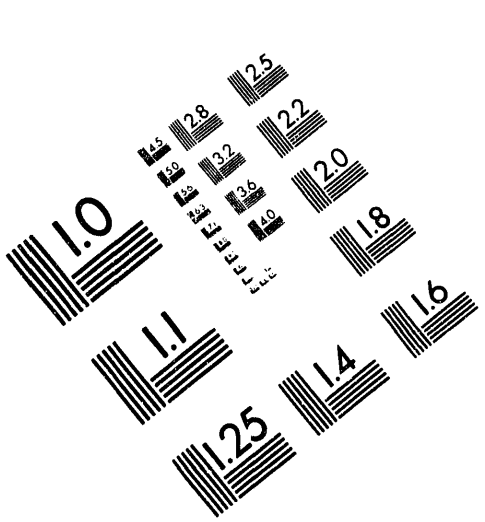

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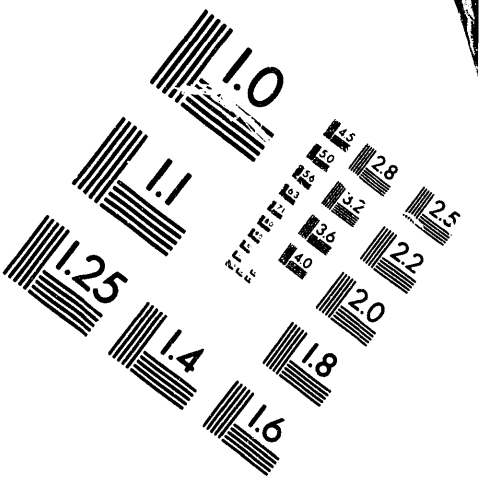

