United States Department of Agriculture

Soil Conservation Service

Northeast NTC
160 East 7th Street
Chester, PA 19013-6092
215-499-3960

Subject: EM-38 Survey of Sodium Affected Soils near Louisville, Illinois; 23 June 1990

Date: 6 June 1990

To: Robert L. Mcleese
State Soil Scientist
USDA-Soil Conservation Service
Springer Federal Building
301 North Randolph Street
Champaign, Illinois 61820

Purpose:
To explore the potentials of using electromagnetic induction methods (EM) to characterize, classify, and map sodium affected soils in Clay County.

Participants:
Jim Doolittle, Soil Specialist, NSSL, NSSC, SCS, Chester, PA
Tonie Endres, Soil Survey Party Leader, SCS, Louisville, IL
Laurie King, Soil Scientist, SCS, Louisville, IL
Dennis Nettleton, Research Soil Scientist, NSSL, NSSC, SCS, Lincoln, NE
Terry Pittman, Soil Scientist, Clay County Board, Louisville, IL

Activities:
A 140 meter square grid was established over a representative area of a Darmstadt (fine-silty, mixed, mesic Albic Natraqualfs) and Hoyleton (fine, montmorillonitic, mesic Aquollic Hapludalfs) complex. The grid interval was 10 meters. At each grid intersect (225 intersects which served as observation points), elevation and EM measurements (both horizontal and vertical positions) were obtained. A transit and stadia rod were used to obtain elevation data. Elevations were not tied to a benchmark and therefore the lowest point within the plot was used as the 0.0 m datum. Soils were sampled by horizon at 23 intersects for characterization and to correlate EM measurements with SAR measurements.

Preliminary Results:
This study expands upon the work completed by Ammon et al., 1989*. Figure 1 is a surface net diagram plotting the relative elevations within the study area. Point 0,0 is in the extreme southwestern corner of the study area. Relief is 1.3 meters. In Figure 1, the vertical scale has been exaggerated 6X.

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* Ammons, J. T., M. E. Timpson, and D. L. Newton. 1989. Application of an aboveground electromagnetic conductivity meter to separate Natraqualfs and Ochraqualfs in Gibson County, Tennessee. Soil Survey Horizons p.66-70.

Figure 2, is a two-dimensional contour plot of the study area. The contour interval is 0.1 meter.

Figures 3 and 4 are contour plots of EM measurements taken in the horizontal and vertical dipole positions, respectively. These measurements will be correlated to SAR values obtained at 23 observations sites within the study area. With the EM-38 soil conductivity meter placed on the surface, measurements of apparent electrical conductivity are made to depths of 0.75 and 1.5 meters, when the meter is oriented in the horizontal and vertical dipole positions, respectively.

The absolute values for EM measurements are not diagnostic in themselves of SAR values. However, lateral and vertical variations in these measurements reflect spatial patterns in soil conductivity and soil type. Conductivity increases with depth at all sites. The presence of a buried pipeline is suspected from the patterns of high soil conductivities evident in Figure 4. This pattern is more poorly expressed in the shallower (0.75m) horizontal EM measurements.

A more detail report will follow the characterization of the soil samples.

