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Outdoor Wood Boiler Town Hall Meeting

Linn County Public Health
Air Quality Division
April 7, 2009





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AGENDA

- 5:30 pm – Doors open – Have information/handouts displayed for people to look at.
- 6:00 pm – Welcome, ask people to take seats.
- 6:05 pm – Presentation on Air Quality Program and Outdoor Wood Boiler.
- 6:30 pm – Take questions and comments from public on concerns with outdoor wood boilers ordinance
- 10 minute BREAK when all comments on concerns with outdoor wood boilers ordinance have been made.
- Open Forum until 8:00 pm on all outdoor wood boiler questions.
- 8:00 pm – Adjourn





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Presentation Outline

- About the Air Quality Division for Linn County Public Health.
- Emissions of particulate matter from Outdoor Wood Boilers (OWBs).
- Air quality in Linn County.
- Linn County Code of Ordinance (LCCO) for Air Quality.
- Modifying LCCO to for operation of OWBs.





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Air Quality Organization Chart

Jim Hodina, MS, QEP
Air Pollution Control Officer

Kyle Lundberg
Laboratory Supervisor

Amy Drahos
Sr. Air Quality Scientist

Joe Strahan, P.E.
Air Permitting Engineer

Tony Daugherty
Sr. Air Quality Scientist

Dustin Hinrichs
Air Quality Scientist

Carole Lamphier
Environmental Chemist

Jeff Lake
Environmental Chemist

David Burns
Environmental Chemist

Wanda Reiter Kintz, Ph.D
Environmental Chemist





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Major Activities of Division

- Permit, inspect, test, and enforcement federal, state, and local air quality regulations for over 300 facilities and 2,000 emission sources.
- Monitor ambient air quality in Linn County for public information and compliance to EPA.
- Implement Federal and State regulations and update local regulations to stay current with those requirements.





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Ongoing Emission Reduction Program Activities

- Implementing federal standards for controlling emissions from gasoline storage tanks.
- Implementing federal standards for controlling emissions from paint booths including auto body paint shops.
- Investigating acetaldehyde emissions from industrial fermentation processes such as yeast on ethanol production.
- Working with local utilities, industries, and public works facilities to expedite regulatory review work for flood recovery work.
- Investigating citizen concerns about emissions from reopened Site 1 Landfill.
- Assisting other local organizations to apply for federal stimulus funding that have environmental ties.





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Wood Boiler Emissions

- Outdoor wood boilers produce smoke when the fuel does not burn completely.
- Smoke from hydronic heaters contains a complex mixture of gases and particles.
- While there are several categories of pollutants in wood smokes, the primary pollutant of concern is particulate matter.





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Particulate Matter (PM)

- Particle pollution (also called particulate matter or PM) is the term for a mixture of solid particles and liquid droplets found in the air.
 - Inhalable Coarse Particles: from 2.5 micrometers (μm) to $10\mu\text{m}$ in diameter
 - Fine particles: equal to or smaller than $2.5\ \mu\text{m}$ in diameter.
- Fine particles are easily inhaled deep into the lungs where they may accumulate, react, be cleared or absorbed.
- Particle pollution, unlike ozone, can occur year-round.

