

State Implementation Plan for Fine Particulate Matter Muscatine, IA

Public Hearing – Muscatine, IA

June 24, 2013

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IowaDNR

The Iowa Department of Natural Resources



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Overview

- **PM2.5 Background**
- **PM2.5 Monitoring in Muscatine**
- **Muscatine PM2.5 SIP Revision**
 - Requirements
 - Modeling Analysis
 - Control Measures
 - Contingency Measures
- **Anticipated Timeline**

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.

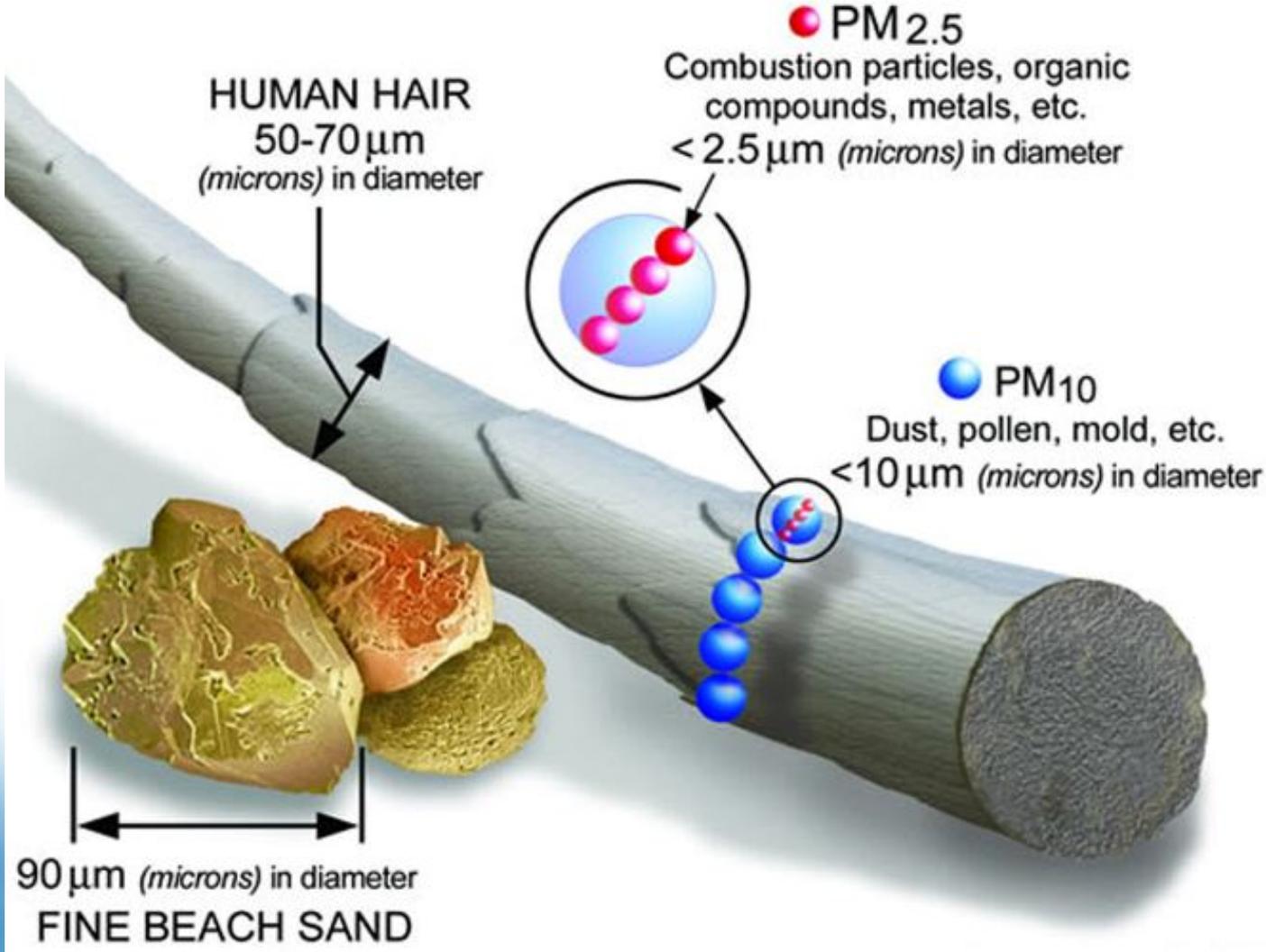
- Primary standards - protect public health
- Secondary standards - protect welfare & the environment.

