

DNR Draft Proposed 1-hour SO₂ Nonattainment Boundaries for Muscatine, IA

Muscatine County Conservation Board
Environmental Learning Center

March 28, 2013

Jim McGraw
Brad Ashton

Dave Phelps
Sarah Piziali

 **IowaDNR**
The Iowa Department of Natural Resources

 Leading Iowans
in caring for
our natural resources

Overview

- **Welcome and Introductions**
- **National Ambient Air Quality Standards**
- **Clean Air Act Requirements**
 - Designations
 - Timelines
- **Technical Analysis**
 - 5-Factor Analysis
 - Modeling
- **Recommended Boundaries**
- **Questions/Comments**

National Ambient Air Quality Standards (NAAQS)

The NAAQS are Federal standards that establish maximum concentrations of air pollutants that are acceptable in the general air we breathe. These standards are set to protect public health and welfare with adequate margin of safety.

- Primary standards - protect public health
- Secondary standards - protect welfare & the environment.

■ **NAAQS are established for “Criteria Pollutants”**

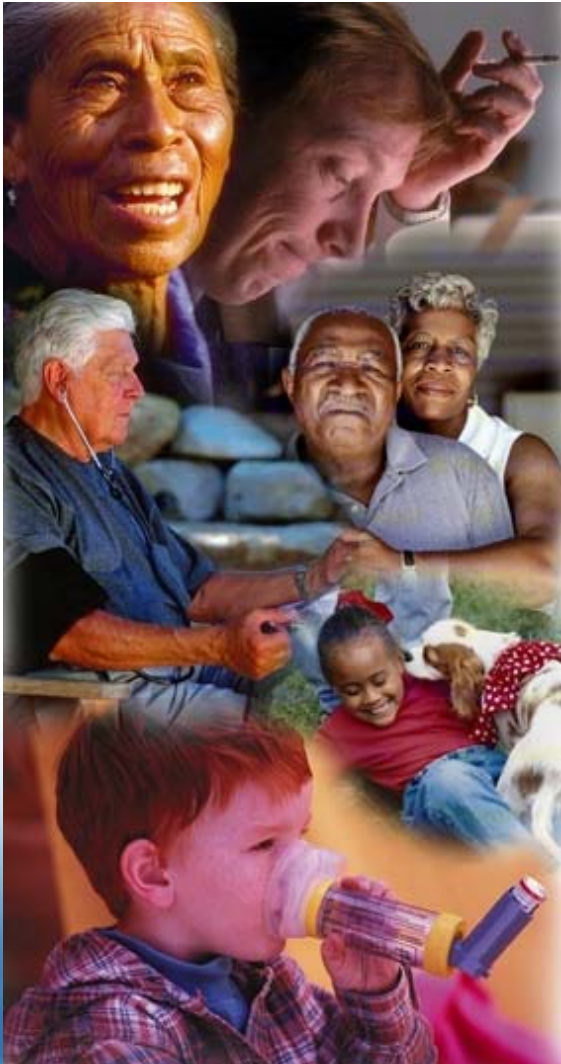
- Sulfur Dioxide (SO₂)
- Nitrogen Dioxide (NO₂)
- Particulate Matter (PM)
- Carbon Monoxide (CO)
- Lead (Pb)
- Ground-level ozone (O₃)

PM broken into two size fractions, PM_{2.5} & PM₁₀

Characteristics of Sulfur Dioxide (SO₂)

- **Burning of fuels containing sulfur for power, heat, manufacturing, and transportation**
 - When a sulfur-containing fuel such as coal or fuel oil is burned, the sulfur is oxidized and released to atmosphere
- **Contributes to secondary PM_{2.5} (sulfates)**
- **Sulfates contribute to visibility loss or haze**
- **Leading contributor to acid precipitation**





SO₂ and Human Health

- **Short-term exposures linked to adverse respiratory effects**
 - Bronchoconstriction
 - Increased asthma symptoms
- **Studies show connection between short-term exposures and increased visits to emergency departments and hospital admissions for respiratory illnesses**
- **At-risk populations include children, the elderly, and asthmatics**
- **Children at higher risk**
 - More likely to be active
 - Breathe more air per pound
 - Bodies still developing

