UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

JUN - 9 1993

MEMORAMDUM

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

FROM: Ellen Baldridge, Computer Specialist
Model Application Section, SRAB, TSD (MD-14)

TO: Royan W. Teter, Environmental Engineer
Air Planning and Development Section, Region VII

In response to your request the Model Clearinghouse has reviewed your position regarding three different approaches for the development of appropriate wind fields for the St. Louis UAM application in support of the State implementation plan (SIP) attainment demonstration. All three methods are consistent with the Environmental Protection Agency guidance, "Guideline for Regulatory Application of the Urban Airshed Model, EPA-450/4-91-0013." Section 3.5.1 recommendations state:

> "The Regional Oxidant Model (ROM)/UAM Interface System should be used to derive the UAM gridded wind fields when the UAM domain is nested within a ROM domain for concurrent time periods and ROM predictions are used to derive the hourly UAM boundary conditions. If it is judged by the Technical Committee (and identified in the protocol) that a wind field derived from the UAM Diagnostic Wind Model (DWM) is more representative of the domain-scale flow, then this wind field may be used in lieu of the ROM diagnostic wind field. To minimize mass inconsistency problems, the ROM gridded winds may be used as the initial wind field in the DWM when generating the UAM gridded wind field."

Your proposal of developing the method or combination of methods that produce the most representative wind fields is consistent with the guidance. We concur with your request to amend the St. Louis photochemical modeling protocol. It is strongly recommended that you obtain sufficient documentation of the method derived for interfacing the ROM gridded wind field to

6/4/93 - 6/8/93

CONCURRENCES

SYMBOL	MAS	MAS	SRAB	SRAB				
NAME	KWB	NCP	D. Wilson	Tikvart				
DATE	6/3/93	6/4/93	6/7/93	6/8/93				

EPA Form 1320-1 (12-70)

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the DWM. The methodology used and the results should be thoroughly documented for your review of the SIP attainment demonstration.

If you have any questions, please contact me at (919) 541-5684.

cc: D. Grano, MD-15
T. Helms, MD-15
N. Meyer, MD-14
R. Scheffe, MD-14
J. Tikvart, MD-14
D. Wilson, MD-14

bcc: Regional Modeling and Ozone Modeling Contacts, Regions I-VI & VIII-X (with copy of incoming memorandum and list of FY-93 Clearinghouse memoranda)

OAQPS:TSD:SRAB:MAS:ELBALDRIDGE:cbaines:x5690:MD-14:June 3, 1993:
File:_____: Disk f: typing.eb\royanclr.uam

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
Environmental Engineer
Air Planning and Development Section—Region VII

TO: Ellen Baldridge (MD-14)
Ozone Modeling Contact
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

