Eastman SO2 NAAQS: Situation and Proposed Approach

Presented at EPA 10th Conference on Air Quality Modeling

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March 15, 2012

SO2 Attainment Status

- New 1-hour SO2 NAAQS of 75 ppb (196 ug/m3)
- June 3, 2011 – TDEC recommends Sullivan County to be designated non-attainment
- Based on SO2 monitor with design value of 196 ppb (2009-2011)

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Eastman Powerhouses

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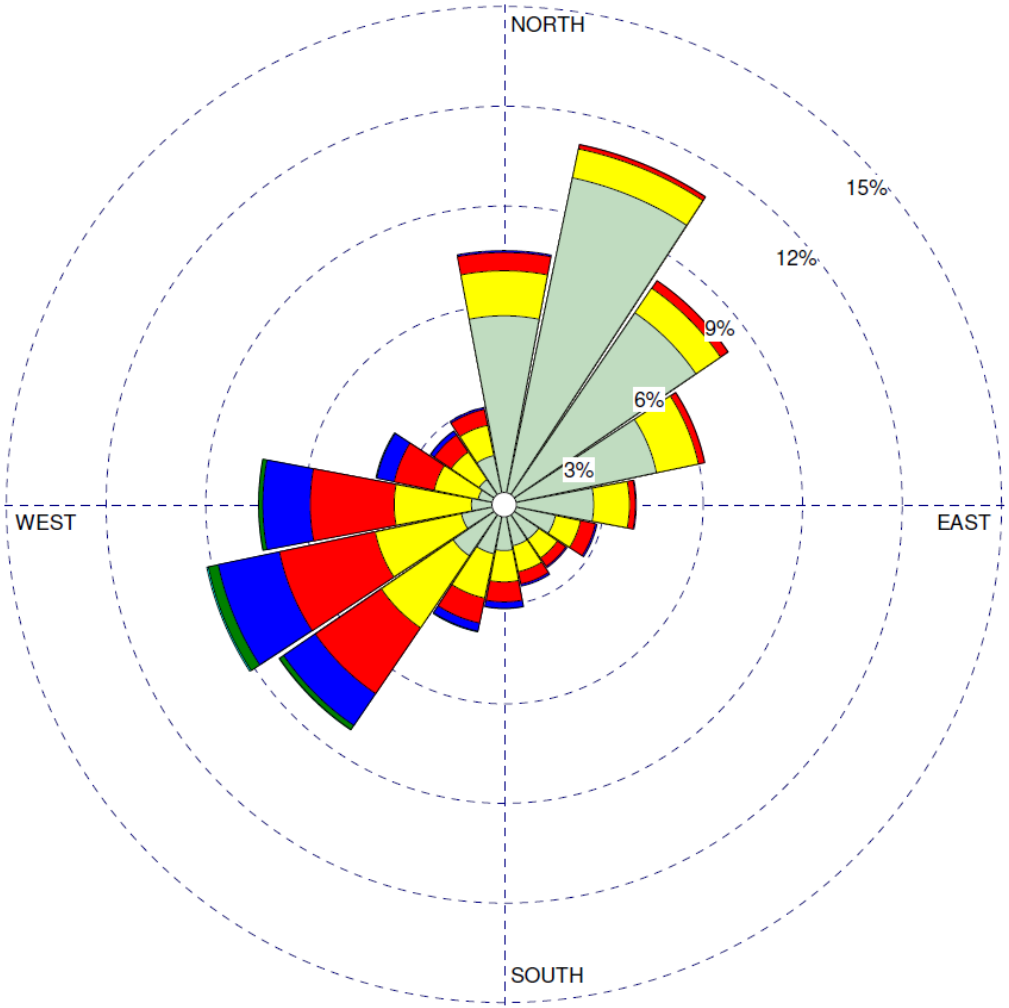
Project Setting
Kingsport, Tennessee
Eastman El - 1210
Tri-Cities Airport - El 1510
Image © 2012 Commonwealth of Virginia

WIND ROSE PLOT:

2005-2009 Wind Rose for Eastman Chemical
Bristol-TriCity Airport, TN Winds

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(Knots)

- >= 22
- 17 - 21
- 11 - 17
- 7 - 11
- 4 - 7
- 1 - 4

Calms: 13.93%

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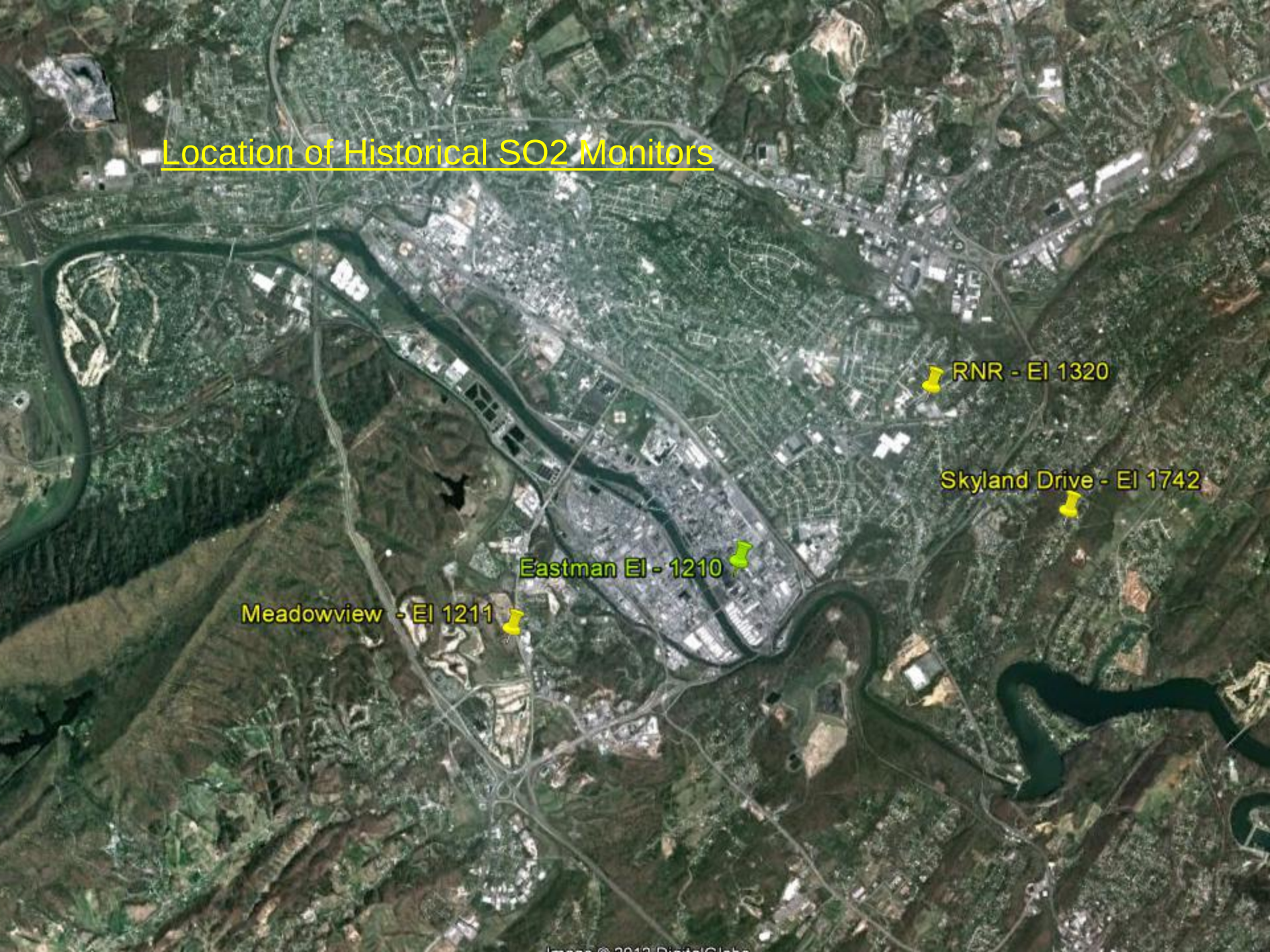
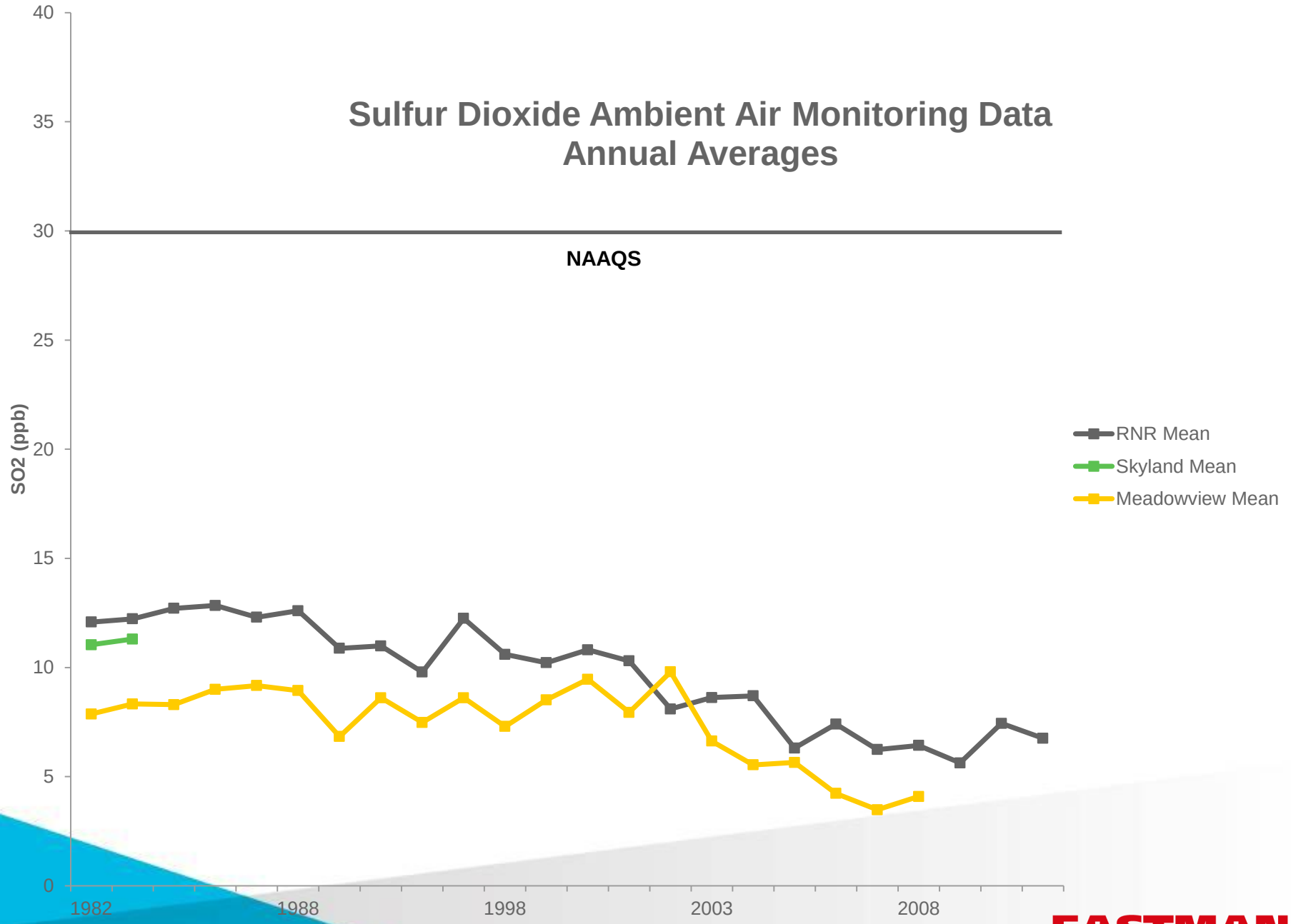
Location of Historical SO2 Monitors