1-hour SO₂ NAAQS

- **NAAQS undergo periodic review, required by CAA**
 - Every 5 years
 - Review latest public health information and scientific data
- **New 1-hr SO₂ NAAQS finalized on June 3, 2010**
 - SO₂ NAAQS established in 1971
 - Reviewed in 1996: No changes
- **Level: 75 ppb**
- **Form: 3 year avg of the 99th percentile of daily maximum 1-hour average concentrations at each monitor**

NAAQS Revisions

■ Designations Process

- **1 year after NAAQS revision**
 - States submit recommended designations
- **2 years after NAAQS revisions**
 - EPA finalizes their designations
 - EPA may take an additional year if data insufficient

3 Designations	Classification
Attainment	Air quality that meets the NAAQS
Nonattainment	Unhealthy air - does not meet the NAAQS
Unclassifiable	No or insufficient data

1-hr SO2 NAAQS Timeline

June 2010	1-hr SO2 NAAQS promulgated
June 2011	State designations recommendations IA recommendation - unclassifiable
Feb 2013	EPA proposed nonattainment designation (120 day letter)
Apr 8, 2013	Public/State responses on EPA's proposed boundaries due
June 2013	EPA issues final designation
~ Aug 2013	Designation becomes effective
~ Jan 2015	Attainment plan due: [Designations Effective + 18 months]
~ Aug 2018	Attainment date [Designations Effective + a maximum of 5 years]

Musser Park SO2 Monitoring 2008-2010

- **Musser Park SO2 monitor failed an EPA audit in the fall of 2010.**
- **Audit failure traced to bad calibration materials (permeation tubes).**
- **DNR and EPA agreed that the Musser Park data should be voided from 9/30/08 - 8/20/10.**

Design Values in Musser Park: DNR

- **According to Appendix T (40 CFR Part 50), a valid design value at a monitoring site cannot be computed if the data capture in any quarter of the 3-year period is 0%.**
- **In view of the data invalidation at the Musser Park monitor, and using the calculations specified in Appendix T, the earliest a valid design value could be generated is for the period 2011-2013. Design values for the periods 2008-2010 and 2009-2011 are invalid, using the instructions specified in Appendix T.**

Design Values in Musser Park: EPA

- However, paragraph 3(d) of Appendix T allows EPA the discretion to “consider consistency and levels of valid measurements” when it evaluates monitoring data for establishing attainment.
- EPA considered two three-year periods, 2008-2010 and 2009-2011, and argued that if the monitor would have recorded its lowest possible reading, 0 ppb, during the hours where the data was invalidated, the design values would have indicated NAAQS violations. The design values calculated by EPA after performing this zero substitution were: 2008-2010: 112 ppb, and 2009-2011: 127 ppb. Both results indicate non-attainment with the NAAQS.

