UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

May 10, 1993

MEMORANDUM

SUBJECT: Wind Field Development for the Urban Airshed Model (UAM)

FROM: Royan W. Teter
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TO: Ellen Baldridge (MD-14)
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Model Clearinghouse

The attached document is a proposed amendment to the St. Louis photochemical modeling protocol. The amendment outlines three different approaches for the development of the appropriate wind fields for the St. Louis UAM application. Method three involves a departure from EPA guidance. Please evaluate the acceptability of such an approach and provide a response as soon as possible so that work can proceed.

Should you have any questions or care to discuss this matter in further detail, I can be reached at (913) 551-7609.

Attachment

RECYCLE
PAPER CONTAINS RECYCLED FIBERS

Comparison of Wind Fields from the Diagnostic Wind Model Using Three Different Sets of Input

March 15, 1993

The USEPA recommends two different techniques for developing wind fields for use in photochemical modeling in the "User's Guide for the Urban Airshed Model" (EPA-450/4-90-007). The first technique is to use actual surface wind speed and direction observations to drive the Diagnostic Wind Model (DWM) wind field calculations. This technique can be incorporated with a domain mean flow field that takes into account any terrain induced variations. The second technique involves using coarse grid wind fields produced by the Regional Oxidant Model (ROM) and interpolating them to the 5 x 5 km grid using the IWIND preprocessor within the UAM system.

It is not clear which method will be able to capture the true flow features. The DWM makes better use of the available measurements, but these measurements are largely limited to the urbanized area. The ROM derived data may be more suitable for these data-sparse regions. For this reason, three different techniques are suggested to produce wind fields for the St. Louis UAM modeling domain. They are:

1) Use only state monitoring sites, National Weather Service, FAA, military, and industry meteorological data along with National Weather Service upper air measurements to generate gridded wind fields using DWM (see Figures A and B).

2) Use only ROM -derived meteorological data to create gridded wind fields using IWIND.

3) Use all measured data from technique #1 plus incorporate psuedo-stations in data sparse areas of the modeling domain using ROM-derived winds as input to DWM.

An approach for implementing method #3 could be to use psuedo-stations at every other grid cell on the domain boundaries as well as for any DWM grid cell that is more than 20 kilometers from a real meteorological monitoring station. More than one approach of this hybrid variety could be produced.

All wind fields that are produced will be evaluated using both statistical and graphical techniques: The first evaluation should be done using software that allows vector plots and streamline plots of the wind fields. This analysis allows for visual analysis and verification that the wind fields are consistent throughout the region. The second analysis would employ a set of statistical tests for the gridded data produced by each of the three methods. In this manner, the method or combination of methods that produce the most representative wind fields will be identified.

SL:bj/65-44

Figure A. Locations of Surface Meteorological Sites to be used in the Diagnostic Wind Model that are within the Modeling Domain