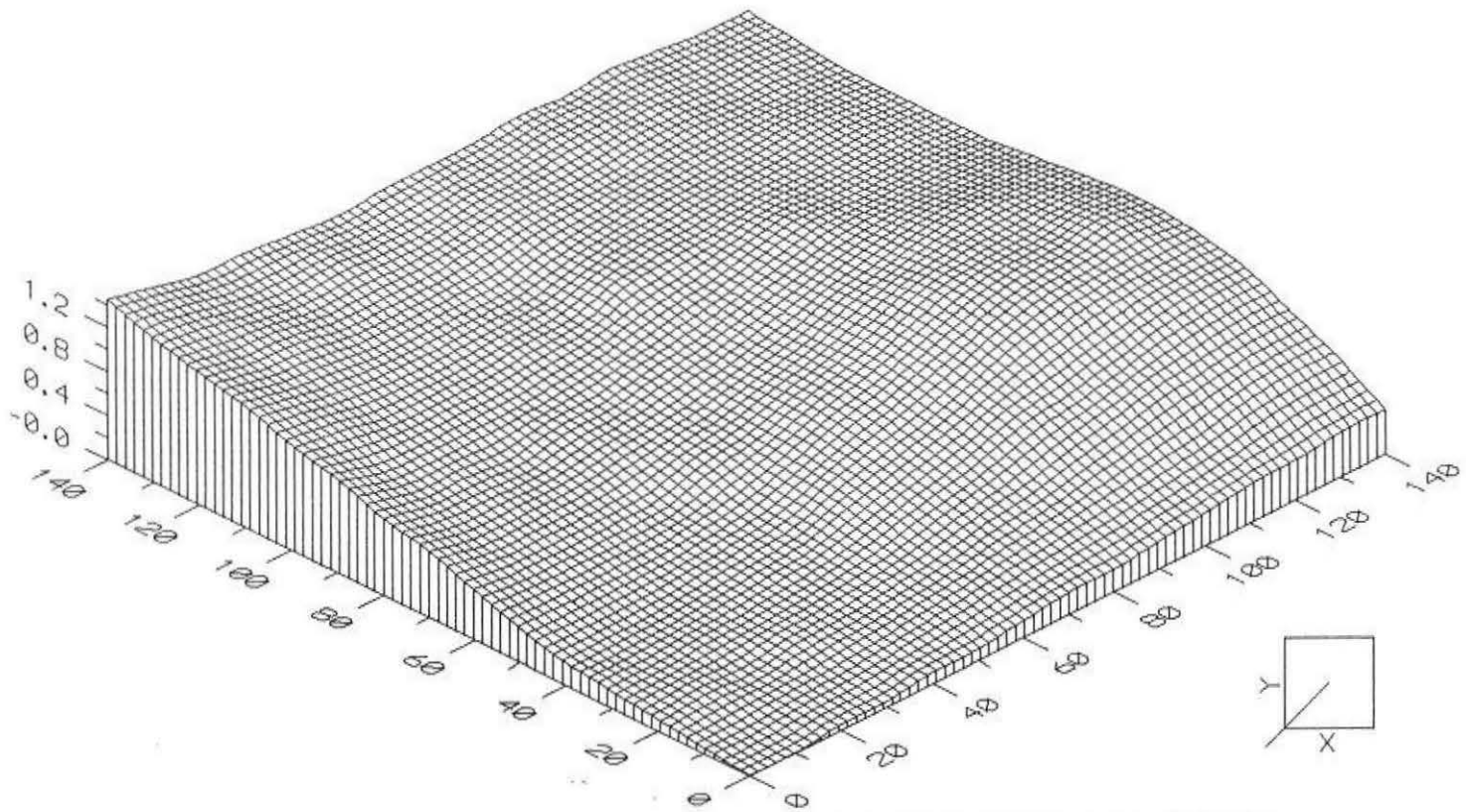
With kind regards.

Jim Doolittle

James A. Doolittle
Soil Scientist (GPR)

