

United States  
Department of  
Agriculture

Soil  
Conservation  
Service

160 East 7th Street  
Chester, PA 19013-6092

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**Subject:** Electromagnetic Induction (EM)      **Date:** September 21, 1991  
of a landfill site in  
Madison County: 11 to 13 September 1991

**To:** Paul A. Dodd  
State Conservationist  
Soil Conservation Service  
Syracuse, NY

**Purpose:**

At the request of the South Central RC&D Council, EM techniques were used to help define the boundaries of an abandon landfill site near the village of Hamilton, New York.

**Participants:**

Sue Cooper, District Clerk, Madison County SWCD, Morrisville, NY  
Steve Carlisle, Soil Scientist, SCS, Canton NY  
Jim Doolittle, Soil Specialist, SCS, Chester, PA  
Mike Johnson, District Manager, Madison County SWCD, Morrisville, NY  
Jim Martin, District Technician, Madison County SWCD, Morrisville, NY

**Activities:**

The survey grid was laid out on 11 and 12 September 1991. The EM survey was carried out on 12 and 13 September. A demonstration of the use of the EM38 meter was provided to faculty and students of Cornell University and S.U.N.Y. Binghamton at an archaeological site near Oneida, New York on 13 September 1991.

**Equipment:**

The electromagnetic induction meters used to delineated the boundaries of the landfill site was the EM38 and the EM31 manufactured by GEONICS Limited. Measurements of conductivity are expressed as milliSiemens per meter (mS/m). With the EM38 meter in the horizontal dipole mode, the scanning depth was about 0.75 meter. With the EM38 meter in the vertical dipole mode, the scanning depth was about 1.75 meters. Measurements reflect the bulk conductivity averaged over a lateral distance of about 1 meters. With the EM31 meter in the horizontal dipole mode, the scanning depth was about 2.75 meters. With the EM31 meter in the vertical dipole mode, the scanning depth was about 5.5 meters. Measurements reflect the bulk conductivity averaged over a lateral distance of about 4 meters.

**Discussion:**

The site proposed for a recreational park by the city of Hamilton, New York, is partially underlain by an abandoned landfill. Presently a baseball field occupies a portion of this area.

Dense underbrush, trees, and mounds of debris, made the use of the ground-penetrating radar (GPR) impractical. Electromagnetic induction techniques were used in an attempt to delineate the boundaries of the former landfill site. It was anticipated that the presence and uneven distribution of debris and metallic materials within the landfill would result in an irregular pattern of measured EM values. In addition to the irregular pattern, the presence of fill materials would be inferred by the occurrence of both elevated and reversed ( $< 0$ ) values.

A 700 by 600 foot grid was established across the site. The grid covered an approximately 9.6 acres. With the exception of the densely vegetated areas, the grid interval was 50 feet. In the densely vegetated area, because of time constraints, grid lines were extended to 100 foot intervals with observation sites spaced at 50 foot intervals along each line. In addition, the western portion of the survey area was not investigated with the EM meters because of very inhospitable terrain conditions. Data were collected at 158 observation points. At each of these sites, EM measurement were taken with each meter in both the horizontal and vertical mode.

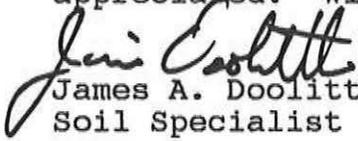
#### **Results:**

The attached, two-dimensional contour plots summarizes the spatial distribution of apparent conductivity values within the upper 0.75 (Figure 1), 1.5 meters (Figure 2), 2.75 meters (Figure 3), and 5.5 (Figure 4) meters of the study area. In each of these figures, asterisks have been used to define the survey's base line. The contour intervals are 20 mS/m for Figure 1, and 10 mS/m for figures 2, 3, and 4. A paved roadway borders the right-hand portion of the study area. The upper boundary of the study area (and figures) is north.

Generally, values of electrical conductivity decreased with increasing depths scanned. Elevated values were most noticeable at shallow depths ( $< 1.5$  meters) where values in excess of 600 mS/m were observed (average background level for undisturbed soil profiles ranged from 5 to 9 mS/m). Elevated values are believed to be associated with near surface metallic debris. These elevated values are most apparent along the extreme upper left-hand corner, and the lower center and right-hand corner of Figures 1 and 2. The upper right-hand portion of the study area appears to be outside the boundaries of the former landfill.

