EMERGENCY MANAGEMENT ROUNDUP

EXPECT THE UNEXPECTED

DUSTRAN—A GIS-based Dispersion Modeling System

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EMERGENCY MANAGEMENT ISSUES

DUSTRAN Development Background

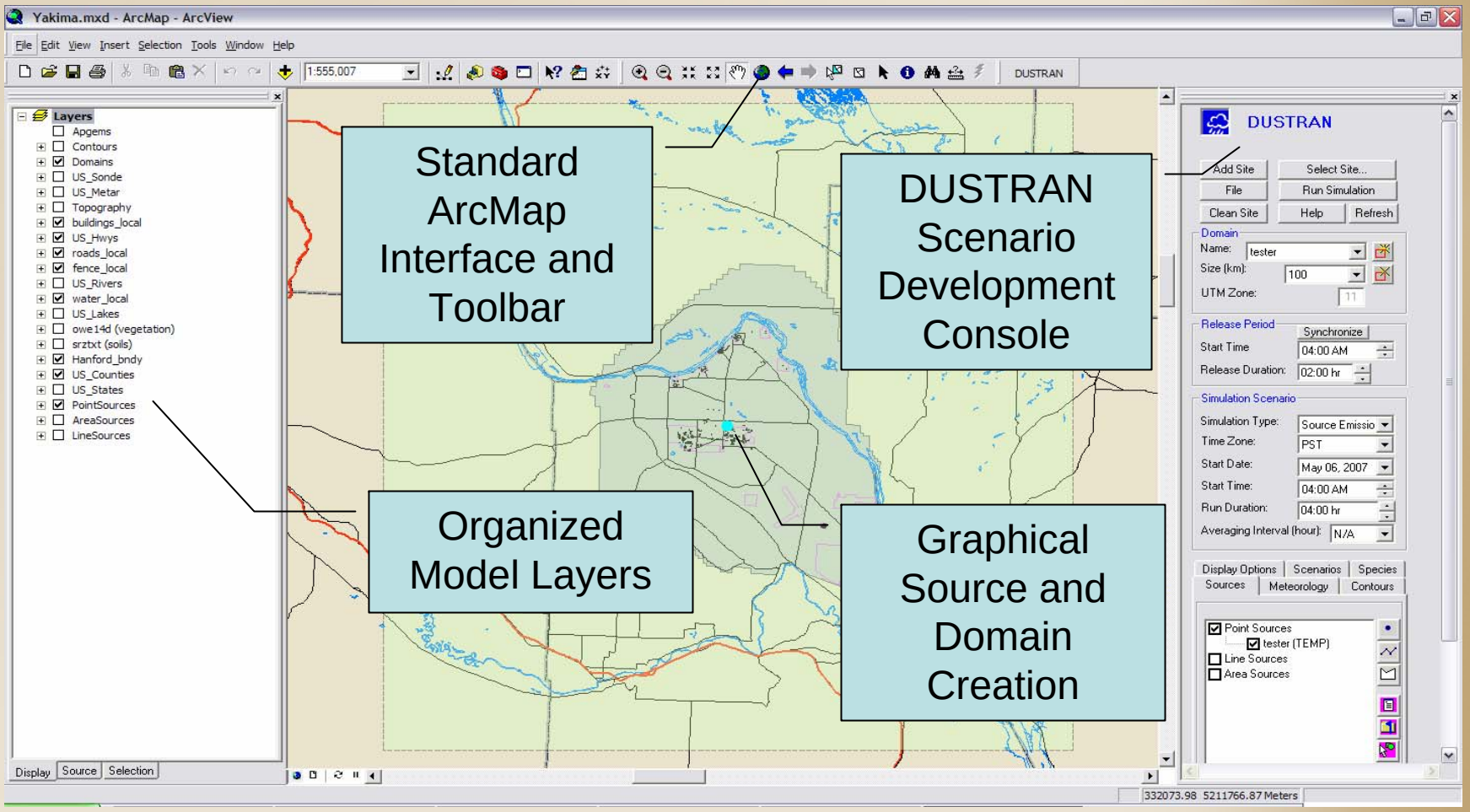
- A multi-year research project that started in January 2001.
- Purpose was to develop a fully-tested and documented atmospheric dispersion modeling system to assist the U.S. Department of Defense in addressing particulate air quality issues at military training/testing ranges.
- Result: DUSTRAN—DUST TRANsport
- Investigators and contributors:

  Jerry Allwine (Lead), Elaine Chapman, Brad Fritz, Bonnie Hoopes, Jeremy Rishel, Fred Rutz, Will Shaw, Tim Seiple

DUSTRAN Components

- The basic approach in formulating DUSTRAN was to construct the system from widely-used, industry-standard components:
  - Graphical User Interface (GUI): ArcMap GIS (Version 9.x)
  - Dispersion Models:
    - CALPUFF (Scire et al. 2000a)—EPA regulatory Lagrangian puff dispersion model
    - CALGRID (Scire et al. 1989)—widely used Eulerian dispersion model
  - Meteorological Model:
    - CALMET (Scire et al. 2000b)—diagnostic meteorological model that uses surface and upper-air observations to construct 3-D fields
- Emissions Model (source-term specification):
  - Currently, DUSTRAN includes dust emission modules for creating source-term factors from both wind-blown dust generation and wheeled military vehicle activities.
  - DUSTRAN's componentized architecture lends to the development and integration of other source-term models, including source-terms for emergency response.

DUSTRAN Interface:



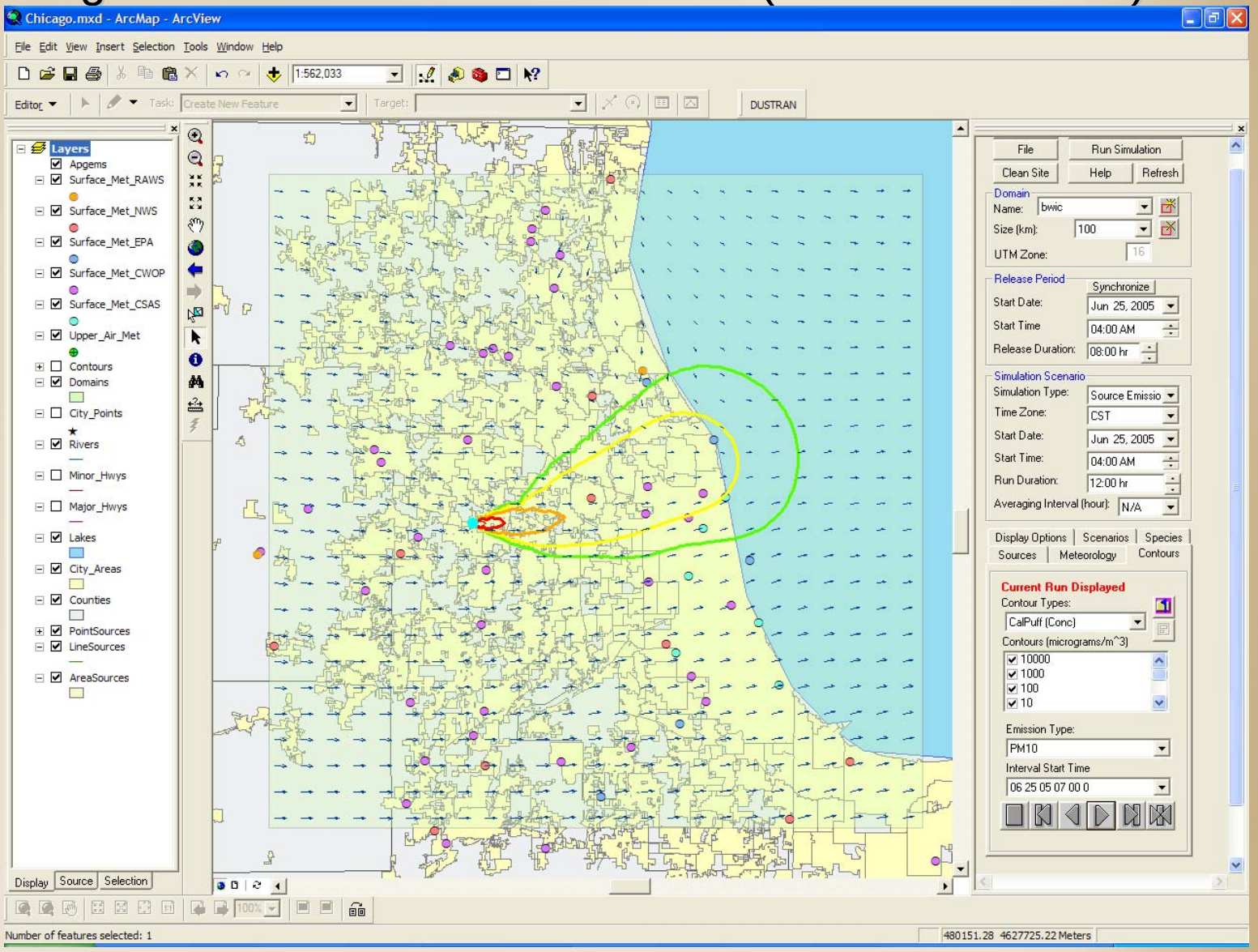
DUSTRAN Scenario Development:

- Intuitive model interfaces allows for quick scenario development:
  - Select site (created from *Add Site* utility…more on this later)
  - Graphically create:
    - Model domain (20-400 km)
    - Source types:
      - Point
      - Area
      - Line
  - Enter simulation, release, and averaging time information through descriptive text and list-box entries.

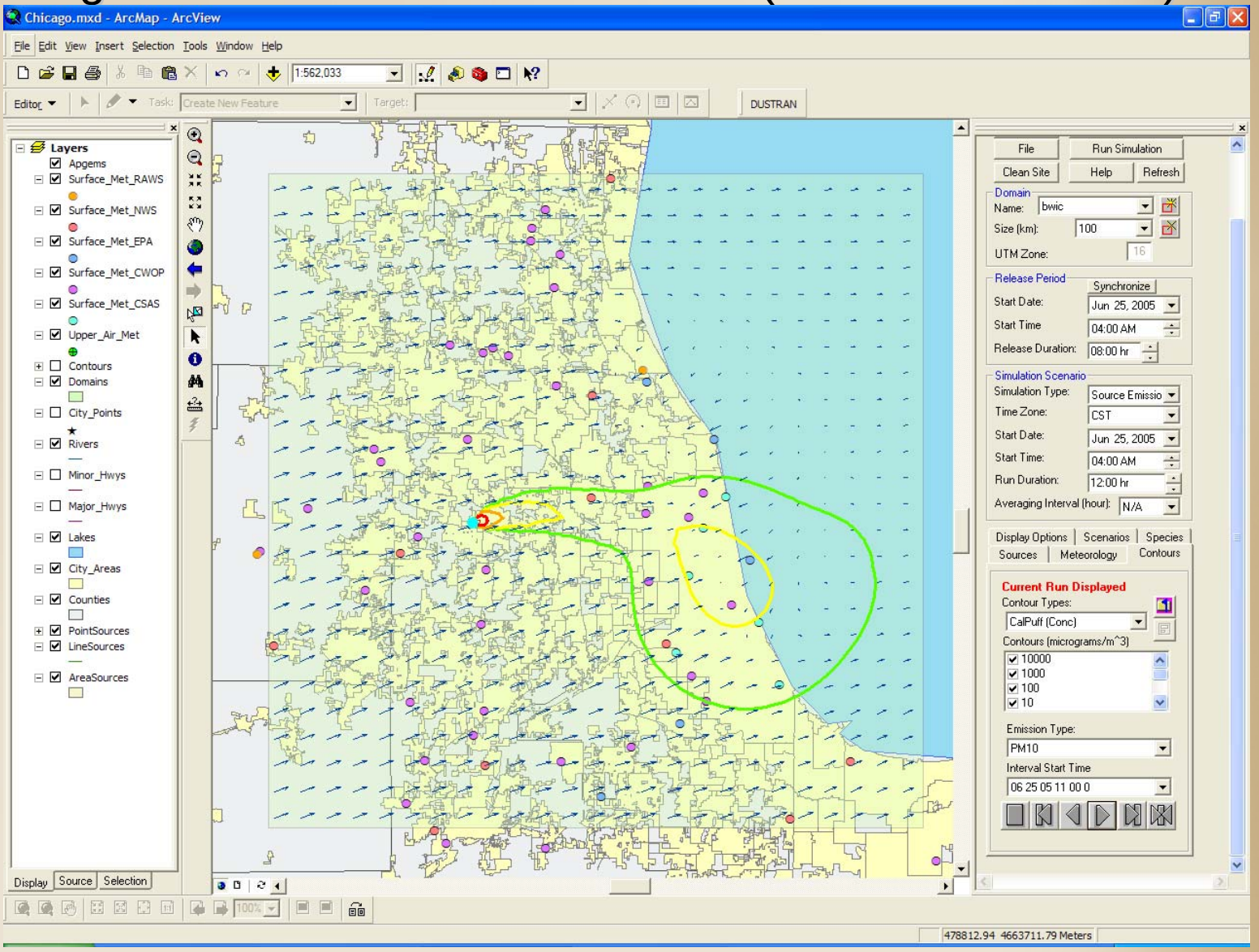
Sample DUSTRAN Simulation:

- Lake Breeze Event: Chicago IL, June 25, 2005 (7:00 a.m.-6:00 p.m. CST).
- Complex wind pattern develops as lake breeze moves inland throughout mid-morning to early evening.
- DUSTRAN is able to capture and simulate the spatial variability of the wind-field and its affect on a material release.