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

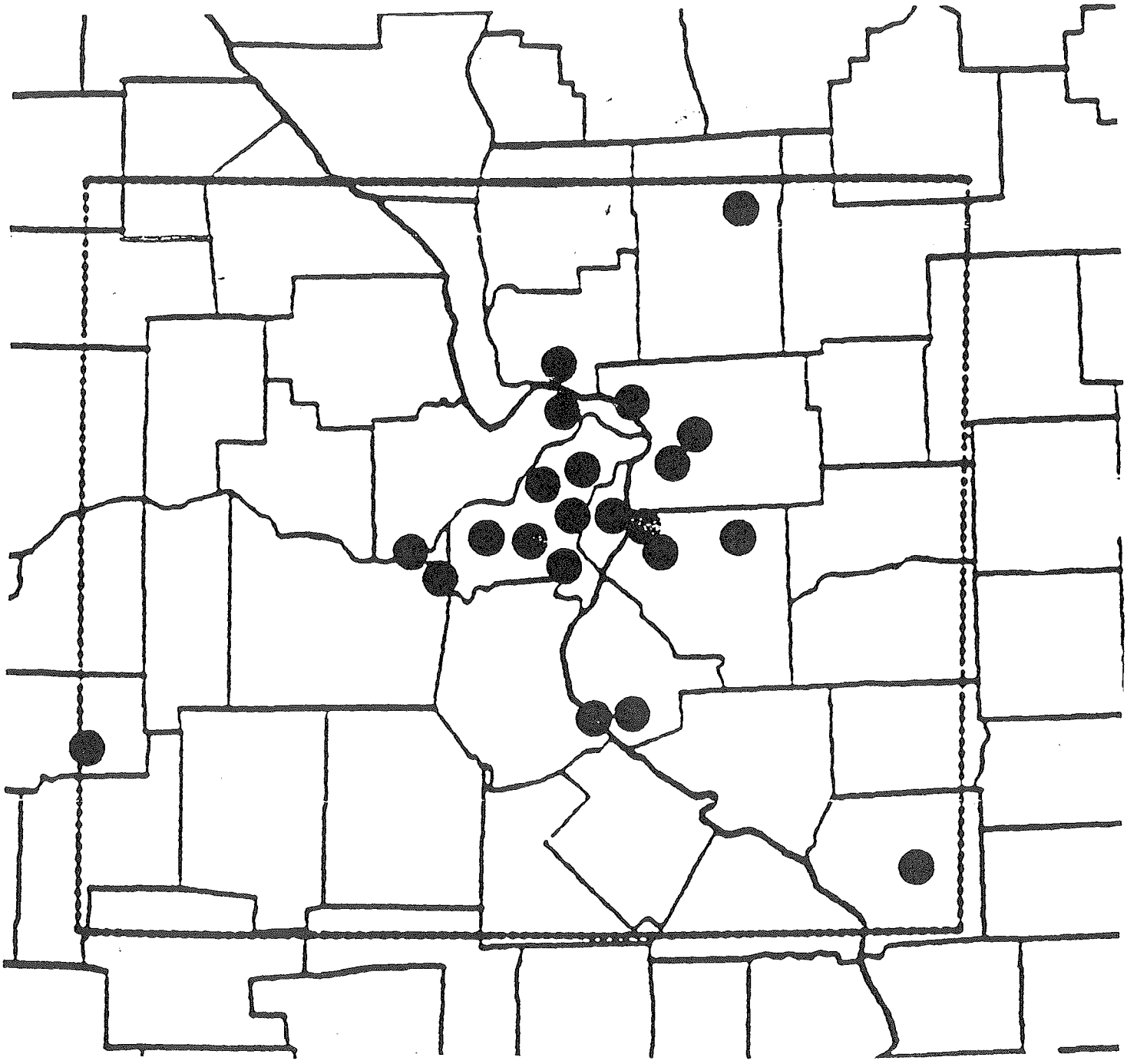
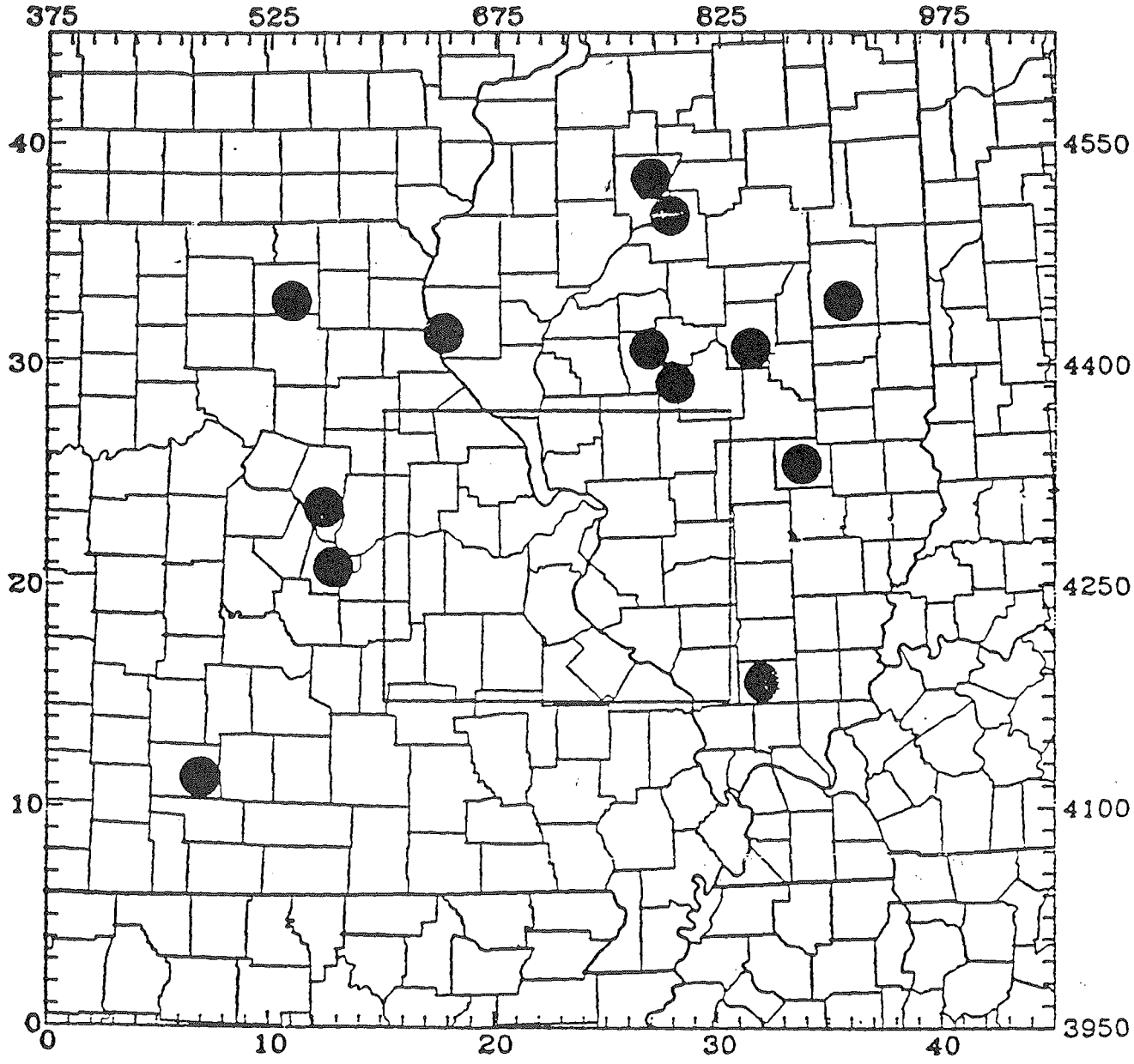