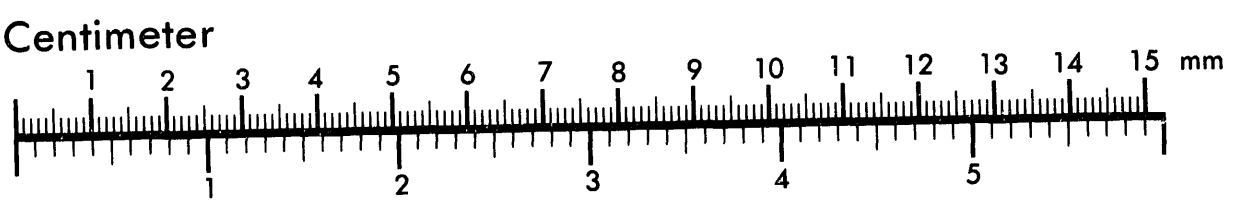

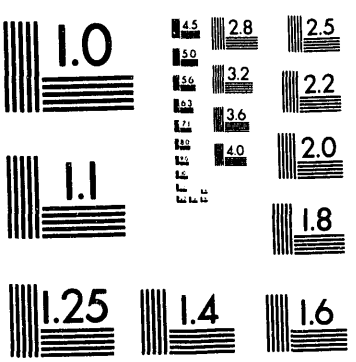

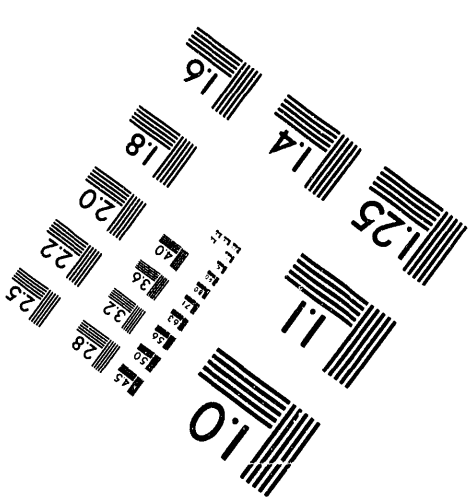

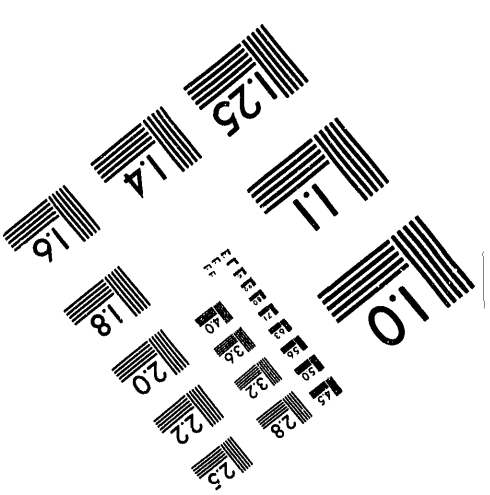

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APPLICATION OF ARC/INFO TO REGIONAL SCALE HYDROGEOLOGIC MODELING

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Richland, Washington 99352

ABSTRACT

Geographic Information Systems (GIS) can be a useful tool in data preparation for groundwater flow modeling, especially when studying large regional systems. ARC/INFO is being used in conjunction with GRASS to support data preparation for input to the CFEST (Coulpled Fluid, Energy, and Solute Transport) groundwater modeling code. Simulations will be performed with CFEST to model three-dimensional, regional, groundwater flow in the West Siberian Basin.

The West Siberian Basin covers an area of about 3.5 million km^2. Because the region is at a continental scale, map projection is an important issue. The