Sulfur Dioxide Ambient Air Monitoring Data
Annual Averages
NAAQS
SO2 (ppb)
40
35
30
25
20
15
10
5
0
1982
1988
1998
2003
2008
RNR Mean
Skyland Mean
Meadowview Mean

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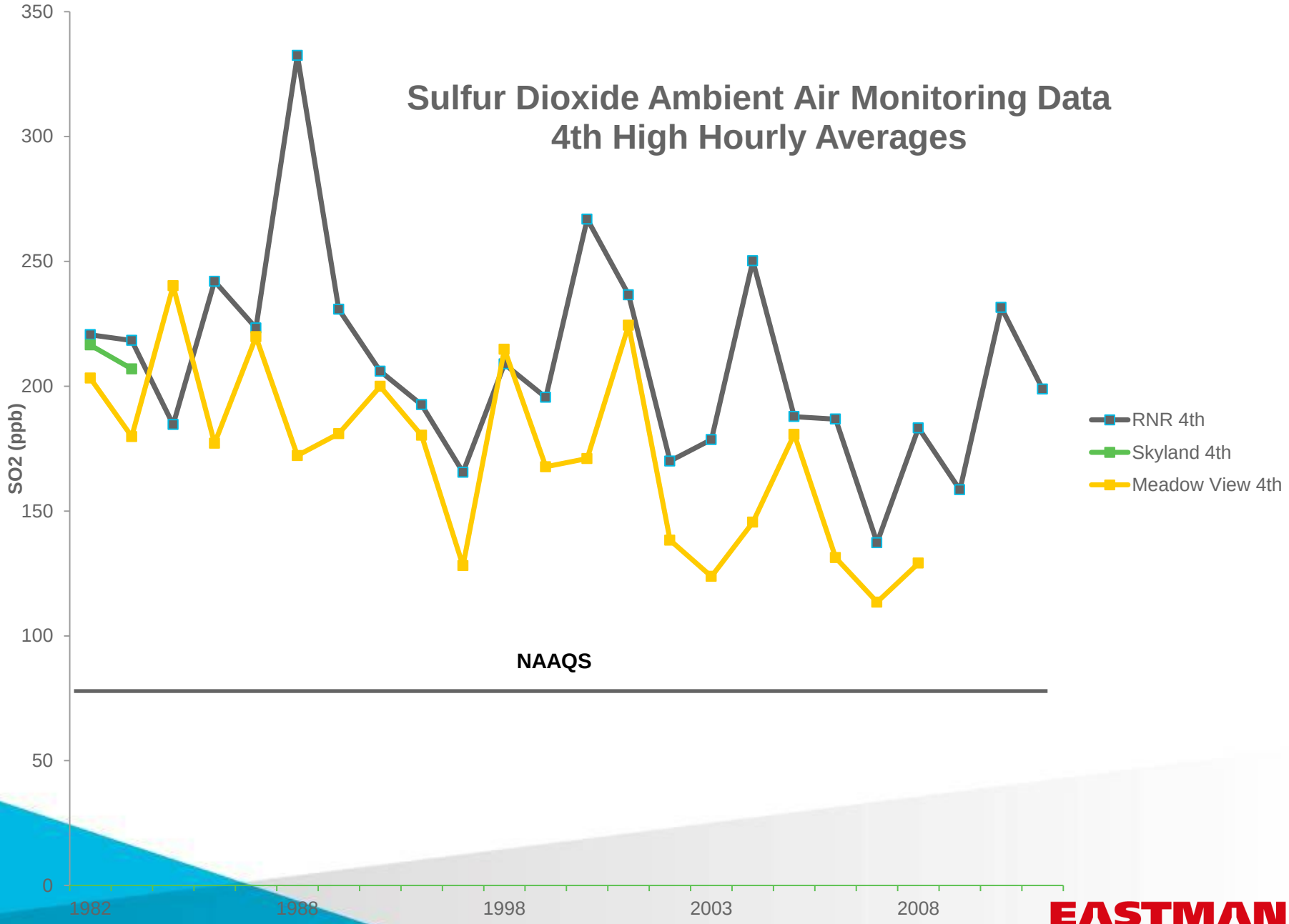
Sulfur Dioxide Ambient Air Monitoring Data
4th High Hourly Averages