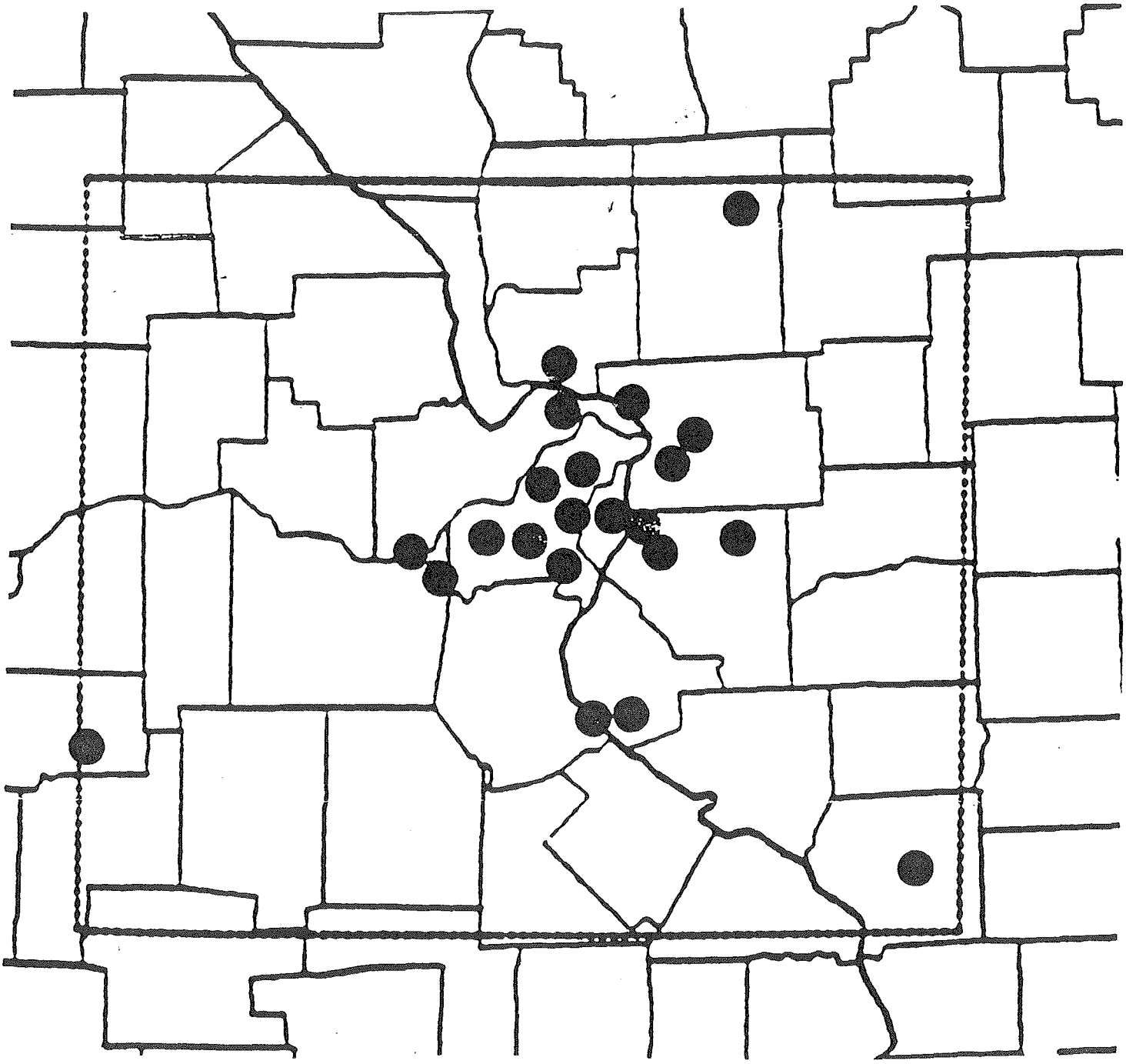
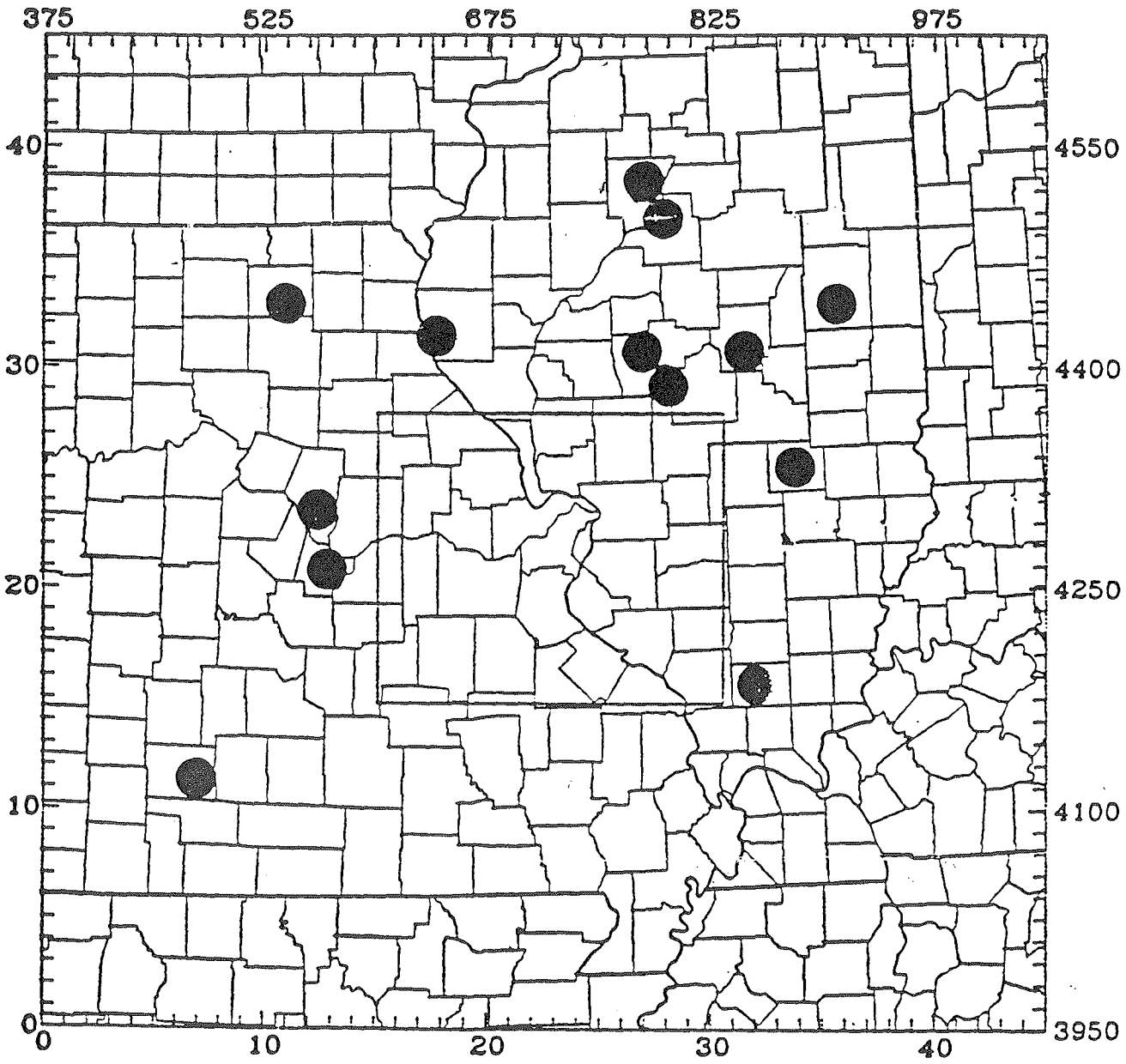
Figure B. Locations of Surface Meteorological Sites to be used in the Diagnostic Wind Model that are outside the Modeling Domain