Lambert Conformal Conic map projection was chosen as the final map projection. Therefore, all digitized data (that were originally in different map projections) as well as the data taken from the Digital Chart of the World database were standardized to the final map projection.

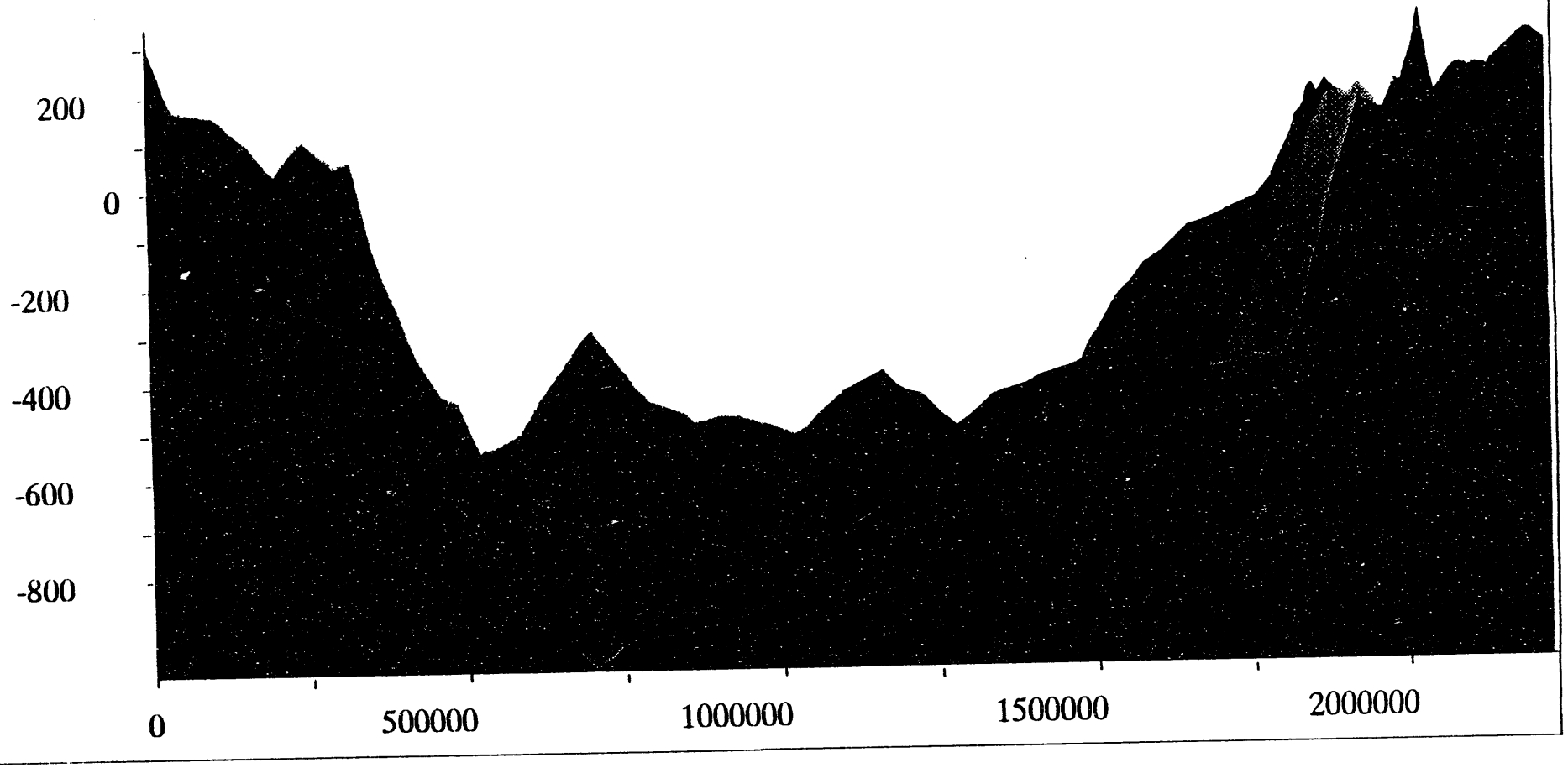
The data requirements for a groundwater flow model are as follows: 1) a finite-element grid, 2) boundary conditions (including the upper boundary, i.e., recharge), 3) initial conditions, and 4) hydraulic properties for the porous media. Once the model has been established and is running, it must be calibrated. Calibration is usually accomplished by adjusting model parameters to match observed values of hydraulic head. In the case of this model, there were no observed data available for this large scale. Therefore, a water table was calculated using information about surface water features and topography. The model will be calibrated to this calculated water table.