■ **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

Particulate Matter



Characteristics of Fine Particulate (PM_{2.5})

Combustion, particles and gases

- Sulfates
- Nitrates
- Ammonium
- Organics
- Carbon
- Metals

Sources: Local & Regional

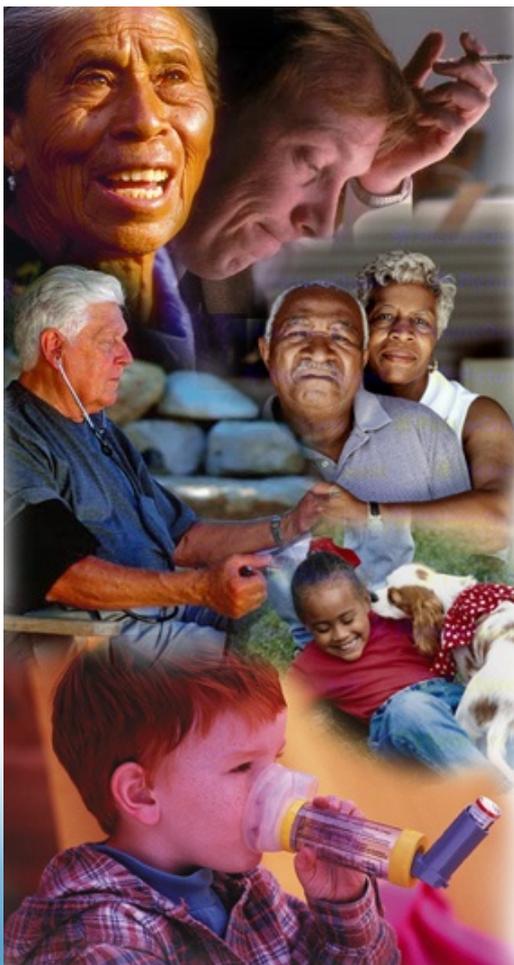
- Direct PM_{2.5}: Combustion of coal, oil, gasoline, diesel, wood combustion
- Secondary PM_{2.5}: Atmospheric transformation of SO₂ and NO_x

Exposure/Lifetime:

- Lifetime, days to weeks
- Regional distribution over urban scale to 100s of miles



Everyone is susceptible to the negative health impacts of fine particulate pollution