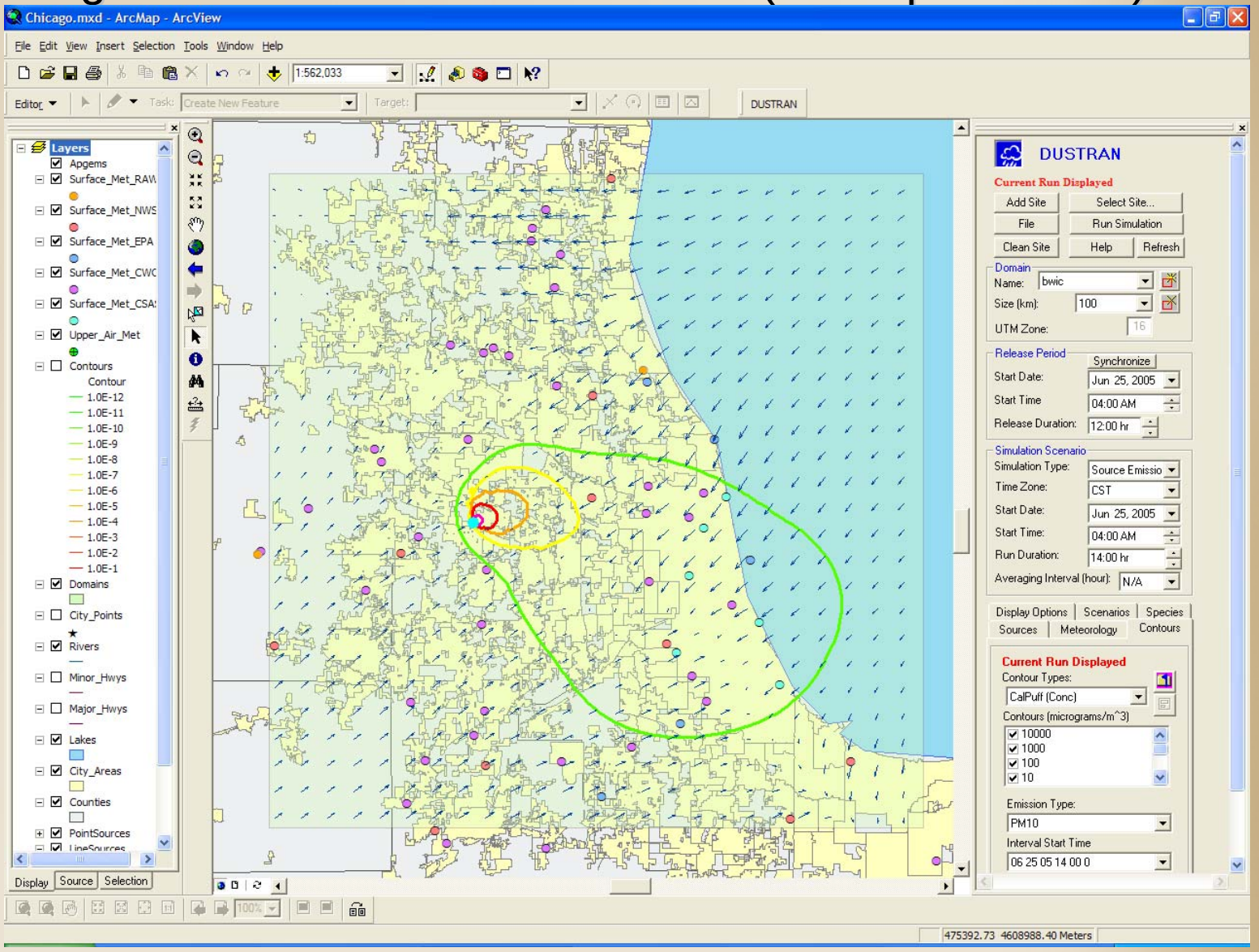
Chicago Lake Breeze: 06/05/05 (7:00 a.m. LST):