EM techniques were judged to provide sufficient information to plot areas suspected of having high concentrations of metallic debris. However, results of this work do not substitutes for direct observations and borings. In addition, the coarseness of the grid interval (50 feet) and the omission of several areas from the survey invalidates all tendencies to attempt a higher level of interpretation than warranted from the data.

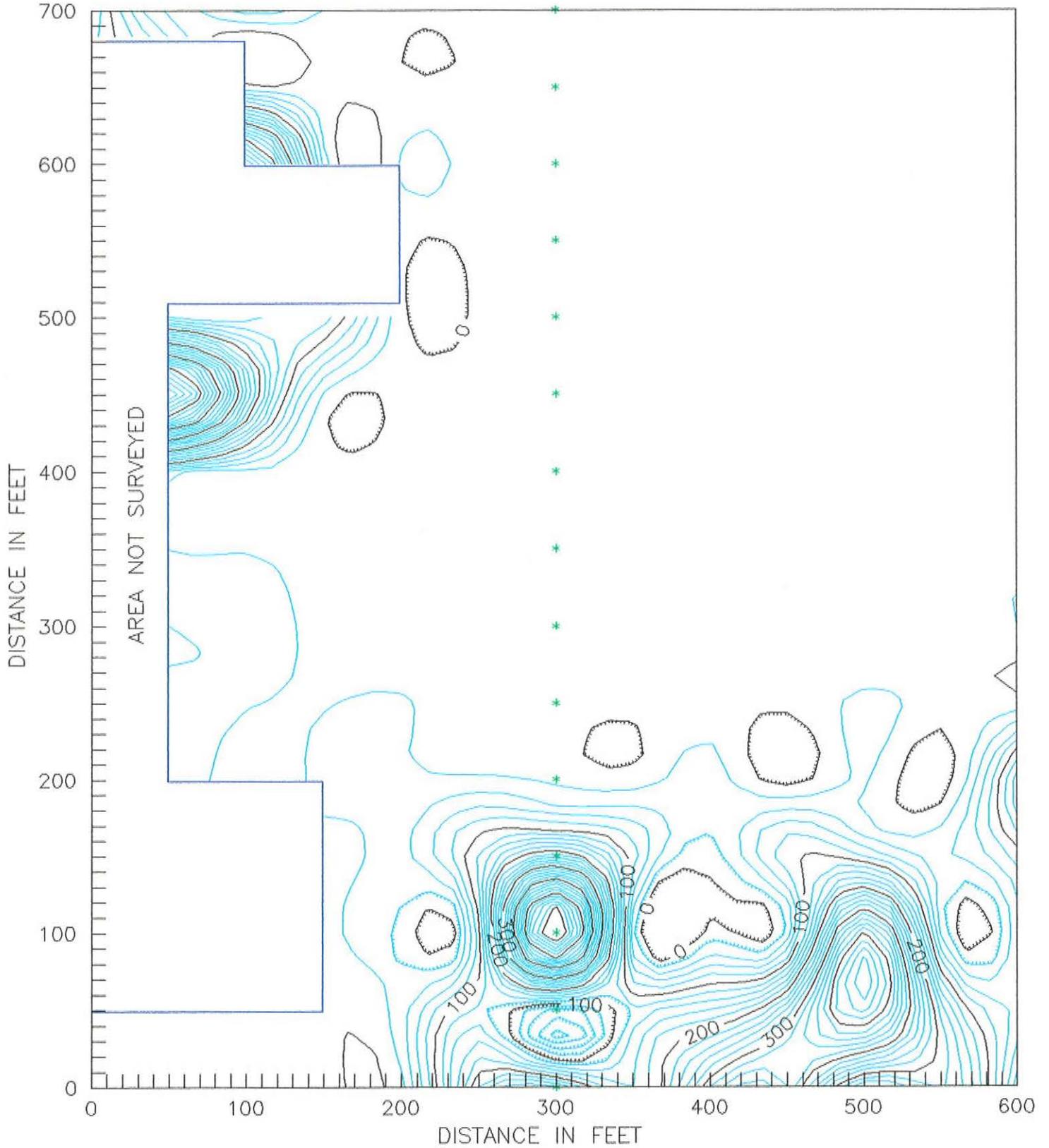
The assistance provided by Steve Carlisle and the SWCD staff was most appreciated. With kind regards.