SO2 Air Monitoring Sites

**New Monitors
Operational in 2012:**

Greenwood Cemetery:
Operational : 1/1/12

Muscatine High
School East Campus:
Operational: 8/1/12



Exceedance Days* for Muscatine SO2 Monitors 2010-2012

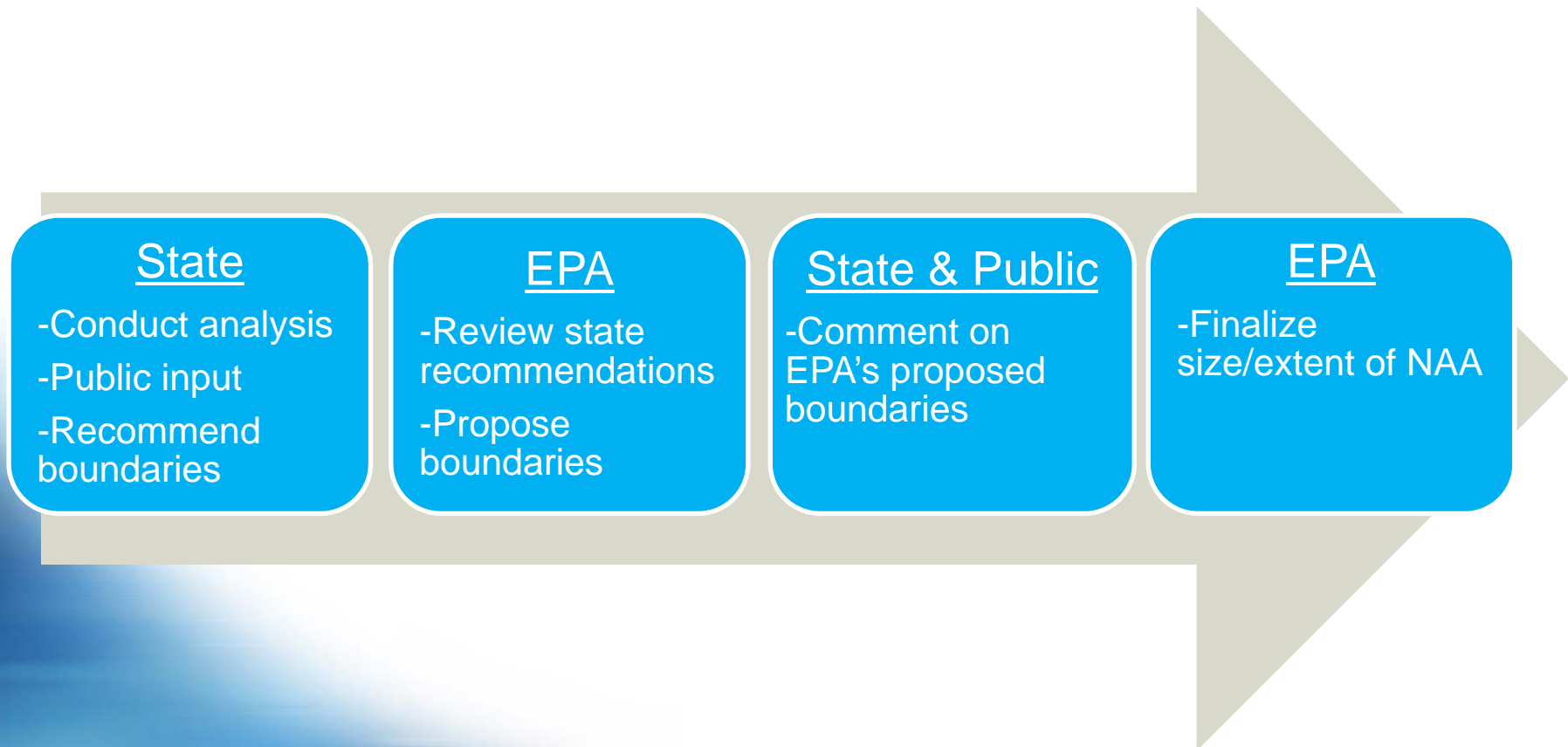
Year	Muscatine HS East Campus	Greenwood Cemetery	Musser Park
2010	-	-	14
2011	-	-	37
2012**	4	7	25

**An Exceedance Day is a Day where the Daily Maximum 1hr SO2 Value of at least 75.5 ppb*

*** Data will be finalized (certified) on 5/1/13.*

Nonattainment Designations Overview

- Designations process ultimately establishes the extent of a non-attainment area (NAA)



Designations – Boundary Development

- **State can provide input/recommendations to EPA**

- **EPA presumptive nonattainment boundary:**
 - **County**

- **Perform 5-factor analysis**
 - **Other available data and analysis (e.g. dispersion modeling) to support state recommendations**
 - Particularly important if recommending non-presumptive boundary