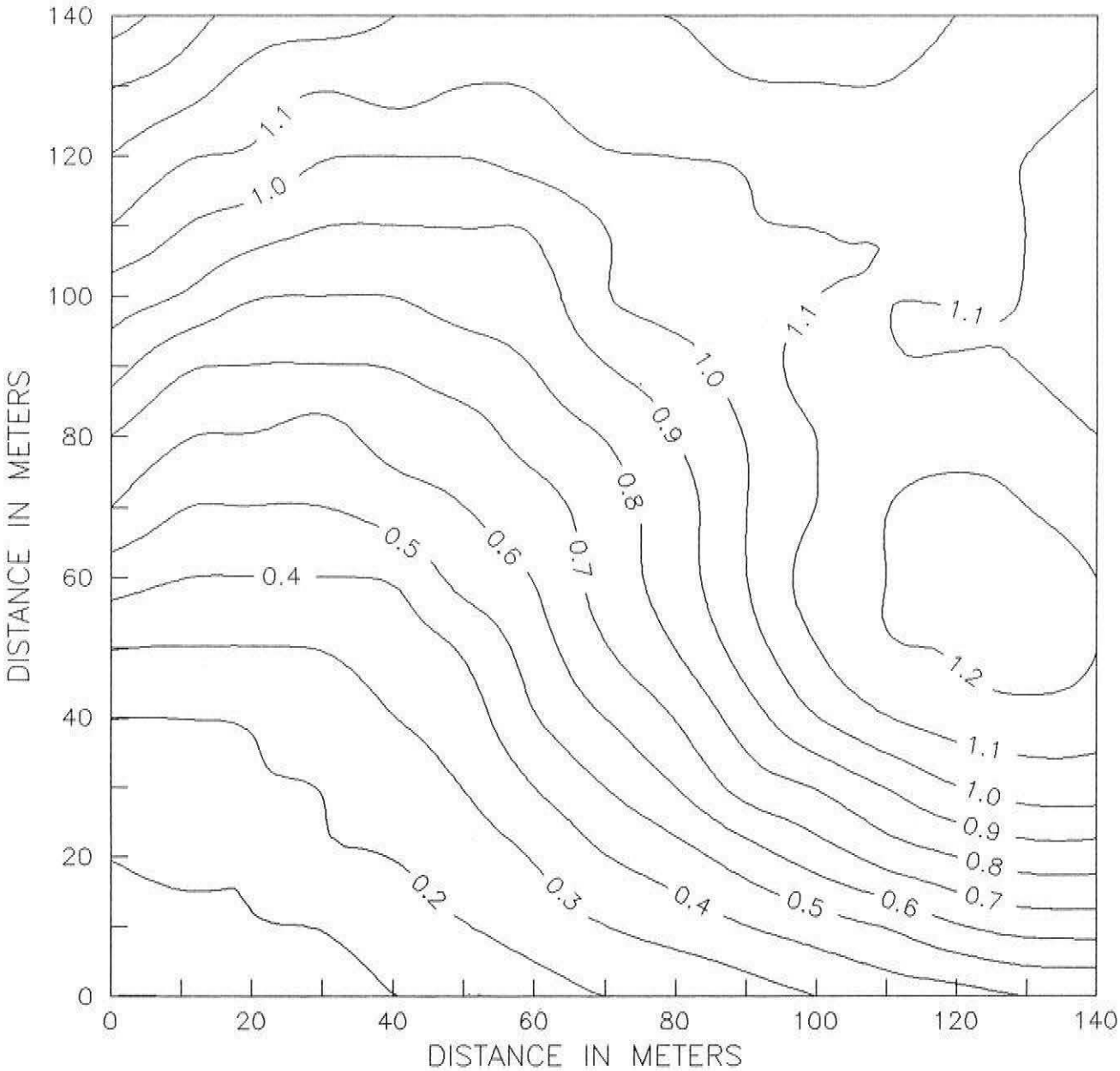
cc:
Dennis Nettleton, Research Soil Scientist, NSSL, NSSC, SCS, Lincoln, NE
Tonie Endres, Soil Survey Party Leader, SCS, 245 Chestnut Street, P.O. Box 249 Louisville, IL 62858

FIGURE !