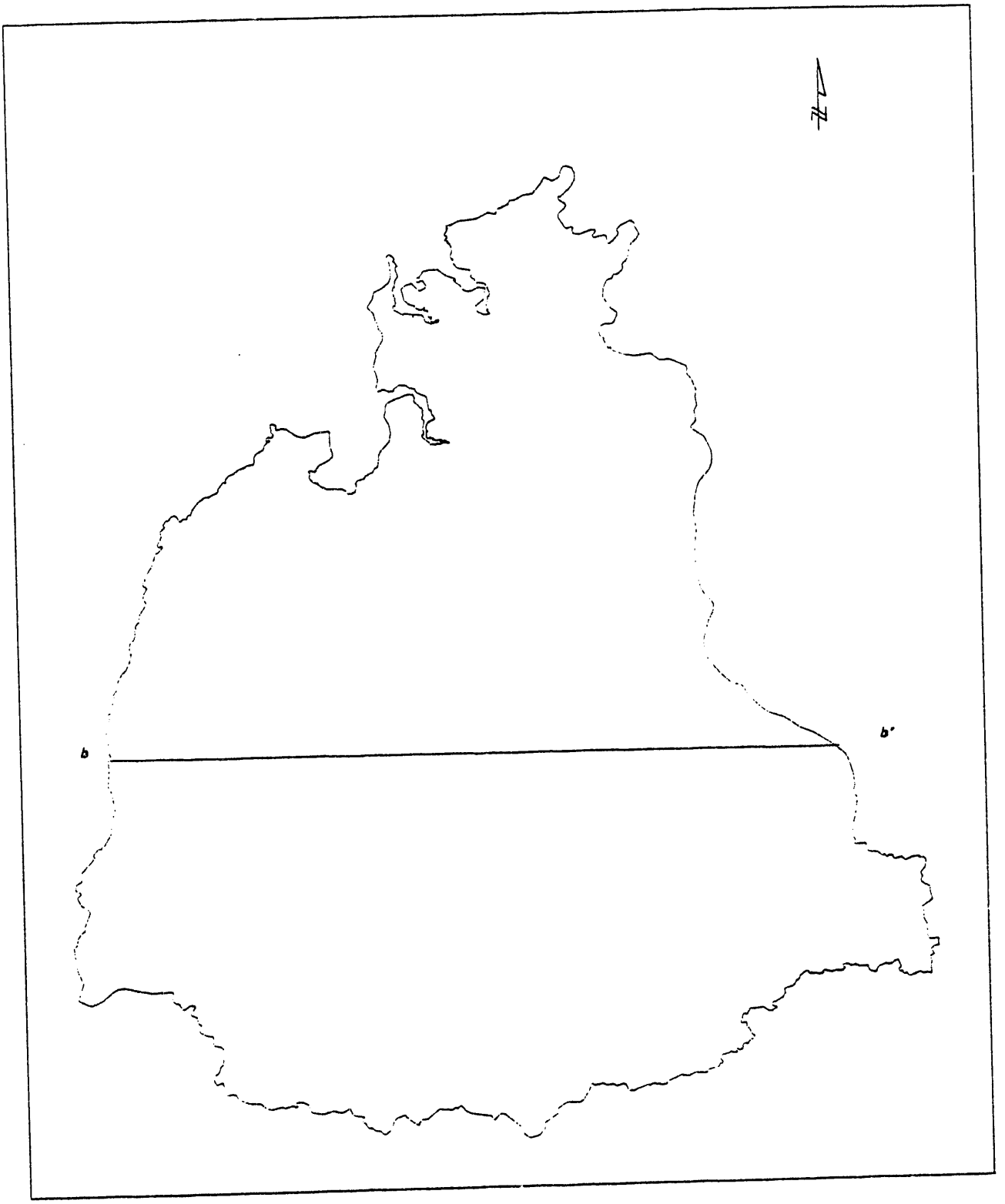
Pacific Northwest Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