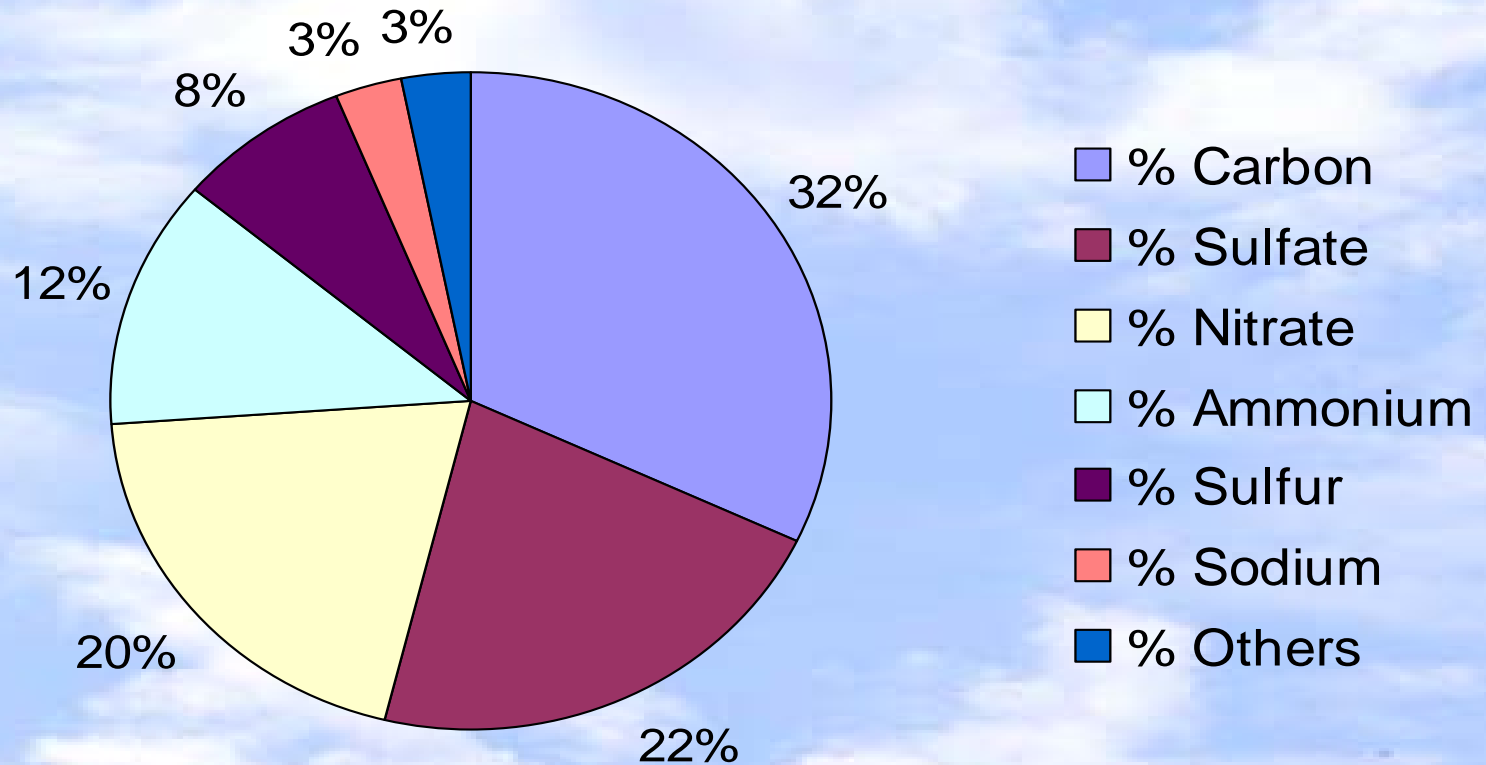




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PM_{2.5} Composition in Linn County





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What is Particulate Matter?

- PM is made up of hundreds of different chemicals.
 - *Primary Particles* are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.
 - *Secondary Particles* form in complicated reactions in the atmosphere of chemicals such as sulfur dioxides and nitrogen oxides
 - Emitted from power plants, industries and automobiles.
 - Make up most of the fine particle pollution in the country.
- Fine particles can remain suspended in the air and travel long distances across regions in the country.





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PM Adverse Health Effects

- Particle pollution, especially fine particles, are linked to a series of significant health problems:
 - increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example;
 - decreased lung function;
 - aggravated asthma;
 - development of chronic bronchitis;
 - irregular heartbeat;
 - nonfatal heart attacks; and
 - premature death in people with heart or lung disease.





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Protection of Ambient Air

- "Ambient air" means that portion of the atmosphere, external to buildings, to which the general public has access. Ambient air does not include the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers.
- National Ambient Air Quality Standards (NAAQS) are set by EPA at levels protective of human health and the environment.
- Meeting the NAAQS is the highest priority for any air quality agency.