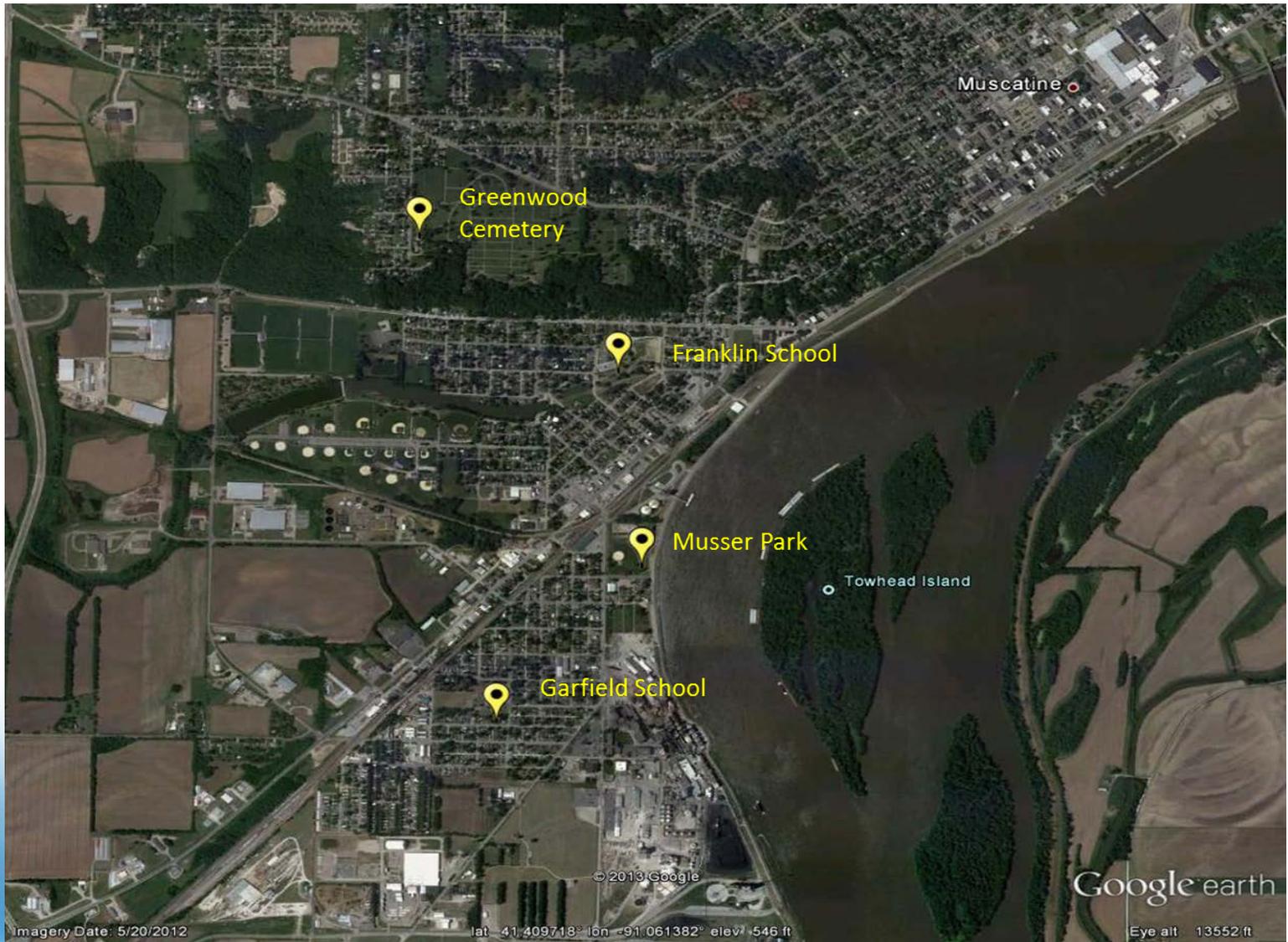
Some Groups of People Are More at Risk

- **Children**
 - More likely to be active
 - Breathe more air per pound
 - Bodies still developing
- **Active Adults**
 - Outdoors
 - Higher respiration rates
- **People with heart or lung disease**
 - Conditions make them vulnerable
- **Older adults**
 - Greater prevalence of heart and lung disease