Model inputs

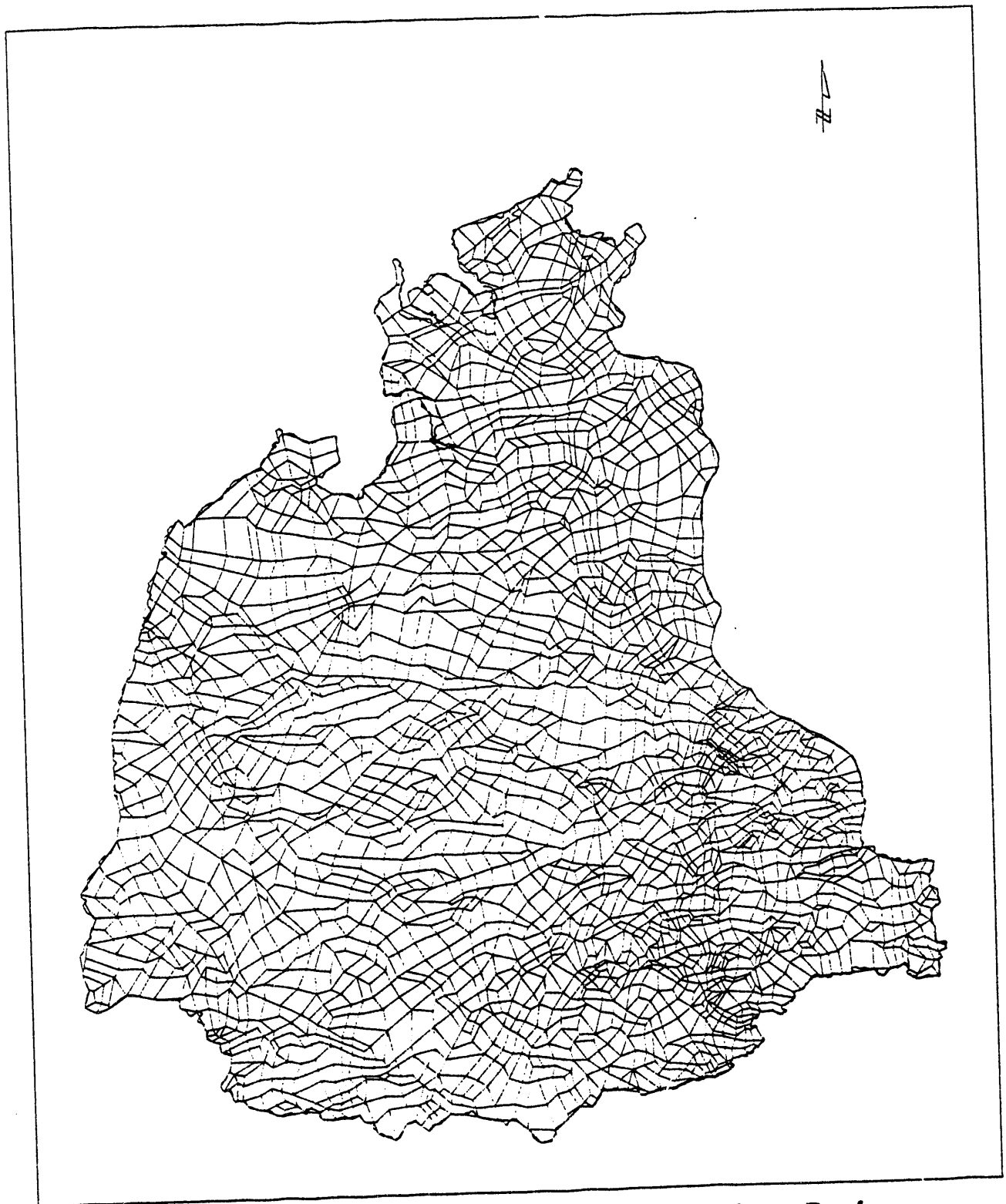
- Cross section of basin showing layering for 3-dimensional model
- Map showing location of cross section
- Finite-element grid
- Transmissivity zones (m^2/s)
- Recharge zones (mm/yr)

