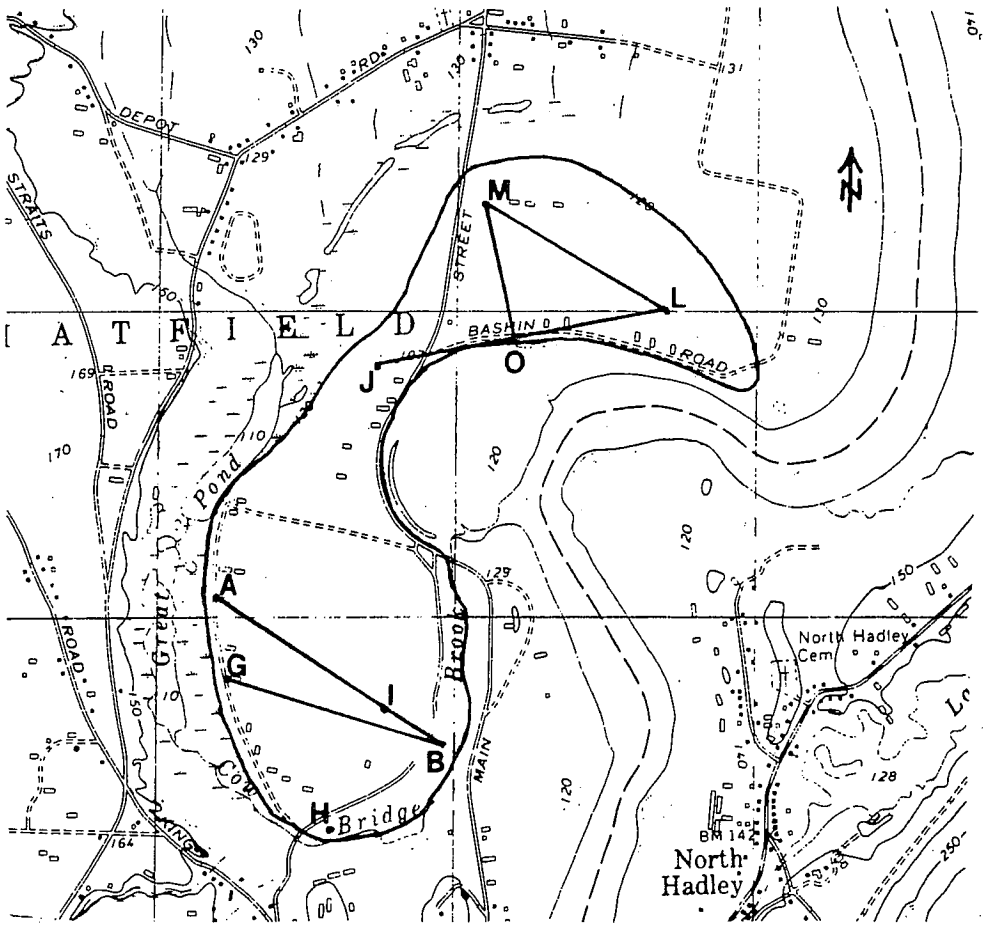

Figure 1 - Map of research area (outlined in bold) within the Mount Toby quadrangle. Also shown here are the locations of the resistivity (A, B, G, H, I, J, L, M, and O) and refraction (A, B, and J) data sites. The bold lines show the lines of cross-section. Scale 1:25,000