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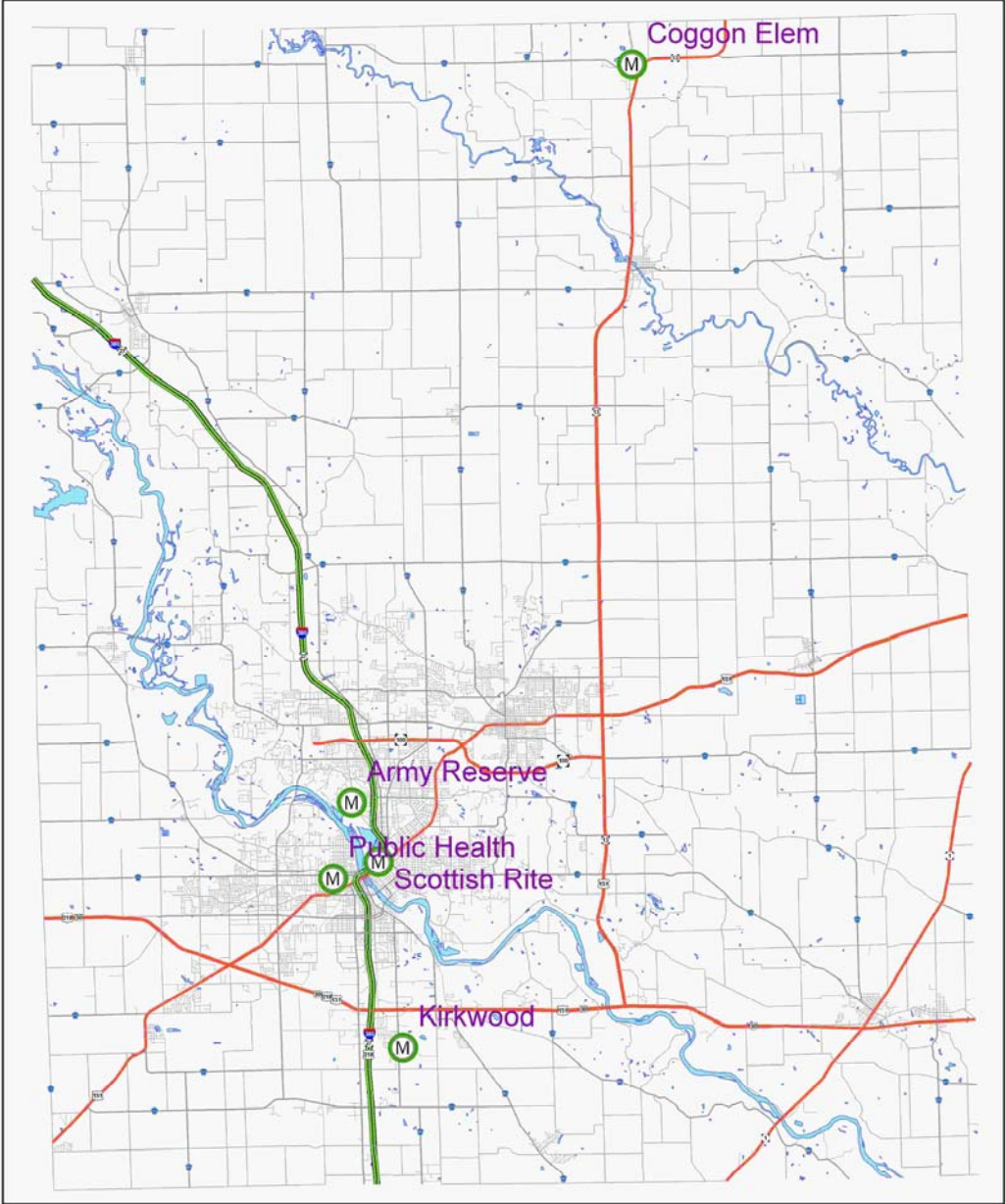
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Protection of Ambient Air

- Compliance with the NAAQS for Linn County is determined by ambient air monitoring results.
 - Exceeding NAAQS requires development of local rules for sources in Linn County to bring area back into compliance with NAAQS.
- Compliance with the NAAQS for individual sources can be done by monitoring but is usually demonstrated through computer modeling, which is predictive (new sources), cheaper, and faster.
 - New projects cannot be approved where it is predicted that the emissions increase would create a violation of the NAAQS.
 - Existing sources found to exceed the NAAQS are given a timeframe by which they have to demonstrate compliance.