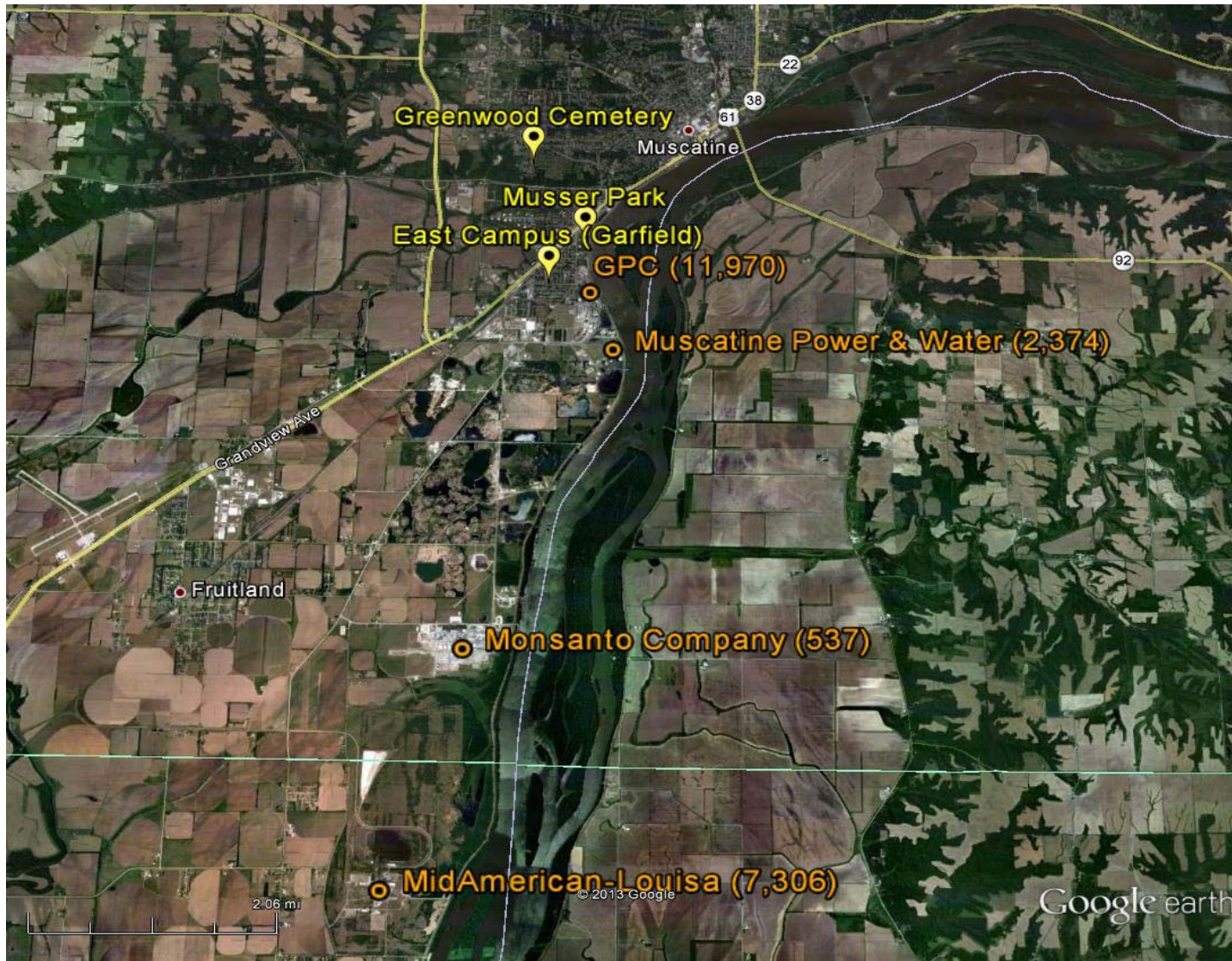
Designations – Boundary Development (cont.)



Criteria for Determining Boundaries

- **Case-by-case basis**
- **Must include area that is violating the standard plus nearby areas that contribute to the violation**
- **Recommendations based on an evaluation of five factors and other relevant data**
- **All factors & data considered in making a recommendation**
 - **No formulas or definitive tests; weight of evidence used**

Nearby Major Sources of SO₂ 2011 Actual Emissions (tons)