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AERMOD Results
Current Case, Airport Data

	Modeled	Monitored
RNR El 1320	~400 ug/m3	~400-500 ug/m3
Skyland El 1742	2,400 ug/m3	~400-500 ug/m3

Base model looks to be ~6X high in complex terrain

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SO2 Control Measures

- Powerhouse BART scrubber project
  - Spray dryer absorber/fabric filter (~90% control)
  - Will reduce Eastman SO2 emissions by ~65 percent
- Anticipate monitored attainment
  - Background SO2 expected to be minor
  - 196 ppb x 0.35 = 69 ppb < 75 ppb
- Question:
  - Will these planned controls be enough to make an attainment demonstration?
  - Common sense and available monitoring data says yes;
  - AERMOD using airport data says no

Eastman Plan for Attainment Demonstration

- Install on-site tall (100m) met tower and co-located SODAR
- Collect one-year of on-site met data
- Collect, in parallel, ambient SO2 data at four sites
  - Downwind valley (“RNR”)
  - Upwind valley (“Meadowview”)
  - Downwind high elevation “hot spot” (“Skyland Drive”)
  - Downwash zone “hot spot”
- Track hourly SO2 emissions
- Evaluate Performance of AERMOD and/or CTDMPlus
- Propose modeling approach using evaluation results as guidance

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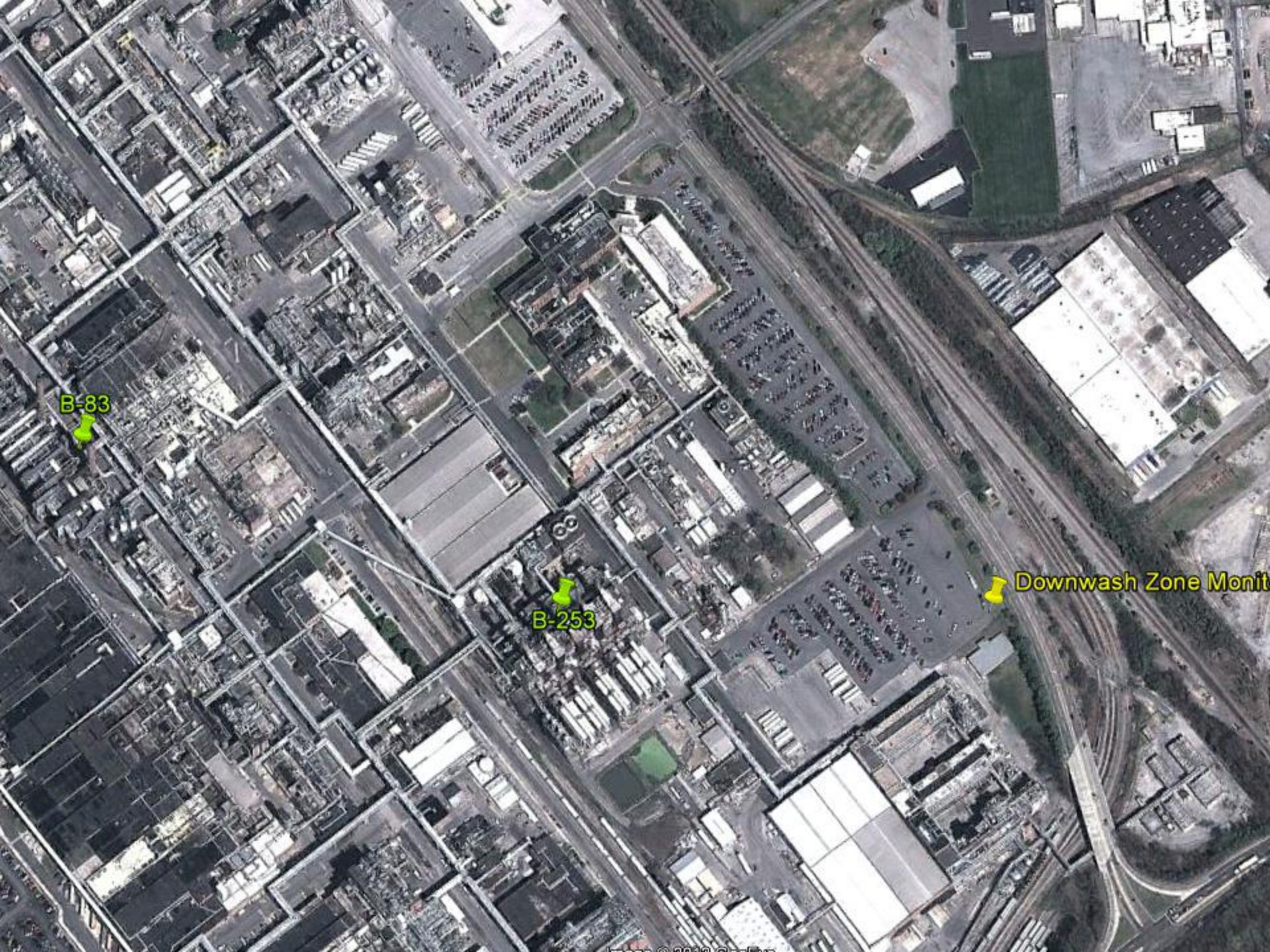
B-83
B-253
Downwash Zone Monit