Linn County Air Monitor Locations





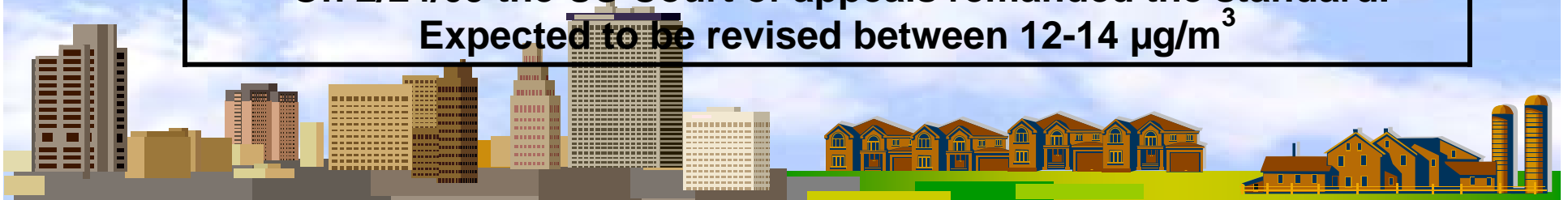
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PM Ambient Air Standards

| Pollutant | Primary Standard | Averaging Times |
|---|-------------------------------|-----------------------------|
| Particulate Matter < 10 microns (PM ₁₀) | Revoked | Annual (Arithmetic Mean) |
| | 150 $\mu\text{g}/\text{m}^3$ | 24-hr |
| Particulate Matter < 2.5 microns (PM _{2.5}) | 15 $\mu\text{g}/\text{m}^3$ * | Annual (Arithmetic Mean) |
| | 35 $\mu\text{g}/\text{m}^3$ | 24-hr |

* On 2/24/09 the US Court of appeals remanded the standard.
Expected to be revised between 12-14 $\mu\text{g}/\text{m}^3$