Cross section b-b' for the West Siberian Basin

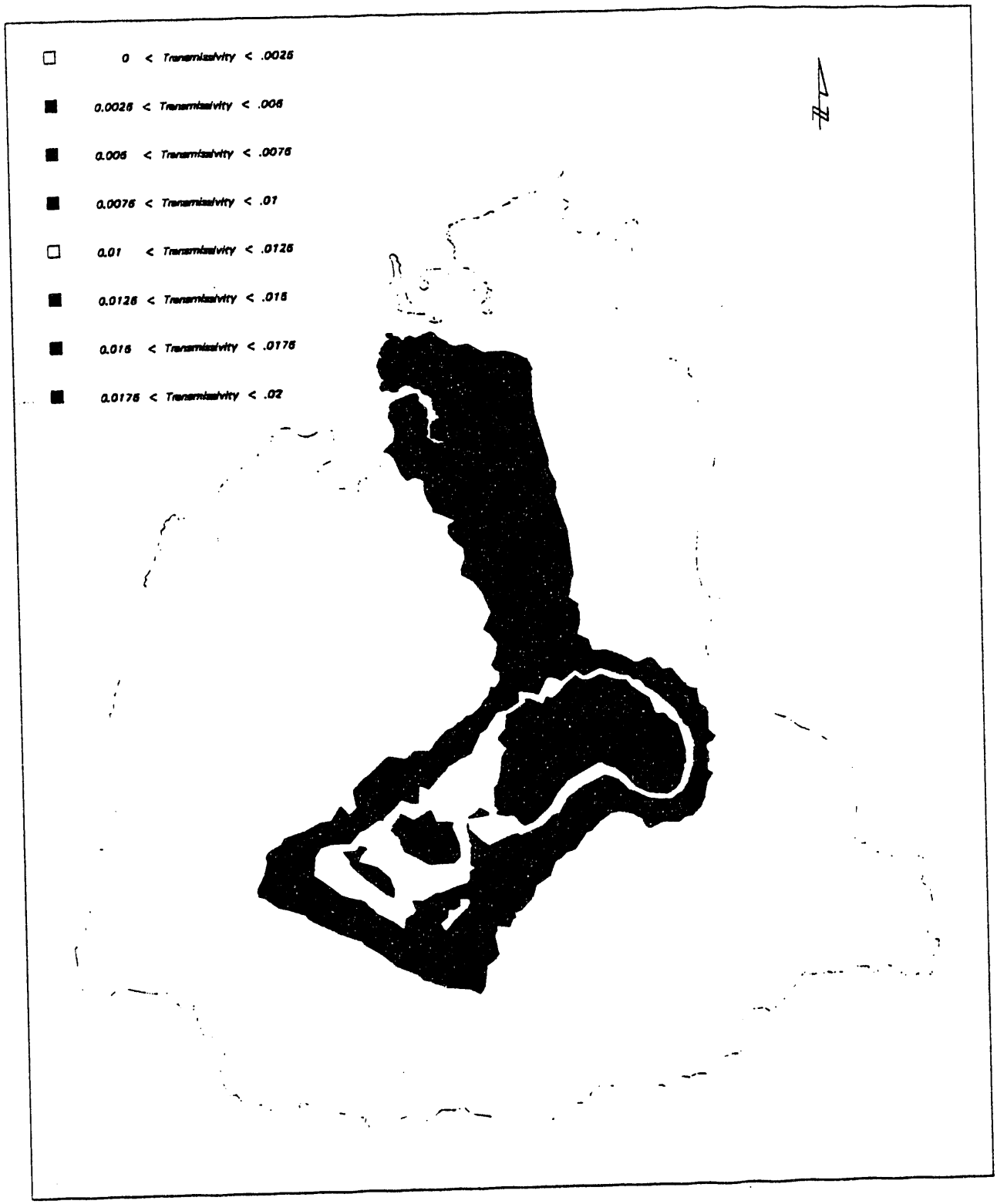


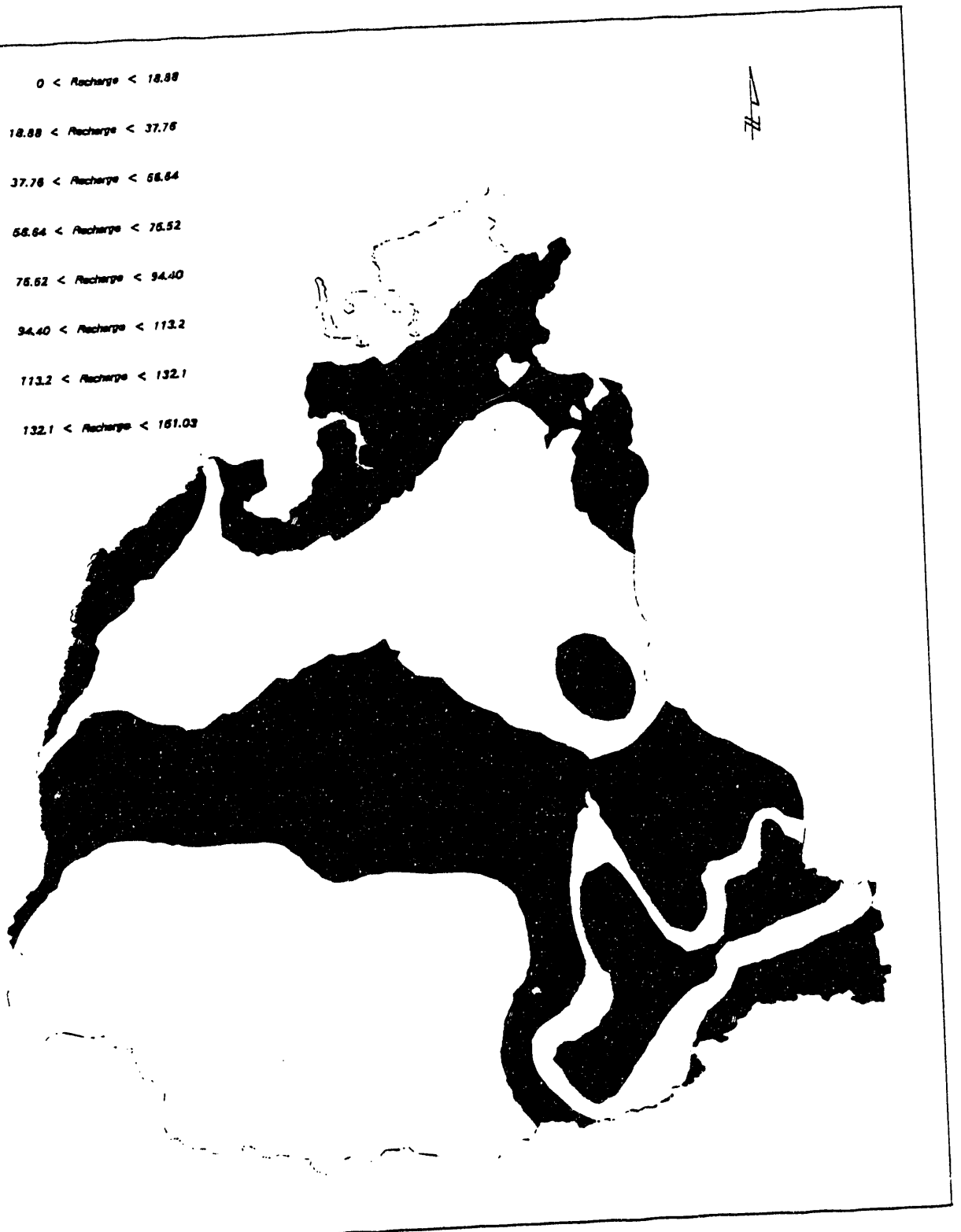


Location of Cross section b-b'