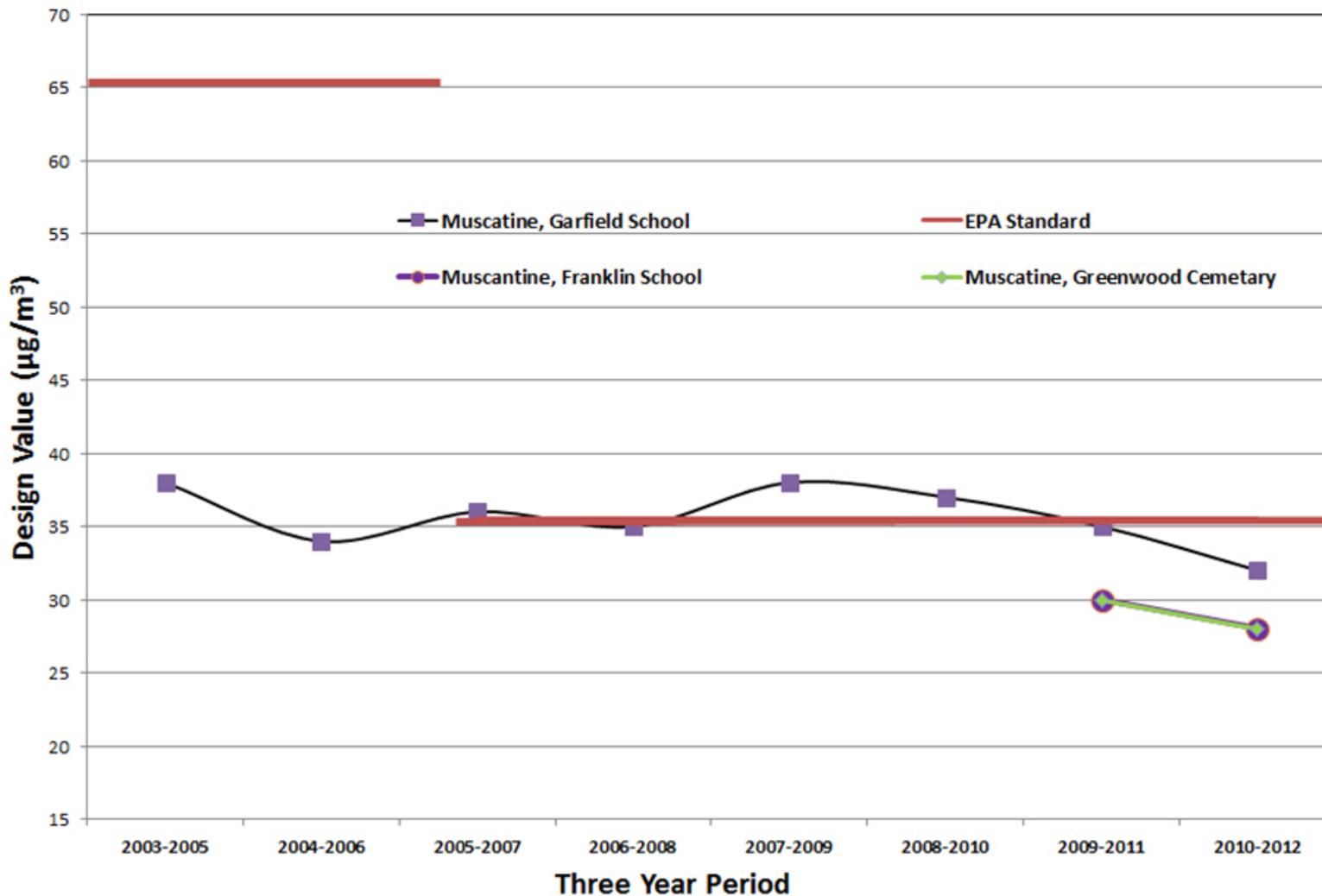
PM_{2.5} NAAQS

- EPA revised 24-hr PM_{2.5} standard in 2006 lowering the standard
 - From 65 micrograms per cubic meter (ug/m³) to 35
- Reason: Outcome of review of latest health studies on daily or shorter term exposures
- Result: Many locations near the standard.
 - Muscatine county: violations of the revised standard

PM2.5 Monitoring Locations in Muscatine



PM2.5 24-hr Design Value Trends



EPA Options

- **Designate area nonattainment for 24-hr PM2.5 OR**
- **Exercise authority under CAA section 110(k)(5)**
 - “[w]henver the Administrator finds that the applicable implementation plan for an area is substantially inadequate to attain or maintain the relevant national ambient air quality standard,... the Administrator shall require the state to revise the plan as necessary to correct such inadequacies.”
 - Also referred to as a “SIP call”
- **EPA selected SIP call option**
 - Published “Finding of Substantial Inadequacy of Implementation Plan; Call for Iowa State Implementation Plan Revision”
 - Federal Register on July 14, 2011 (76 FR 41424)
 - Effective August 15, 2011

Effect of SIP Call on Muscatine Area

- **Area stays in attainment**
 - No LAER
 - No Offsets
 - Minimized impact on local economic development
- **Control strategy targeted to sources causing/contributing to PM_{2.5} air quality problems**
- **Accelerated schedule for control strategy development and implementation**
 - Result- faster improvements in air quality

SIP Revision Requirements

- **Modeling demonstration showing reductions needed to attain and maintain PM2.5 NAAQS in area**
 - Consistent with Appendix W, 40 CFR 51
 - Modeling protocol established with EPA

- **Adopt measures to achieve needed reductions with enforceable schedules for implementing the measures as expeditiously as possible**
 - Based on modeling and facility operational considerations
 - Construction permits, consent orders
 - Establishes PM2.5 emission limits at affected facilities

SIP Revision Requirements (cont.)