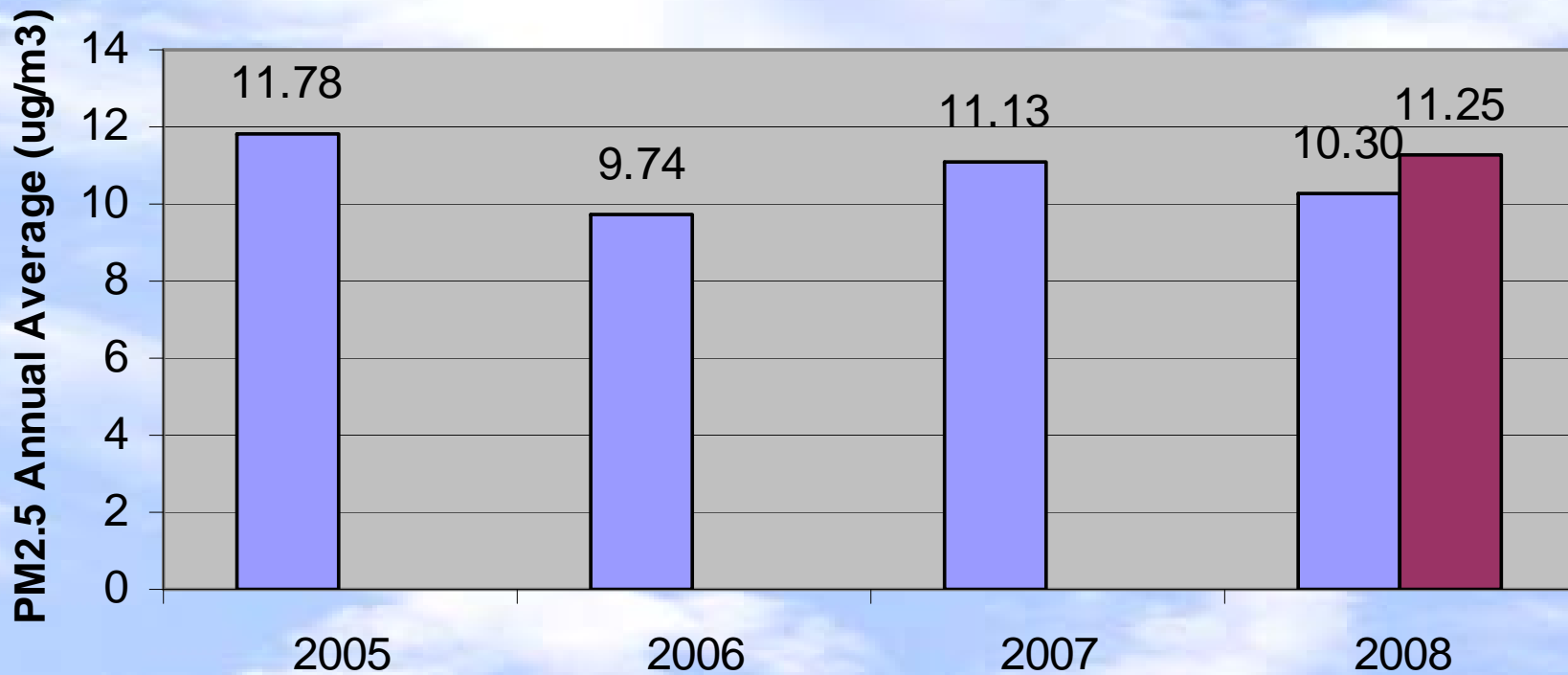


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Air Quality – PM_{2.5}

Annual NAAQS is 15 $\mu\text{g}/\text{m}^3$, 98th Percentile, 3 Year Average