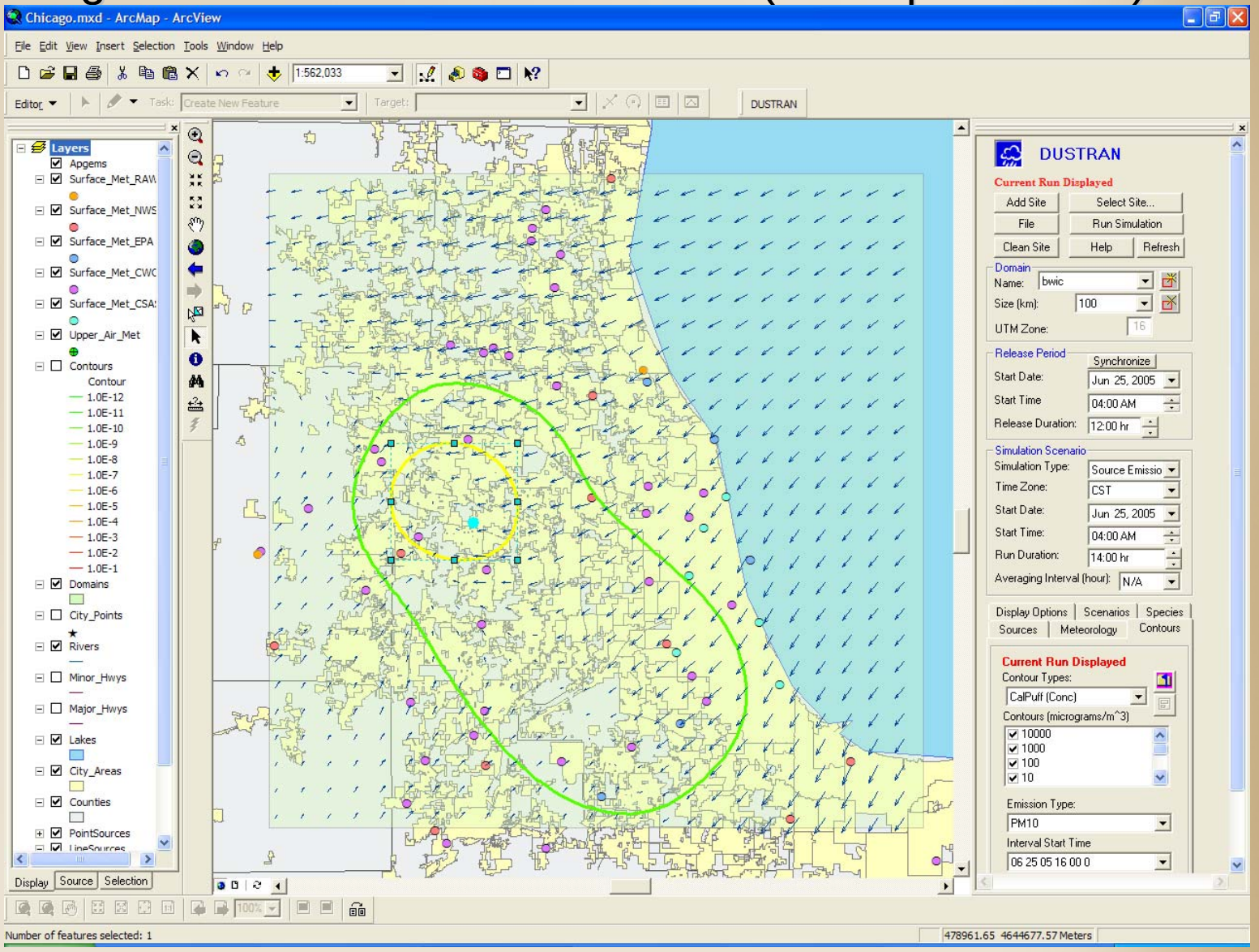
Chicago Lake Breeze: 06/05/05 (11:00 a.m. LST):