- **Enforceable commitment to adopt and implement sufficient contingency measures, if triggered, in an expeditious and timely fashion.**
 - Adoption and implementation within 24 months of trigger

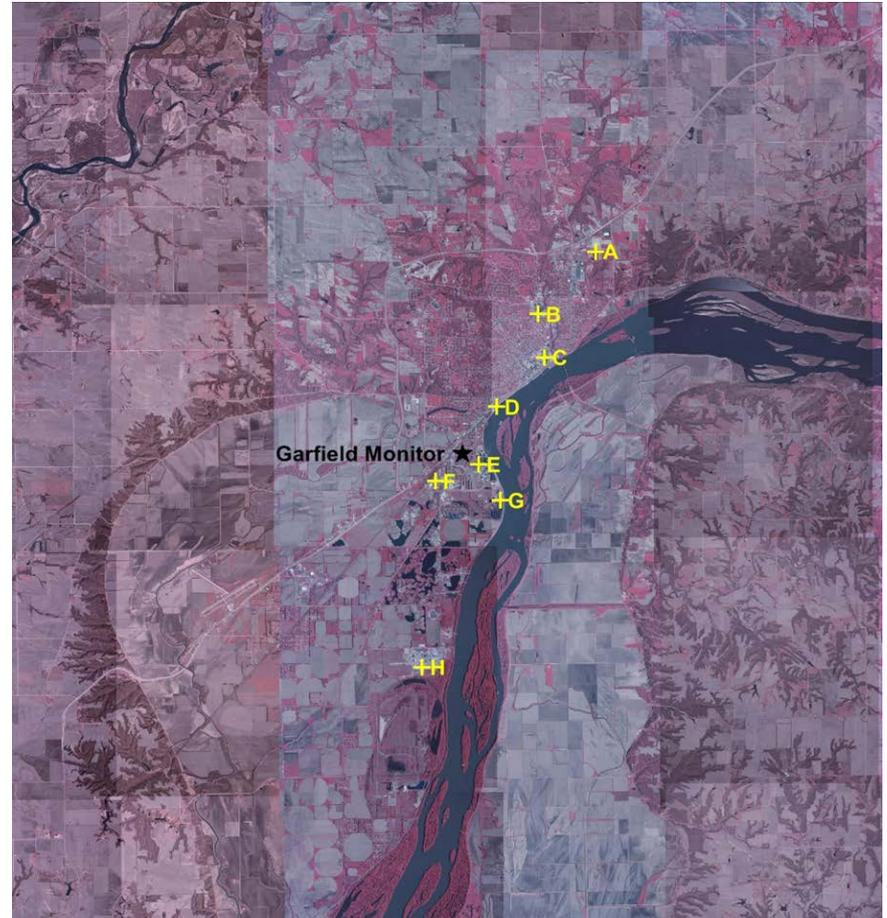
- **Revised emissions inventory for all sources that could be expected to contribute to the monitor readings**
 - Includes area sources, mobile sources, other significant sources

Modeling Demonstration by the Numbers

- **Evaluated 38 sources of PM2.5 in 4 counties**
- **Used 2 years of emissions data (2007/2008)**
- **Model predictions at 4,002 receptors over 5 kilometer area**
 - **Receptors: user specified locations where model makes impact predictions**
- **43,800 hours (5 years) of meteorological data processed to make impact predictions**
- **Two iterations of baseline modeling**
- **Four phase cumulative impact modeling**
 - **Cumulative = impacts from all facilities combined**

Baseline Modeling

- ID all major sources within 50 km of Garfield School
 - 38 sources
- If 24-hr impact >1.2 ug/m³ within 5 km of Garfield School, include in modeling analysis
 - 8 sources