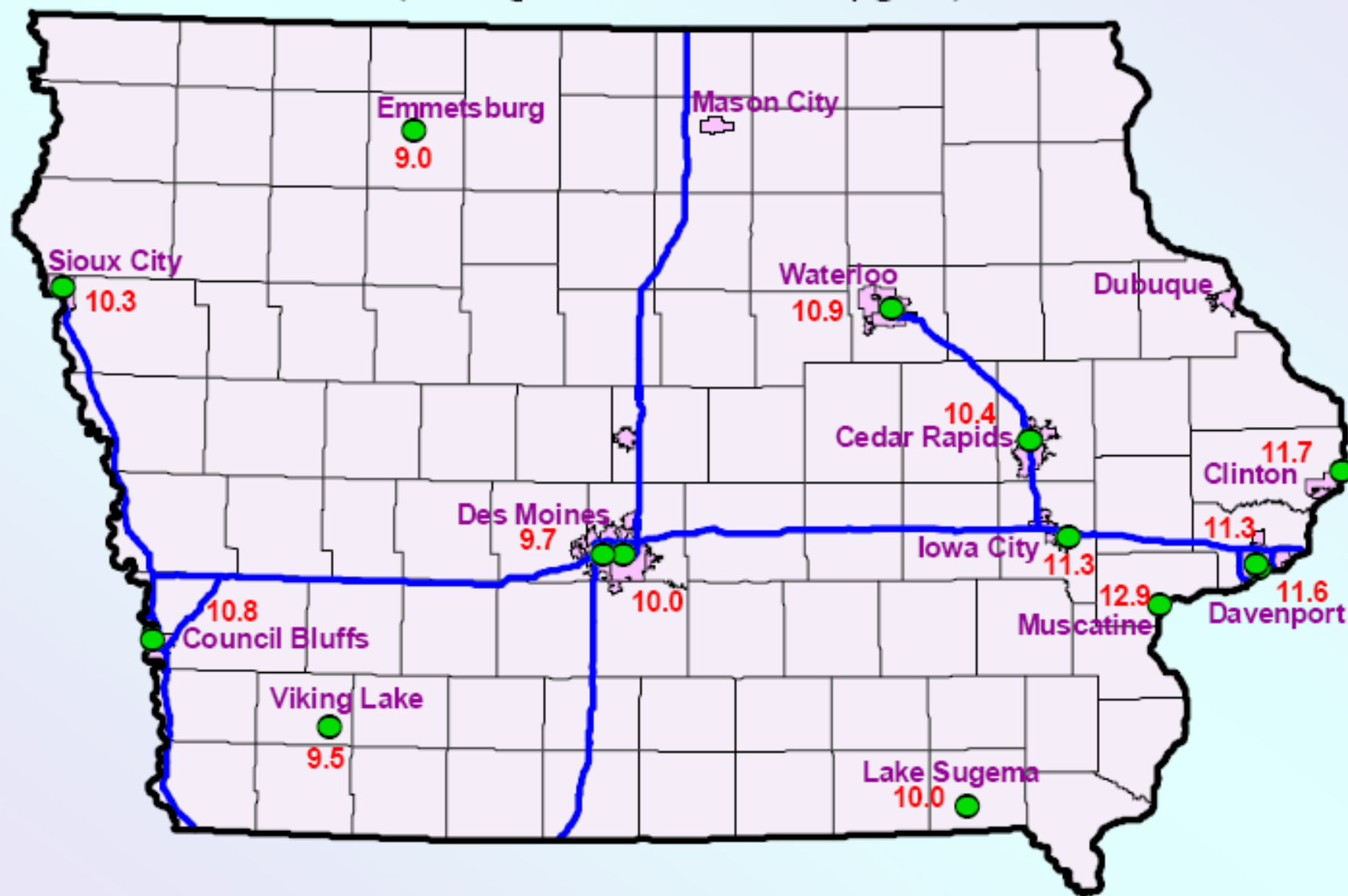
□ Army Reserve

■ Health Dept



Iowa PM_{2.5} Annual Design Values 2006-2008

(NAAQS Standard is 15.0 $\mu\text{g}/\text{m}^3$)