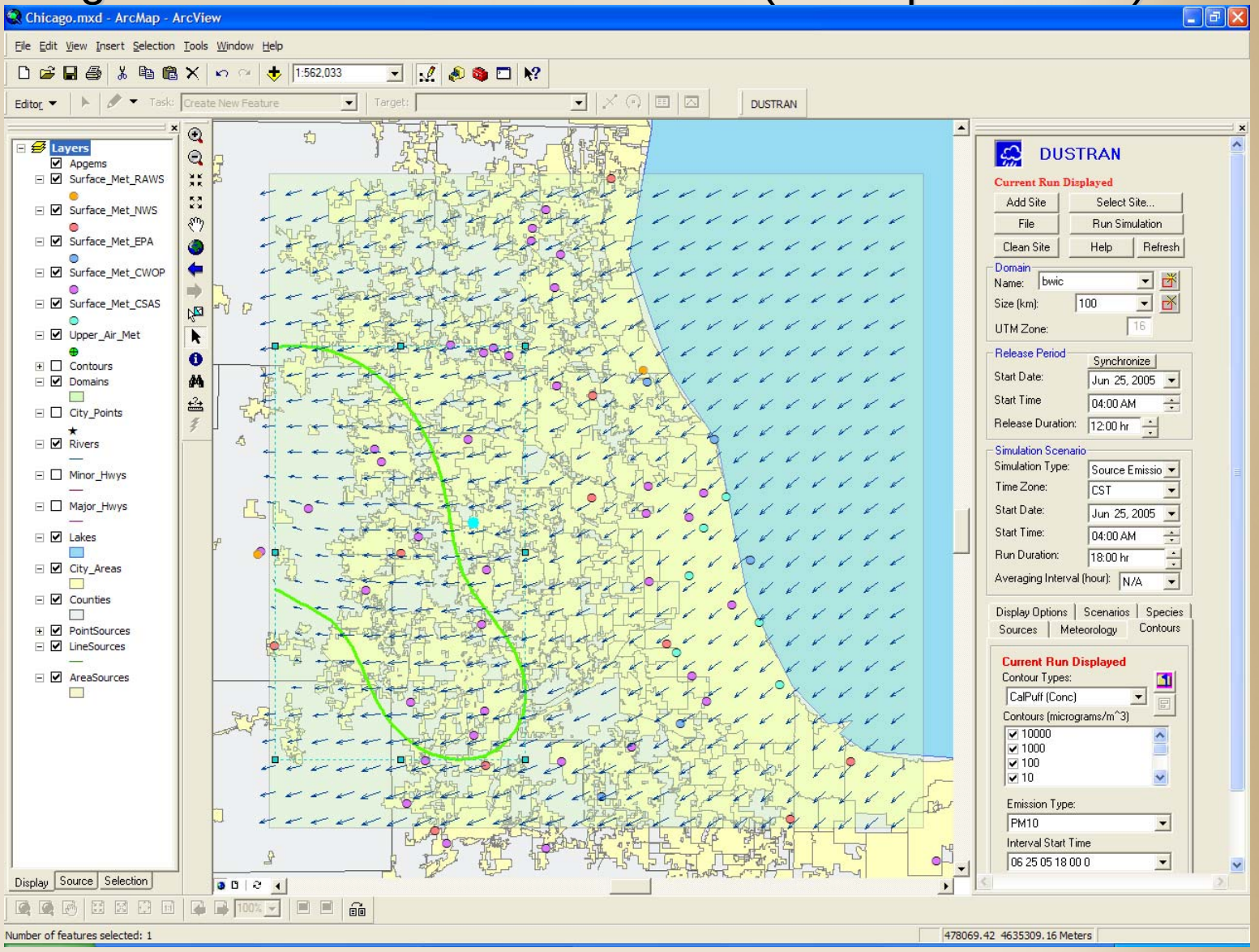
Chicago Lake Breeze: 06/05/05 (2:00 p.m. LST):



Chicago Lake Breeze: 06/05/05 (4:00 p.m. LST):



Chicago Lake Breeze: 06/05/05 (6:00 p.m. LST):



Other DUSTRAN Productivity Tools:

- *Add-Site Utility*: companion tool that allows for the creation of a model-ready site, including all standard GIS layers, for direct use in a DUSTRAN simulation.
- *Met-Archiver*: archives meteorological observations from the National Weather Service (NWS) and NOAA's MADIS archiving system. Archived data is available for direct use in a DUSTRAN simulation.

Future DUSTRAN Development:

- A possible name change…since DUSTRAN is extensible to modeling other source types and scenarios.
- Incorporation of the recently-released sub-hourly CALPUFF/CALMET models.
- A website which describes the modeling system in greater detail and how to obtain the software.

Questions?

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