Figure B. Locations of Surface Meteorological Sites to be used in the Diagnostic Wind Model that are outside the Modeling Domain



FY-93 MODEL CLEARINGHOUSE MEMORANDA

Date	Region	Subject
10/7/92	IV	Response to Proposal to Allow Credit for a Stack Height Increase at the Dade County Resource Recovery Facility, Dade County, Florida
10/28/92	V	Demonstrating Attainment of the Ozone National Ambient Air Quality Standards (NAAQS) with the Urban Airshed Model (UAM) for Detroit
10/28/92	VII	Demonstrating Attainment of the Ozone National Ambient Air Quality Standards (NAAQS) with the Urban Airshed Model (UAM) for St. Louis
10/28/92	IV	Attainment Demonstrations using the Empirical Kinetics Modeling Approach (EKMA)
11/5/92	I	Proposal to Use ISCRDT to Model Intermediate Terrain (Boise Cascade, Rumford, Maine)
11/12/92	VIII	Denver PM-10 State Implementation Plan (SIP) Modeling Issues
12/10/92	V	Proposal for Resolving Part D Sulfur Dioxide State Implementation Plan Revision for Rhinelander, Wisconsin
12/15/92	IV	The Ozone Attainment Test in the State Implementation Plan (SIP) Modeling Demonstrations
2/18/93	II	AES Guayama, Puerta Rico Proposal to Use the Rough Terrain Dispersion Model with Off-Site Meteorological Data
2/22/93	VIII	Carbon Monoxide State Implementation Plan Attainment Demonstrations
2/23/93	II	AES Guayama, Puerta Rico Proposal to Use the Rough Terrain Dispersion Model with Off-Site Meteorological Data

FY-93 MODEL CLEARINGHOUSE MEMORANDA (Cont'd)

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3/2/93	VIII	E. Helena Lead SIP Attainment Demonstration
3/30/93	V	Nonmethane Organic Compound (NMOC) and Nitrogen Oxides (NO_x) Monitoring Required for the Empirical Kinetics Modeling Approach (EKMA) for Nonattainment Areas in Ohio
4/5/93	V	Nonmethane Organic Compounds (NMOC) and Nitrogen Oxides (NOx) Monitoring Required for the Empirical Kinetics Modeling Approach (EKMA) for Nonattainment Areas in Ohio
5/18/93	VI	Technical Comparison Document--Phelps Dodge Smelter
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