  
James A. Doolittle  
Soil Specialist

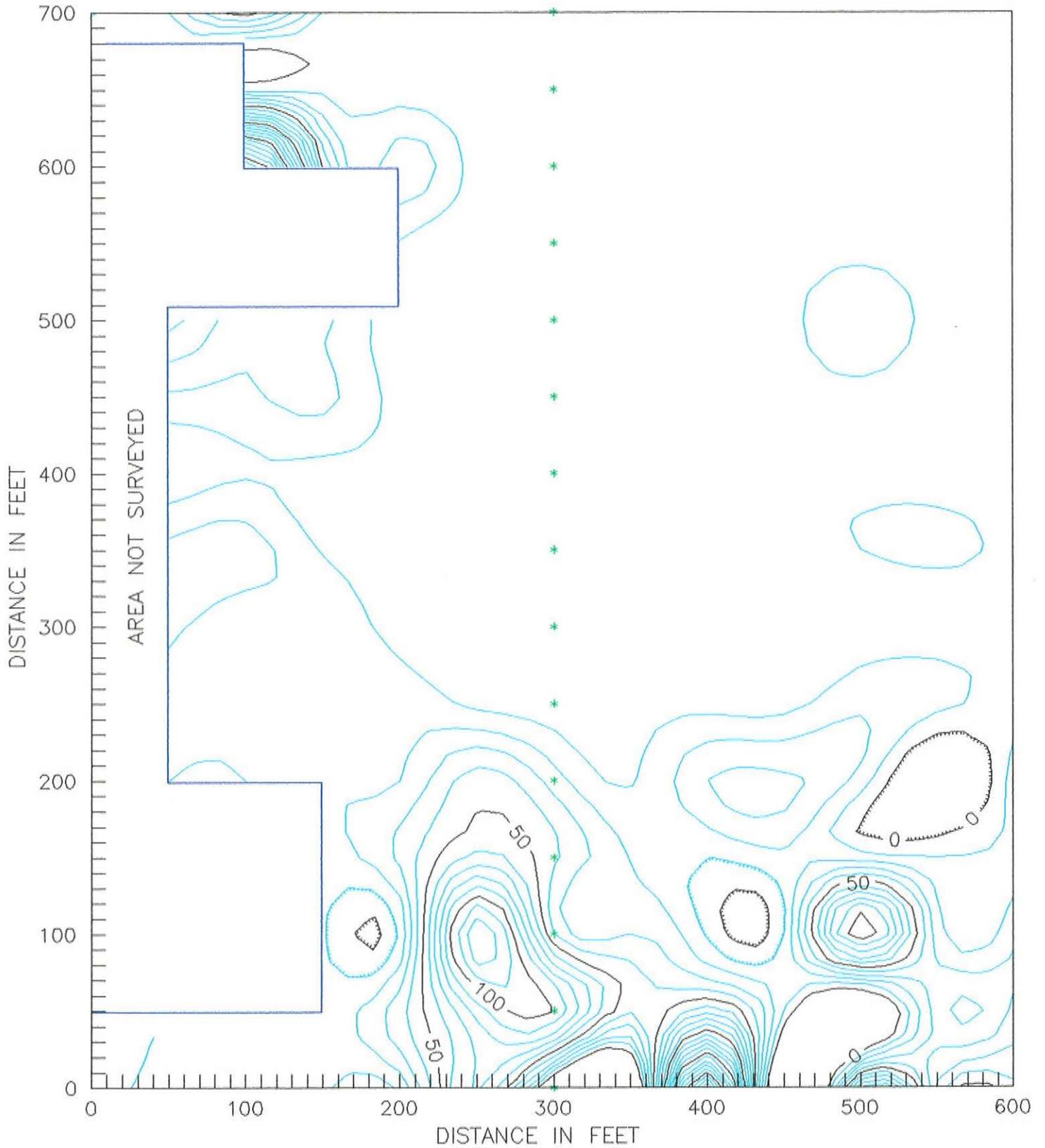
cc:

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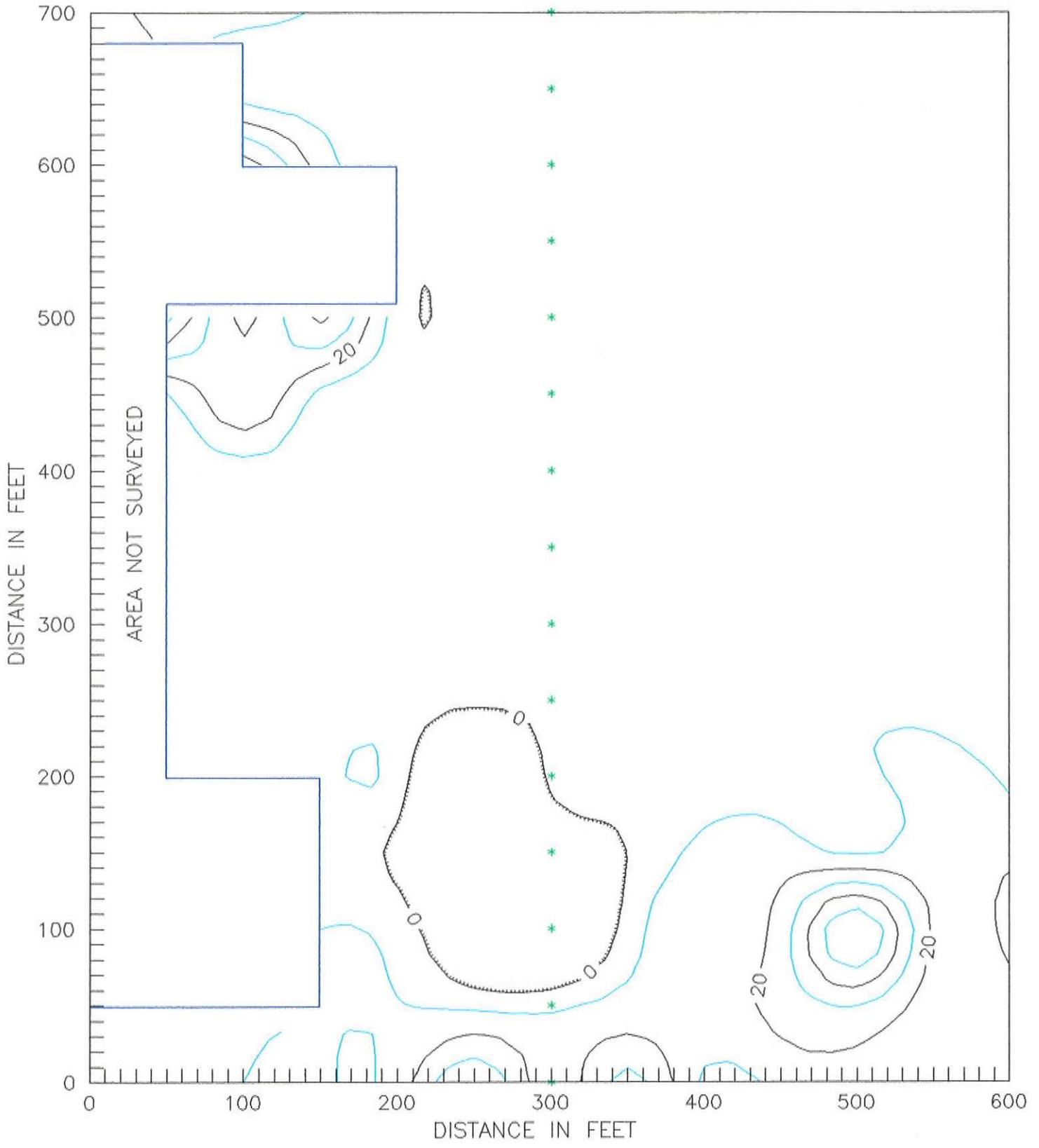
EM38(H) SURVEY OF BALLFIELD SITE NEAR HAMILTON, NEW YORK



EM38(V) SURVEY OF BALLFIELD SITE NEAR HAMILTON, NEW YORK



# EM31(H) SURVEY OF BALLFIELD SITE NEAR HAMILTON, NEW YORK



EM31(V) SURVEY OF BALLFIELD SITE NEAR HAMILTON, NEW YORK