CROSS-SECTION A-B

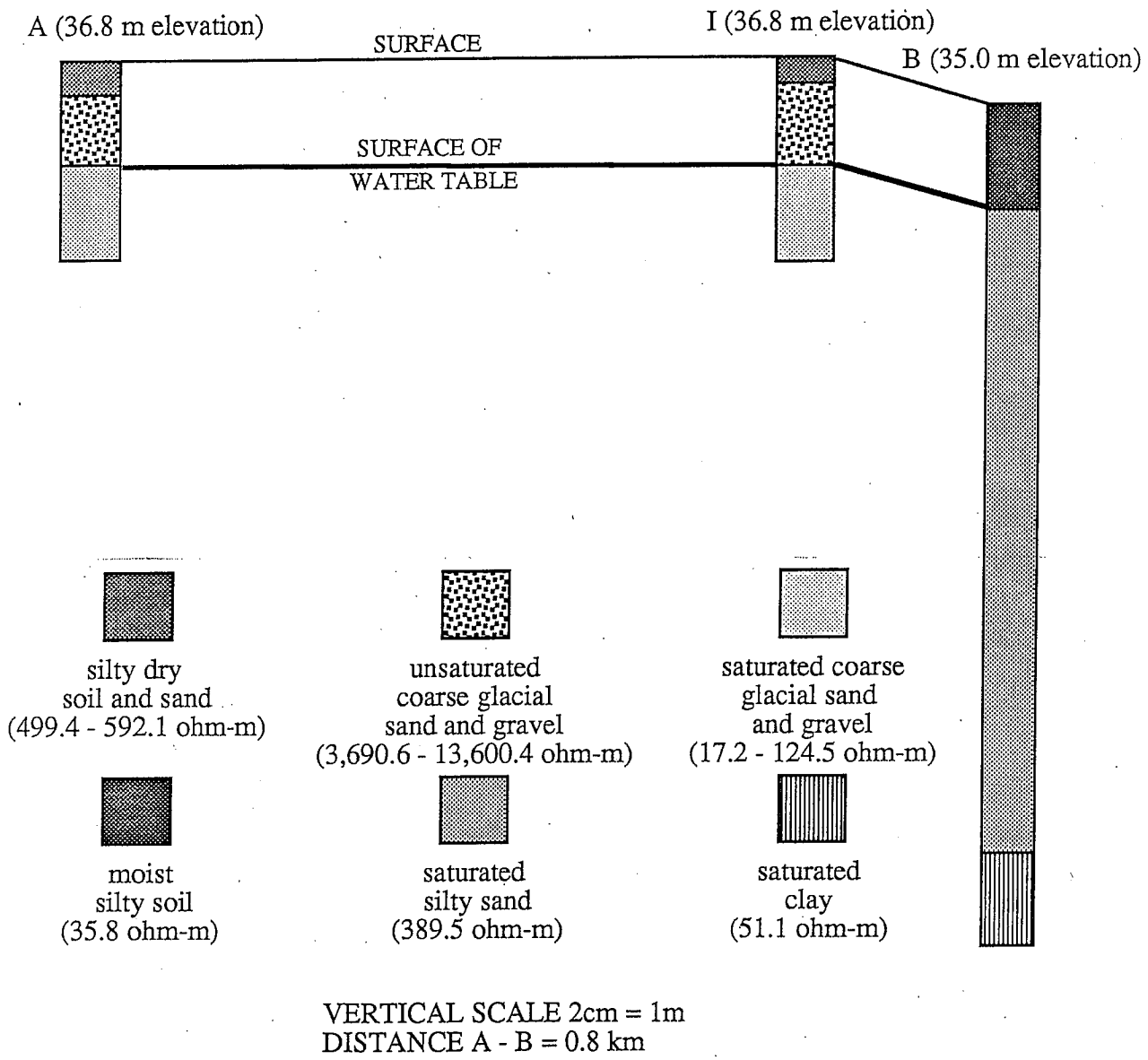

Figure 2 - Cross-section A-B (based on resistivity data). The elevation of the surface of the water table which is shown by the bold line decreases from 34.8 m to 31.3 m. Surface elevations were computed from the 7 1/2 " topographic map of the Mount Toby quadrangle. See Figure 1 for location.