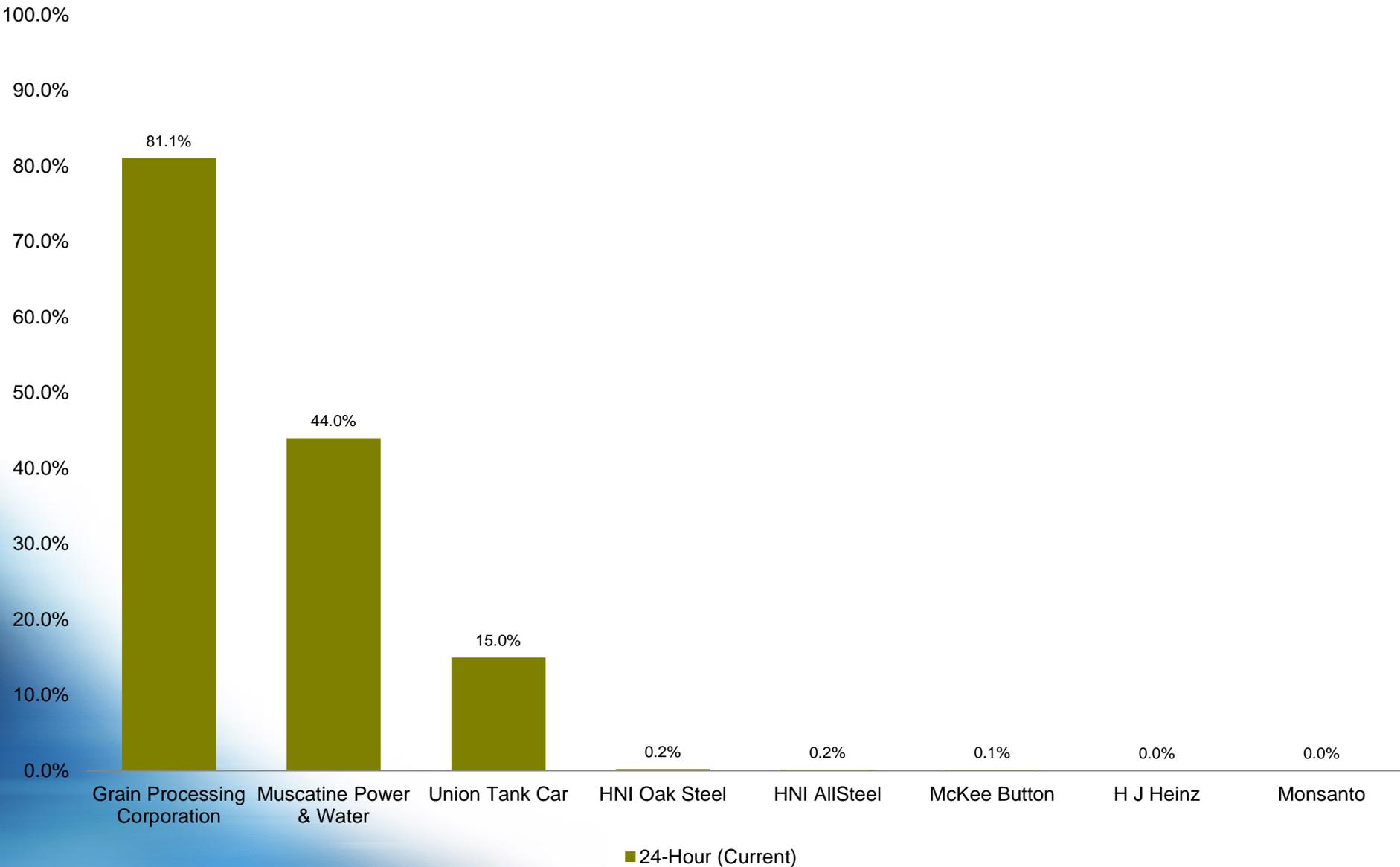
A - HON Allsteel
B - H J Heinz
C - HON Oak Steel
D - McKee Button

E - Grain Processing Corporation
F - Union Tank Car
G - Muscatine Power & Water
H - Monsanto