Meteorology

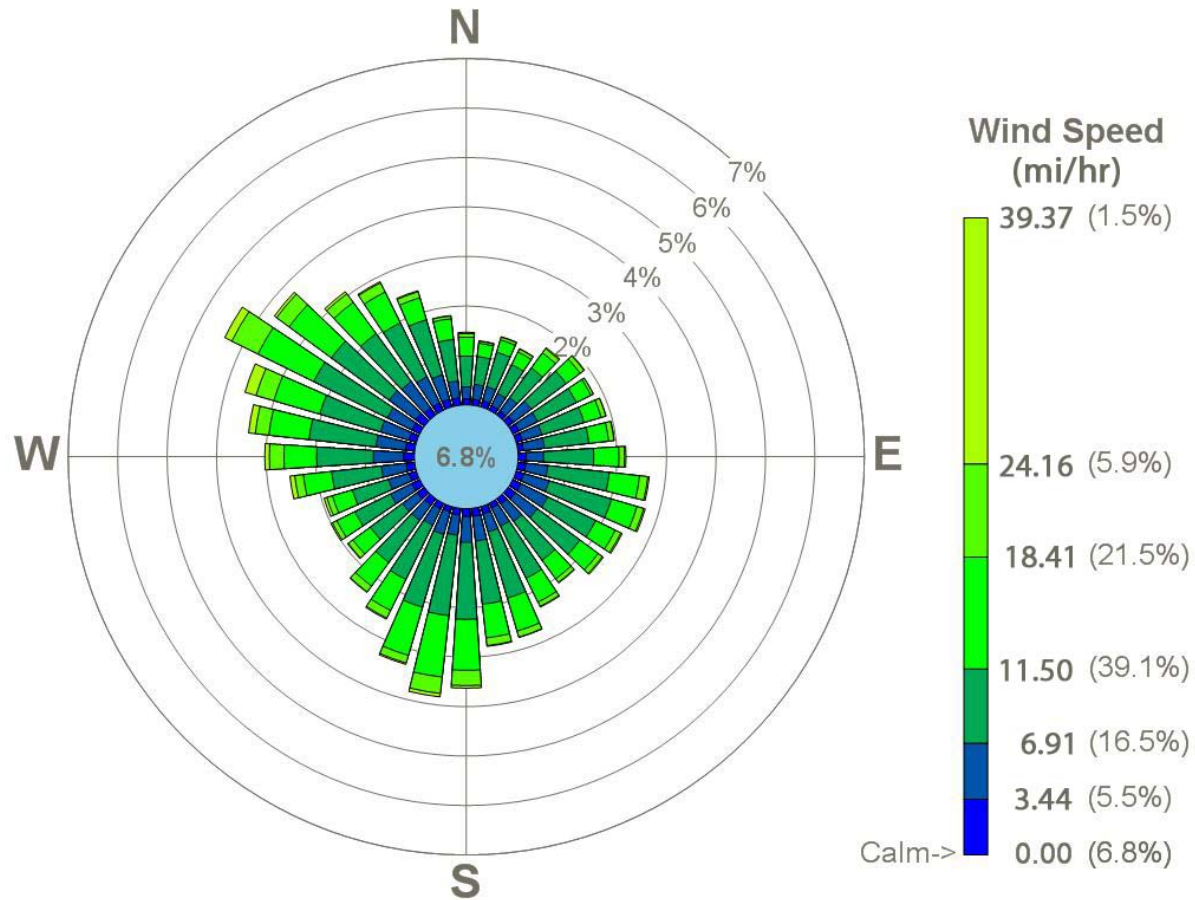
- **Analysis of meteorological variables that influence SO₂ concentrations**
- **Focus is on wind direction**
- **Meteorological data collected at Davenport**
 - Modeled years: 2005-2009
 - Wind roses: Exceedances from Aug 27, 2010 – March 12, 2013
- **Muscatine data not used**
 - Unusually low percentage of calms
 - Faulty anemometer?

Wind Rose

- **Wind rose is a graphical representation of prevailing wind directions**
- **Shows distribution of measured wind direction over a period of time**
- **Length of each bar represents frequency**
- **Angle represents the measured direction (coming from)**