CROSS-SECTION G-B

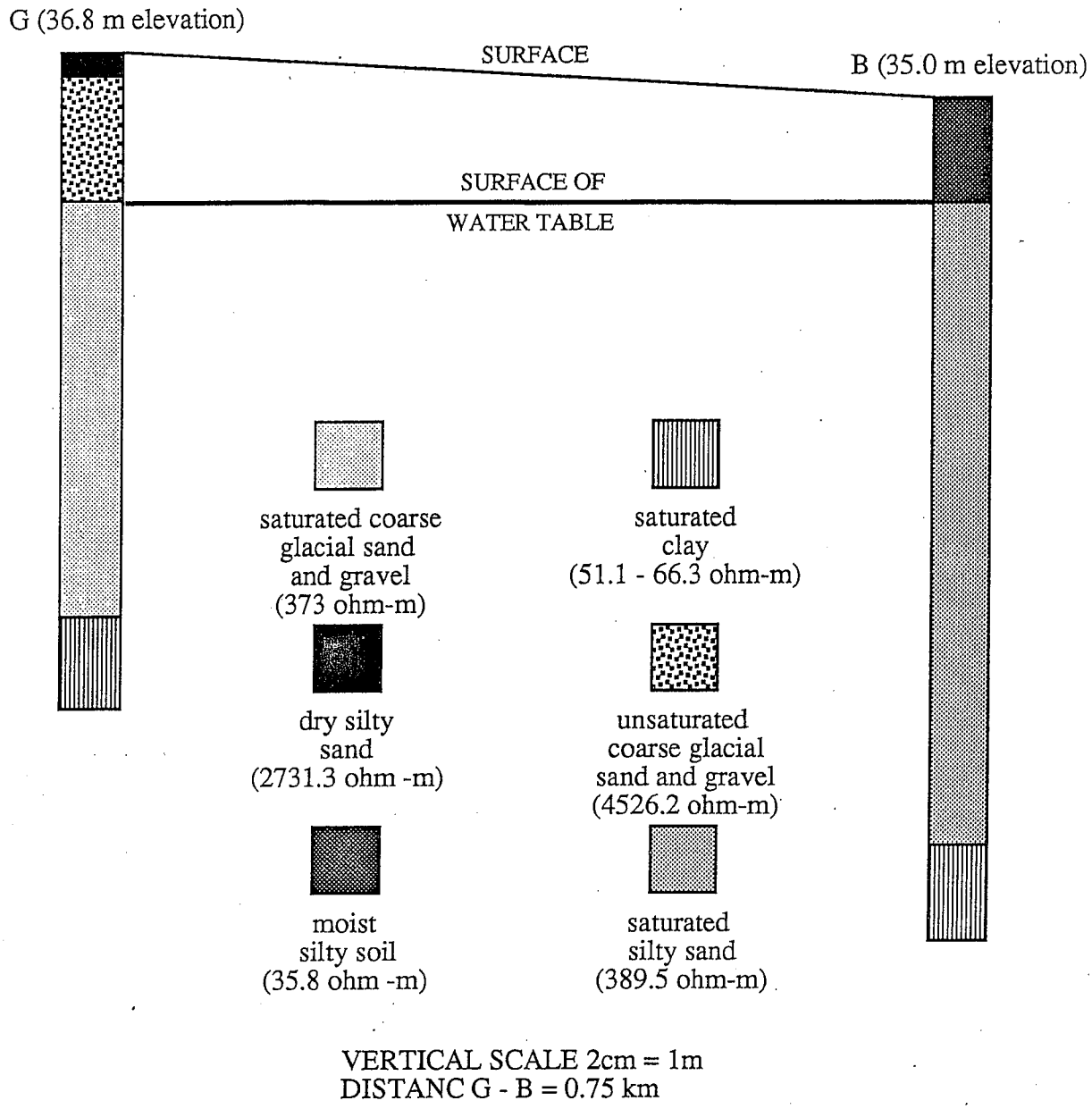

Figure 3 - Cross-section G-B (based on resistivity data). The elevation of the surface of the water table which is shown by the bold line decreases from 33.1 m to 32.2 m. Surface elevations were computed from the 7 1/2 " topographic map of the Mount Toby quadrangle. See Figure 1 for location.