Met Tower and SO2 Monitor Locations for One Y
RNR - El 1320
Skyland Drive - El 1742
Downwash Zone Monitor - El 1254
Eastman El - 1210
New Met Tower
Meadowview - El 1211
Image © 2012 GeoEye

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View from Top – Looking East

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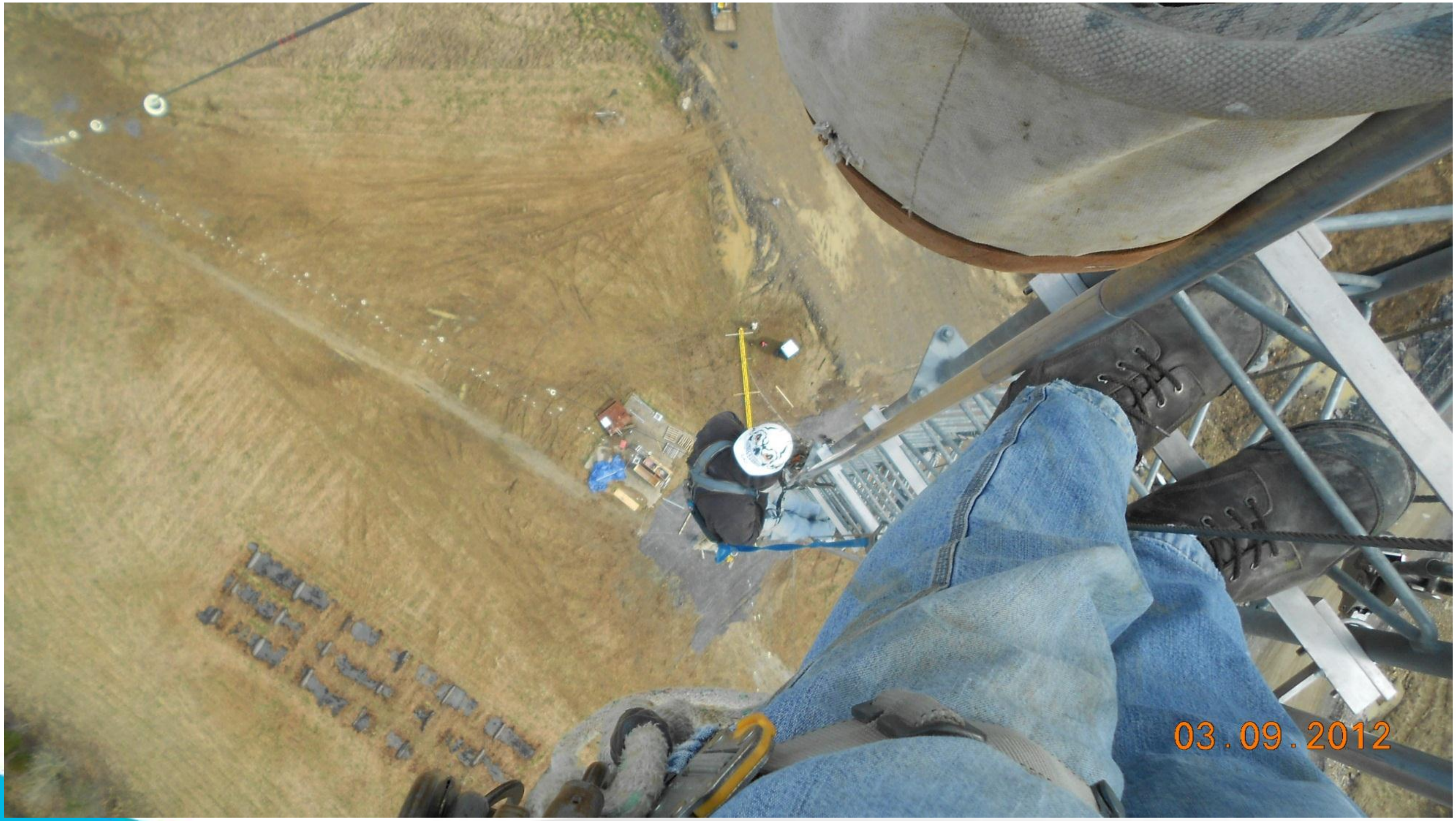
View from Top – Looking Northeast