Wind Rose

Davenport ASOS: 2005-2009



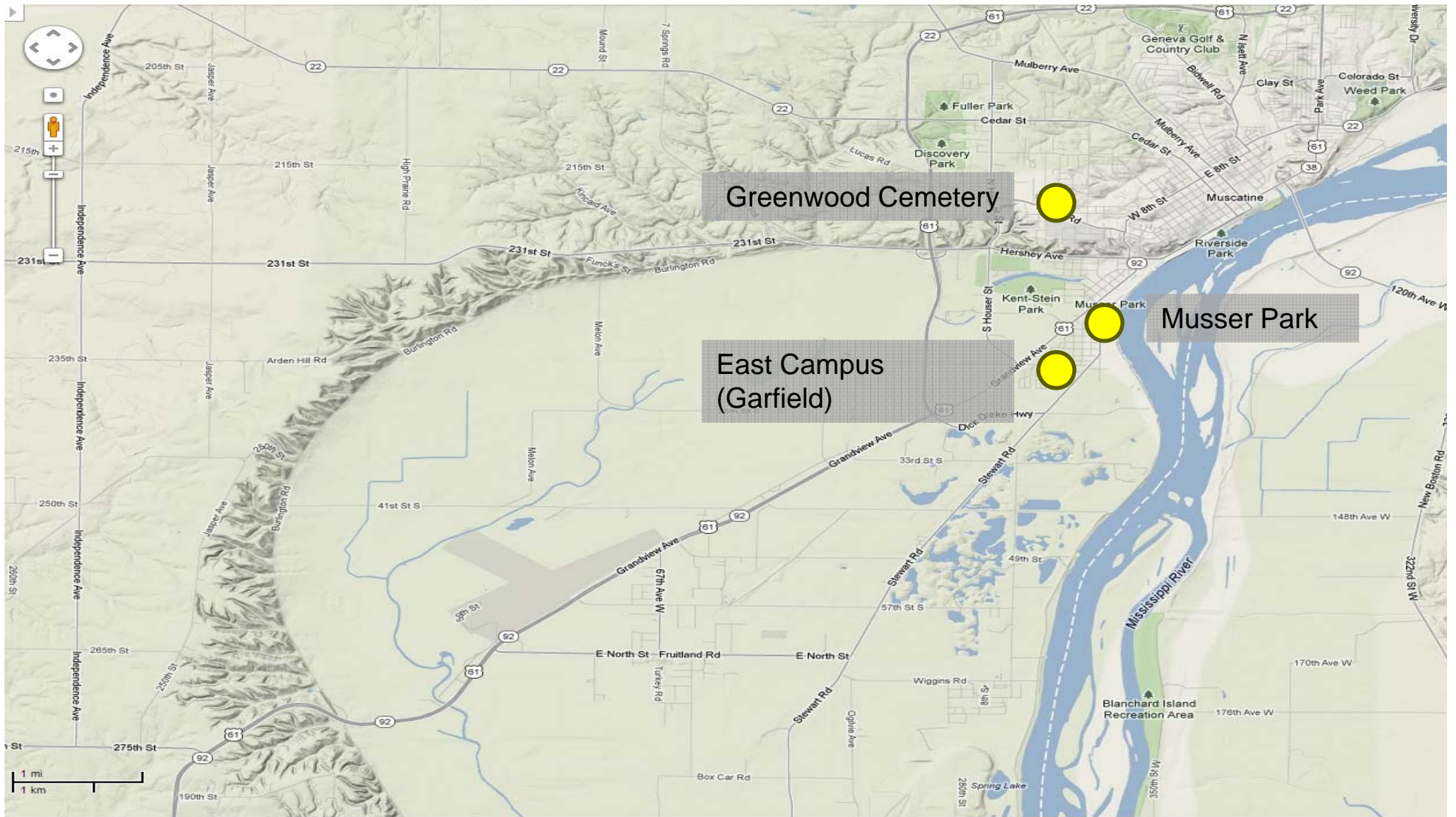
Meteorology

- Winds over a year long period are generally from the south-southwest and northwest
- Wind directions are predominantly from the south on days with measured SO₂ exceedances at the Musser Park and Greenwood Cemetery
- Wind directions are from the east on days with measured SO₂ exceedances at East Campus (Garfield).
- Coincides with the direction of nearby major SO₂ sources from monitors

Wind Roses- Exceedance Episodes



City of Muscatine Area Topography



- Does not influence boundary determination.

Jurisdictional Boundaries

- **Boundary types often considered:**
 - **County border**
 - **City borders**
 - **Sections/Townships**
 - **Immovable landmarks such as major roadways**
 - **State borders**
 - **Other permanent and readily identifiable boundaries**

- **Relied on sections and townships**

Additional Factor: Air Dispersion Modeling

- **Evaluated nearby major sources of SO₂**
 - EPA's AERMOD dispersion model
 - 2009/2010 actual SO₂ emissions
 - 2005-2009 Davenport meteorological data
- **Determine extent of area where predicted SO₂ impacts are 75.4 ppb (197.4 ug/m³) or higher**
 - Included default background of 32 ug/m³
- **Included SO₂ emissions changes since 2010**
 - GPC SO₂ reductions
 - CIPCO shutdown
 - Monsanto reductions
- **Louisa Generating Station and CIPCO not significant contributors to predicted exceedances at Musser Park**