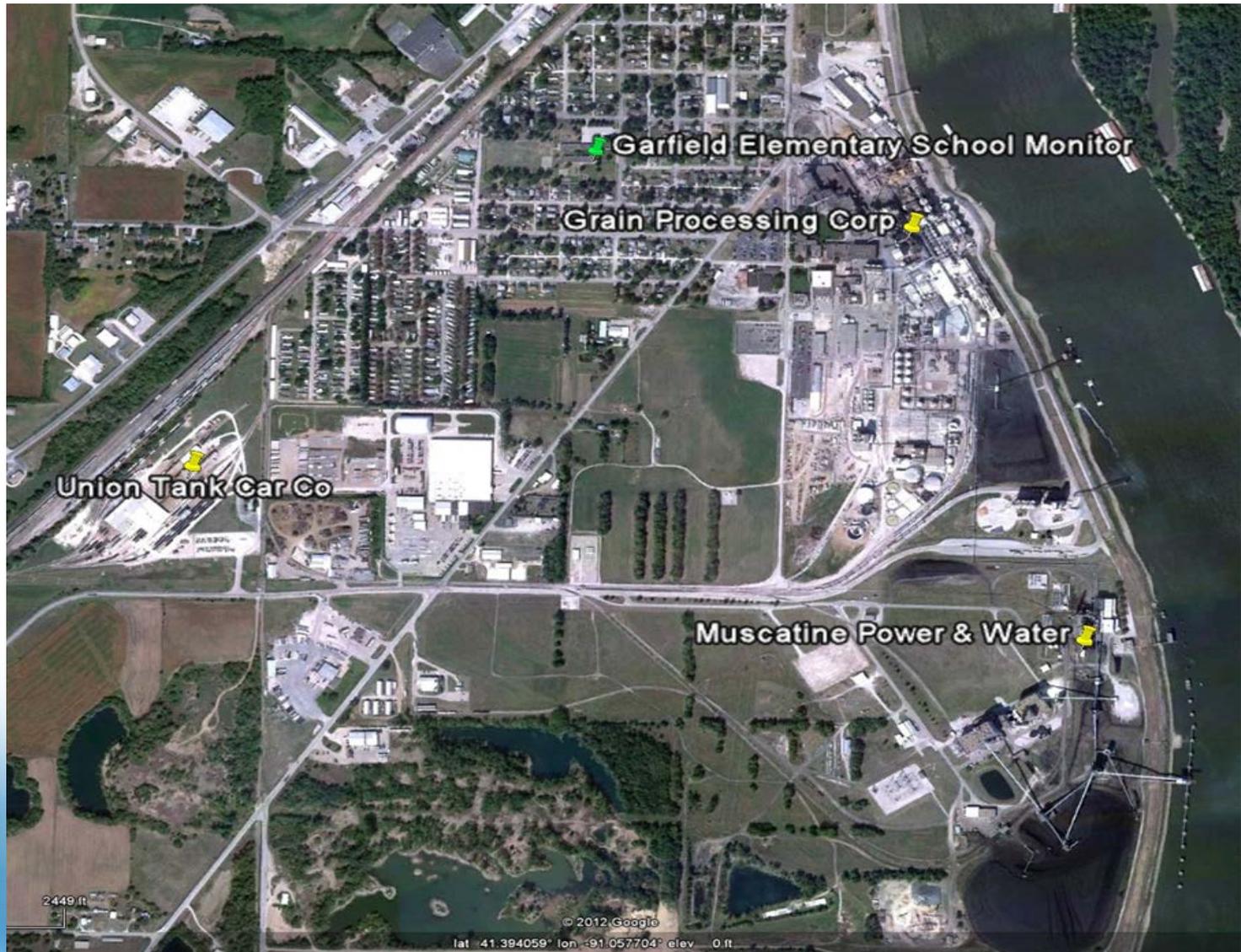
Baseline Modeling (Cont.)