View from Top, Looking Northwest

View from Top, Looking Southwest

View from Top, Looking South



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Planned SO_2 Monitoring Program

- Would include the four monitors shown in the previous slide:
  - Meadow View (to the west of the plant)
  - Ross N Robinson (to the northeast of the plant)
  - Skyland Drive (in high terrain to the southeast of the plant)
  - Downwash Zone
- These monitors would be used for two purposes:
  - Provide some information for evaluating the accuracy of the modeling approach
  - Provide concurrent hourly regional background information (the lowest monitored value would be assumed to represent hourly regional background)

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Use of Meteorological Data by EPA Models

- AERMOD and CTDMPLUS are guideline dispersion models supported by US EPA
- A key component of the model's ability to accurately predict concentrations in terrain is meteorological data:
  - Vertical temperature difference near stack height – affects plume rise and interaction with terrain features
  - Direct turbulence measurements – affects plume dispersion
- AERMOD is designed to be conservative (but still provide predictions) in the absence of these measurements
- CTDMPLUS requires these measurements to run at all

Design of Meteorological Measurement Program

- Obtain wind measurements to at least 200 meters (supplement a tower with SODAR)
- Obtain temperature difference measurements to the top of a 100-m tower
- Tower wind measurement heights would be 10, 50, and 100 m
- SODAR measurement heights would start at 50 m and use 25-m increments
- Overlap between tower and SODAR at 50 and 100 m would provide continuous SODAR Q/A
- Instruments will meet specifications stipulated in EPA's "Meteorological Monitoring Guidance for Regulatory Modeling Applications" (EPA-454/R-99-005)

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Meteorological Measurement Program (continued)

- Wind measurements would include wind direction, wind speed, sigma-theta (for horizontal wind fluctuation), sigma-w (for vertical wind fluctuation), and sigma-u (alongwind standard deviation for possible roughness calculations)
- Temperature difference would be measured relative to 10 m at 2 m, 50 m, and 100 m
- Surface measurements would also include solar radiation, pressure, and precipitation (for SODAR QA)

Various Uses for the Database

- Combined use of monitoring and modeling to address SO2 NAAQS compliance
- Possible AERMOD evaluation database for both complex terrain and building downwash
- Available for comparison to WRF/MMIF wind and temperature profiles to test accuracy and consequences for use of the mesoscale meteorological data

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