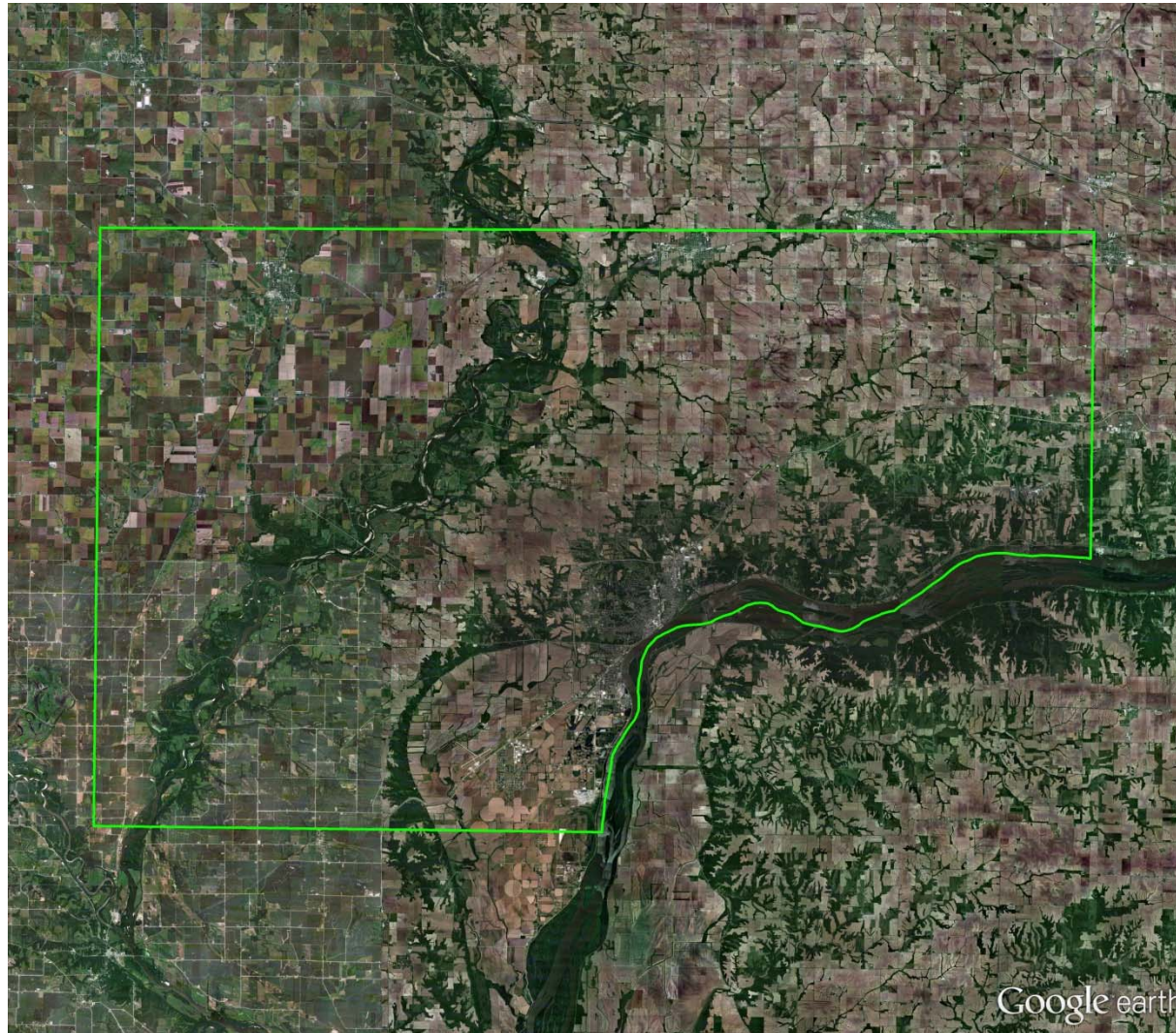
Boundary Development

- **Consider:**
 - **Weight of evidence from the 5-factor analysis**

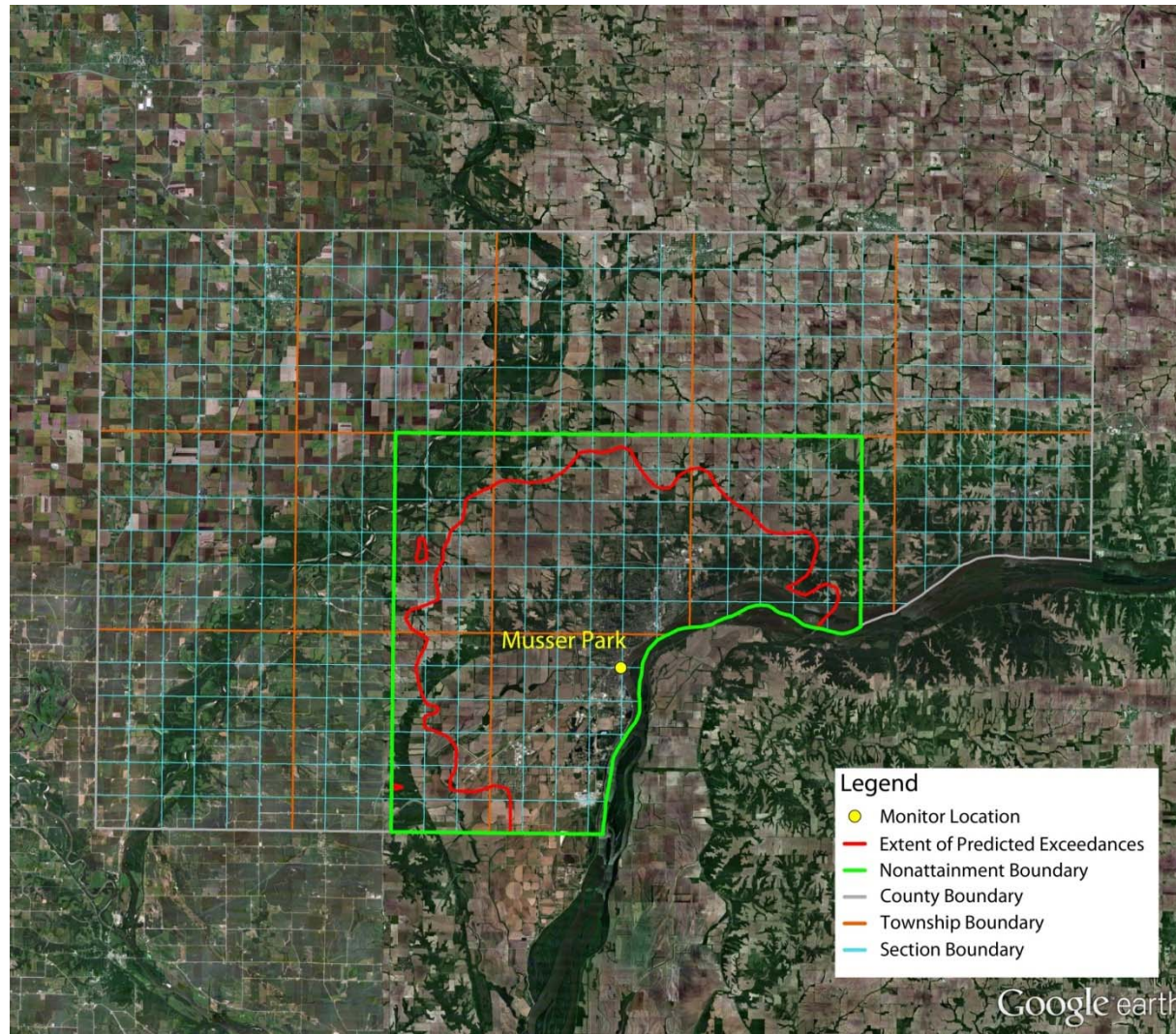
 - **Modeling**
 - Combines many of the factors in a comprehensive, scientific framework

- **Conclusion:**
 - **Presumptive county boundary too large**

EPA Presumptive Boundary



Draft Proposed Boundary Identification



Comments, Questions, Discussion

<http://www.iowadnr.gov/InsideDNR/RegulatoryAir/StakeholderInvolvement/MeetingsWorkgroups.aspx>

- **Jim McGraw, Program Development Supervisor**
 - jim.mcgraw@dnr.iowa.gov 515-242-5167
- **Brad Ashton, Lead Worker, Dispersion Modeling**
 - brad.ashton@dnr.iowa.gov 515-242-6532
- **Dave Phelps, Construction Permits Supervisor**
 - dave.phelps@dnr.iowa.gov 515-281-8189
- **Sarah Piziali, Construction Permit Engineer**
 - sarah.piziali@dnr.iowa.gov 515-281-3762