RELATIVE SURFACE-NET OF LOUISVILLE SITE

FIGURE 2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DISTANCE IN METERS
0
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80
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120
140
DISTANCE IN METERS
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1.0
1.1
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.5
0.6
1.2
1.1
1.0
0.9
0.8
0.7
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0.3
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FIGURE 3

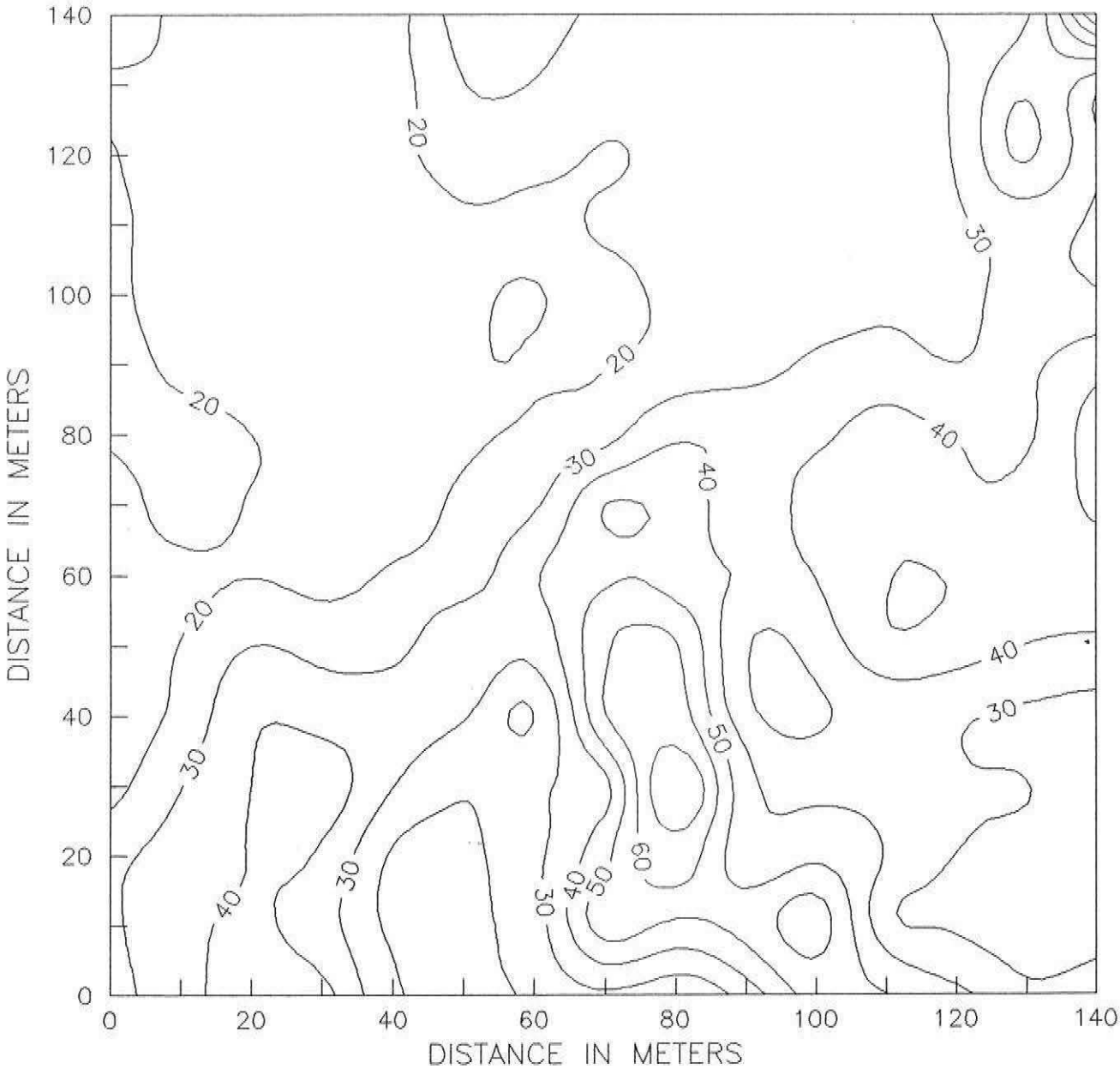
DISTANCE IN METERS
DISTANCE IN METERS
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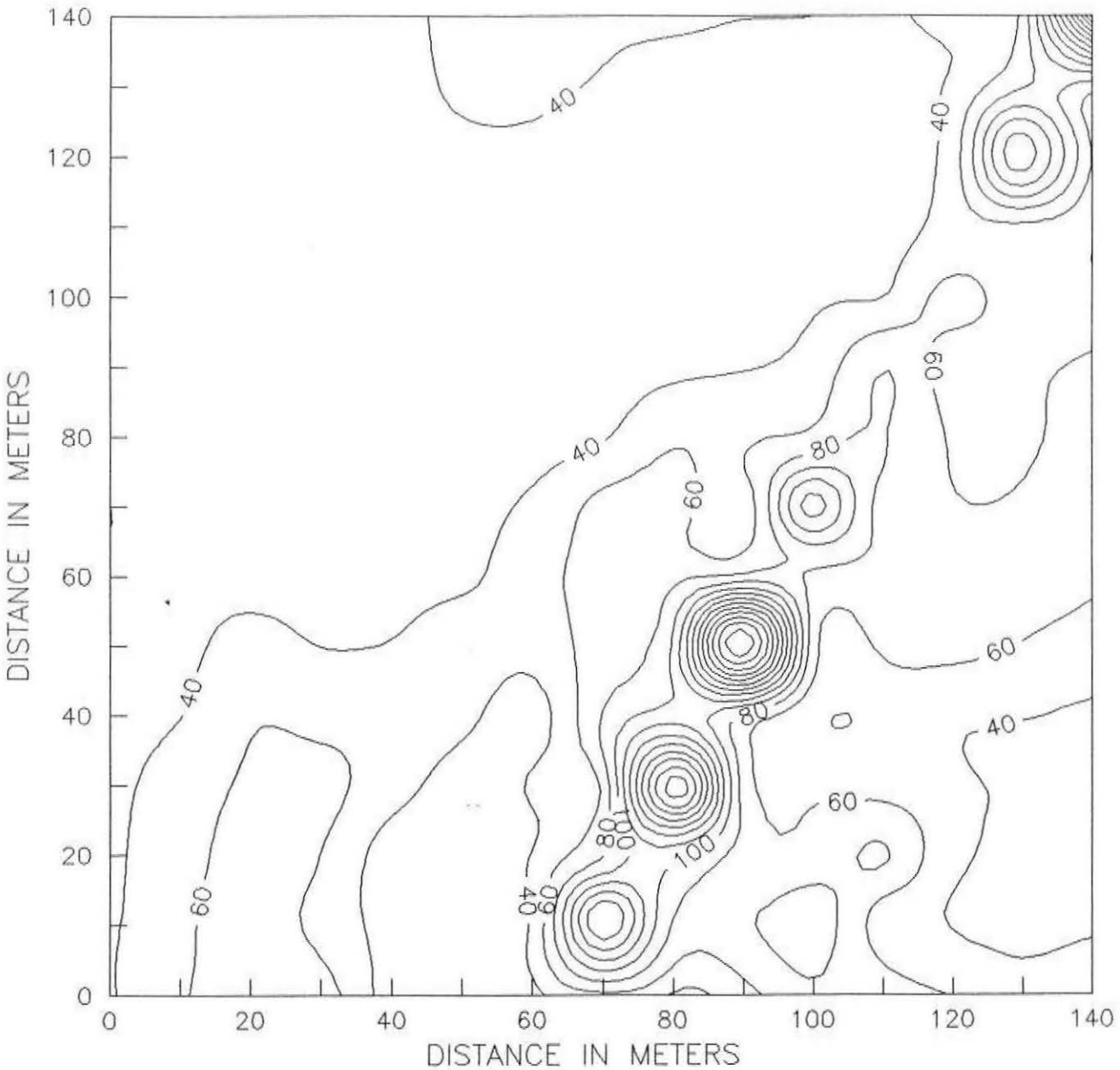
FIGURE 4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