Finite Element Grid for the West Siberian Basin


0 < Transmissivity < .0025
0.0025 < Transmissivity < .005
0.005 < Transmissivity < .0075
0.0075 < Transmissivity < .01
0.01 < Transmissivity < .0125
0.0125 < Transmissivity < .015
0.015 < Transmissivity < .0175
0.0175 < Transmissivity < .02
N


0 < Recharge < 18.88
18.88 < Recharge < 37.76
37.76 < Recharge < 56.64
56.64 < Recharge < 75.52
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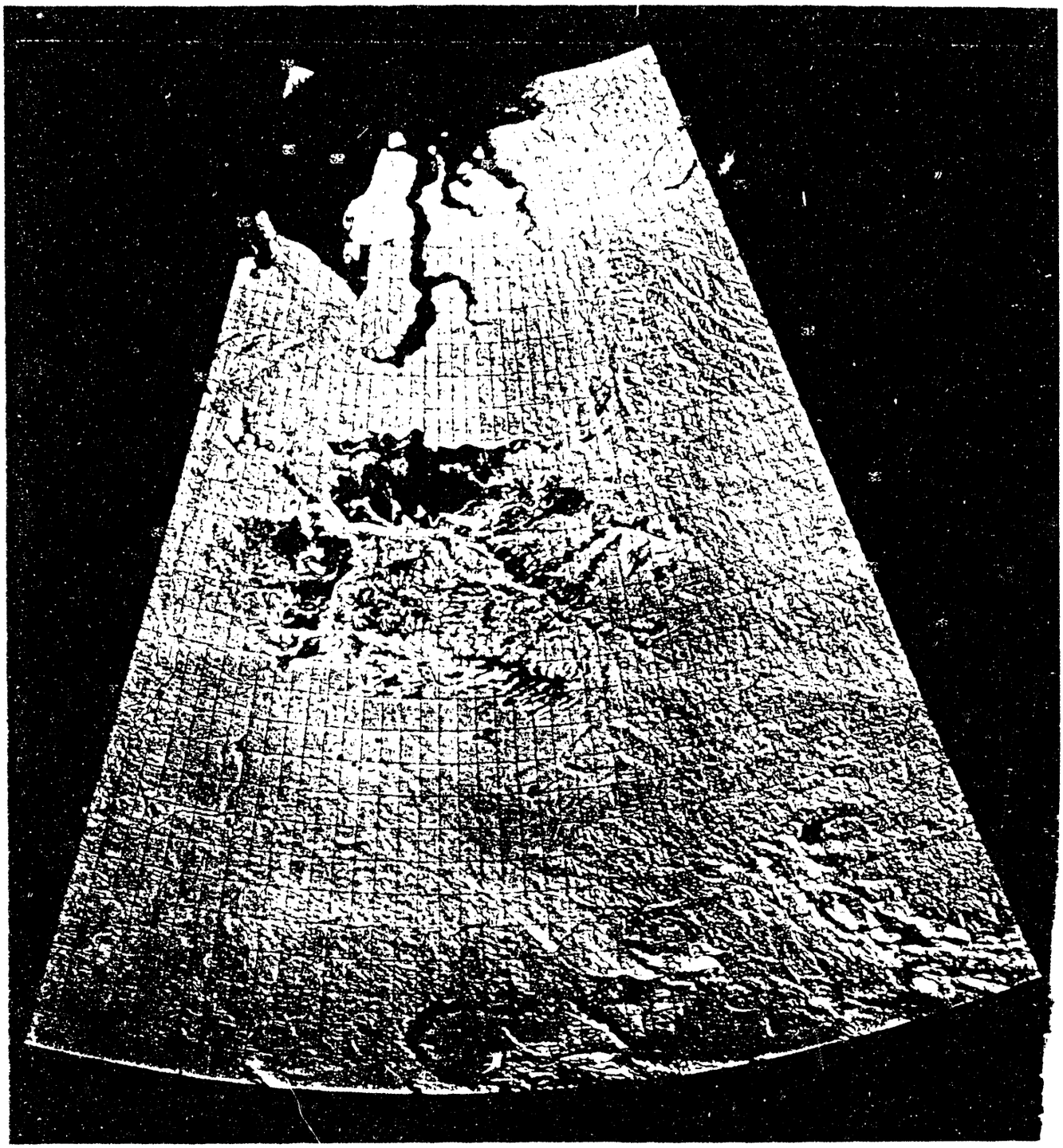
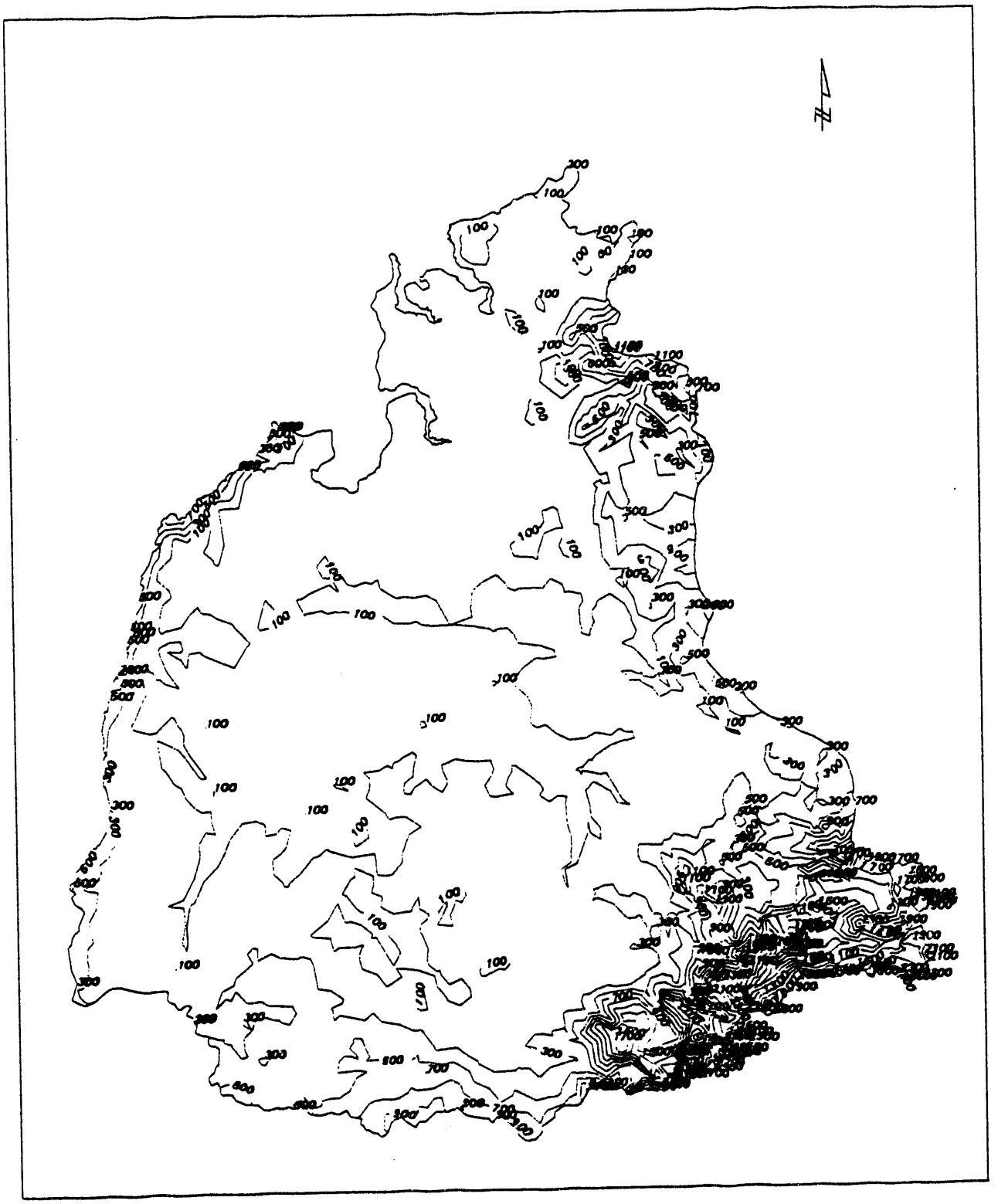
94.40 < Recharge < 113.2
113.2 < Recharge < 132.1
132.1 < Recharge < 151.03





CALCULATED WATER-TABLE
CONTOUR INTERVAL = 200 m

DATE
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9/16/93

END