- **Determine percentage of predicted NAAQS exceedances (35 ug/m³) to which each facility significantly contributed.**
 - **Result: Four facilities each had a significant contribution to at least one percent of the predicted 24-hour NAAQS exceedances**
- **Percentages reevaluated with updated facility data**
 - **Result: Three affected facilities identified for inclusion in control strategy**

Percentage of Predicted NAAQS Exceedances to Which Each Facility Significantly Contributes - Revised Baseline



Garfield School Monitor & Affected Facilities



Cumulative Impact Modeling

Phase I

- Individual facilities modeled
- Mitigate impacts so highest, first-high impacts below NAAQS

Phase II

- Phase I data combined into cumulative analysis
- Evaluate highest, 8th high impacts with five additional sources and background

Phase III

- Contributions to predicted exceedances from Phase II evaluated
- Mitigate impacts so no NAAQS exceedances or insignificant contributions to exceedances

Phase IV

- Combine updates from Phase III mitigation at each facility
- Result: High, 8th high cumulative impact of 35.29 ug/m³

PM2.5 Control Measures- GPC

- **Summary:**
 - **New particulate controls or improvements to existing particulate controls on a number of sources;**
 - **Cessation of operation of various existing equipment;**
 - **Replacement of several existing operations with new, more efficient equipment;**
 - **Regular sweeping and watering of road surfaces;**
 - **Increasing select stack heights; and**
 - **Restricting operation of certain processes**
- **Restrict public access to levy between property and river**
 - **Combination of signs, physical surveillance**

PM2.5 Control Measures- GPC (Cont.)

- **Phased implementation schedule**
 - **Begin 2013**
 - **Conclude 2016**
- **Enforceable through consent order and permits**
- **Voluntary measure: implementation of corn truck queuing and idling policy**
 - **Truck scheduling and processing changes**
 - **More orderly queuing procedures**

PM2.5 Control Measures- MPW

- **Summary:**
 - Regular watering of road surfaces and paving one unpaved road;
 - Cessation of operation of various existing equipment;
 - Restricting operation of certain processes;
 - Installing an enclosure on the limestone hopper;
 - Reducing the size of the coal, limestone, and synthetic gypsum piles;
 - Increasing select stack heights; and
 - Reconfiguring the coal reclaim handling dust collector and the dust collector for the coal crusher feeders.
- **Full implementation in 2013**
- **Enforceable through permits (public comment)**

PM2.5 Control Measures- UTLX

- **Summary:**
 - Installation of new particulate controls on a number of emission points;
 - Increasing select stack heights; and
 - Restricting operation of certain processes.
- **Full implementation in 2013**
- **Enforceable through permits (Issued)**

PM2.5 Estimated Emissions Reductions

Facility	Facility Estimated Actual Emissions - tons/yr*	DNR Estimated Control Plan Reductions-tons/yr	DNR Estimated Percent Reduction
Grain Processing Corporation (GPC)	537.6	367.9	68.4%
Muscatine Power & Water (MPW)	58.3	0.7	1.2%
Union Tank Car Company (UTLX)	3.0	0.3	10.0%
Total	598.9	368.9	61.6%

* Based on average of 2007/2008 emissions inventory data

GPC Estimated Co-Benefits Emissions Reductions

Pollutant	Estimated Percentage Reduction (2011-2017)
Sulfur Dioxide (SO ₂)	84
Hazardous Air Pollutants (HAPs)	82*
Volatile Organic Compounds (VOC)	48
Nitrogen Oxides (NO _x)	18
Carbon Monoxide (CO)	13

*Seventy-one percent of the reduction is due to decreased Hydrogen Chloride (HCl) emissions from the coal-fired boilers.

Contingency Measures

- **DNR proposed trigger:**
 - Violation of the PM_{2.5} design value as measured at the Garfield School monitor
 - First design value considered will be 2017-2019
- **Maintain current PM_{2.5} monitoring network**
- **If design value violated, require the submission of an emissions control program**
 - Sources included based on cause of violation
 - Include additional control equipment, changes in work practices and operations, etc.
- **Program measures feasible to implement within 24-months of violation**

Anticipated SIP Revision Timetable

Action	Date
SIP Submittal*	July/August 2013
Control Strategy Implementation	MPW & UTLX: 2013 GPC: 2013-2016
Projected Attainment (98 th percentile 24-hr PM2.5 value at or below 35 ug/m3)	2017 (First full calendar year following full implementation of controls)

*Amendments to SIP submittal will be made as needed to add GPC consent order and construction permits.

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