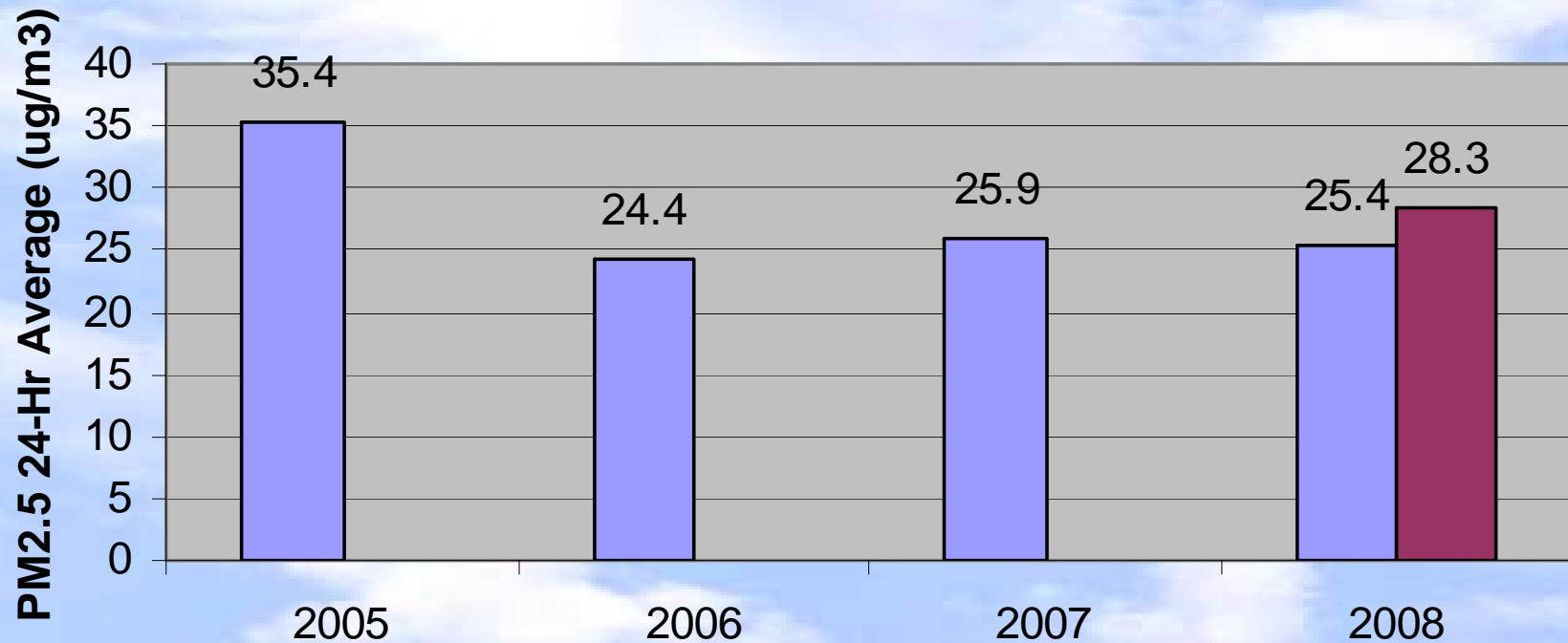


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Air Quality – PM_{2.5}

24-hr NAAQS is 35 $\mu\text{g}/\text{m}^3$, 98th Percentile, 3 Year Average



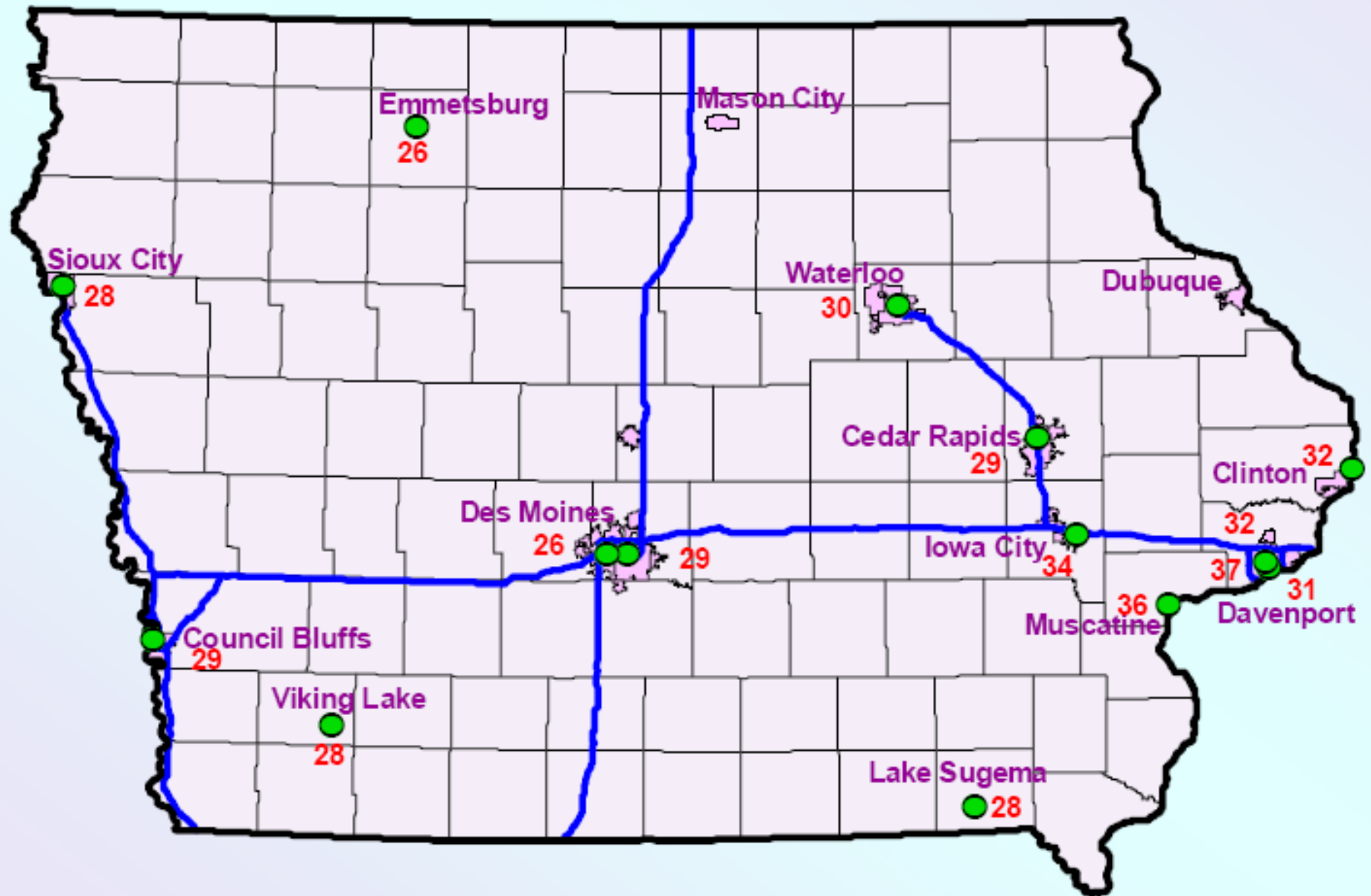
□ Army Reserve

■ Health Dept



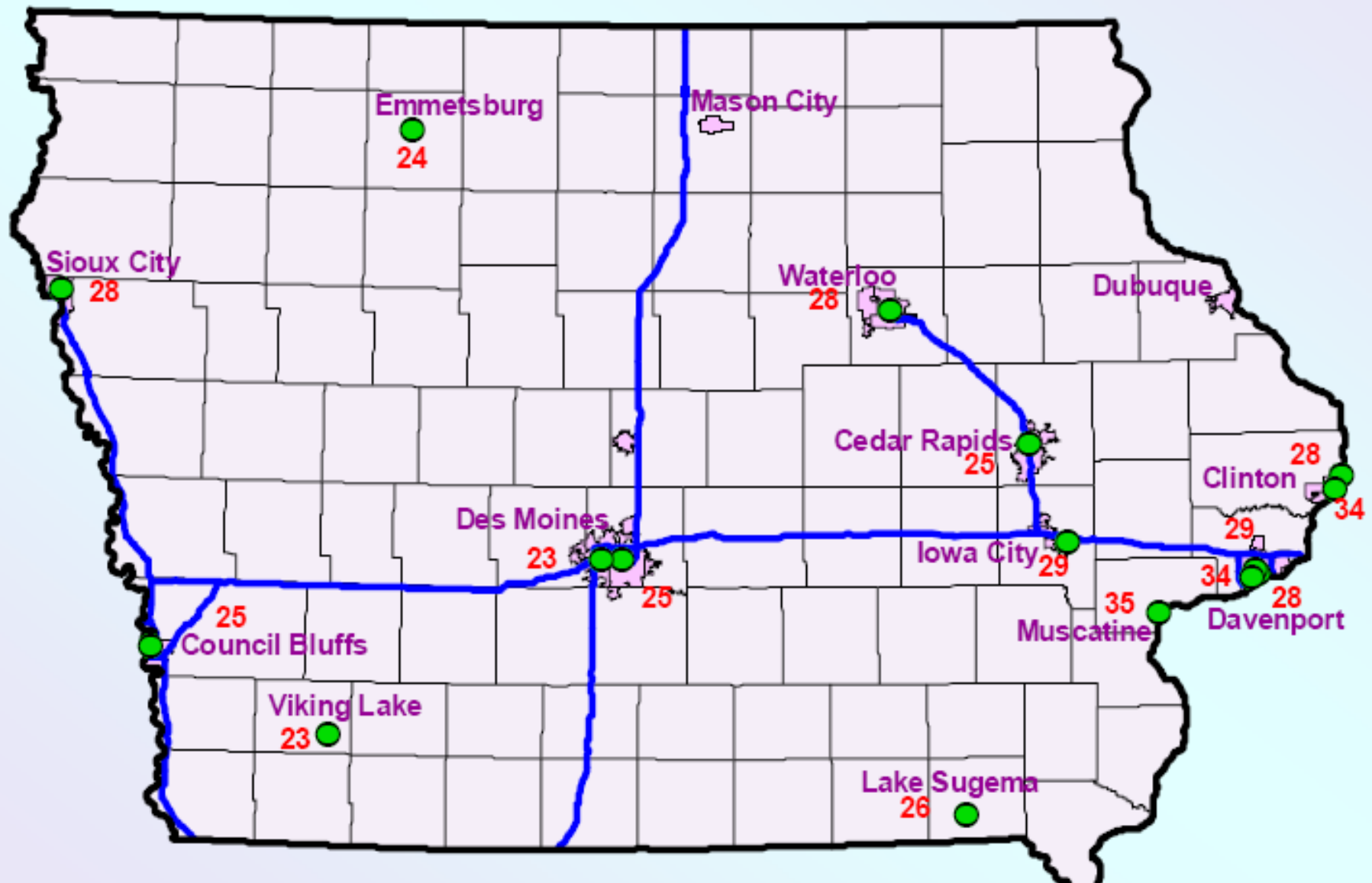
Iowa PM2.5 24-hour Design Values 2005-2007

(NAAQS Standard is 35 $\mu\text{g}/\text{m}^3$)



Iowa PM_{2.5} 24-hour Design Values 2006-2008

(NAAQS Standard is 35 $\mu\text{g}/\text{m}^3$)





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Linn County Air Quality Ordinance

10.8 Emissions From Fuel-Burning Equipment

1. General Provisions.

- a. This section applies to installations in which fuel is burned for the primary purpose of producing steam, hot water, hot air or other liquids, gases or solids and in the course of doing so, the products of combustion do not come into direct contact with process materials.

2. Emission Limitation.

- a. *** For heat inputs less than 10 million BTU, 0.6 lb/million BTU shall apply.





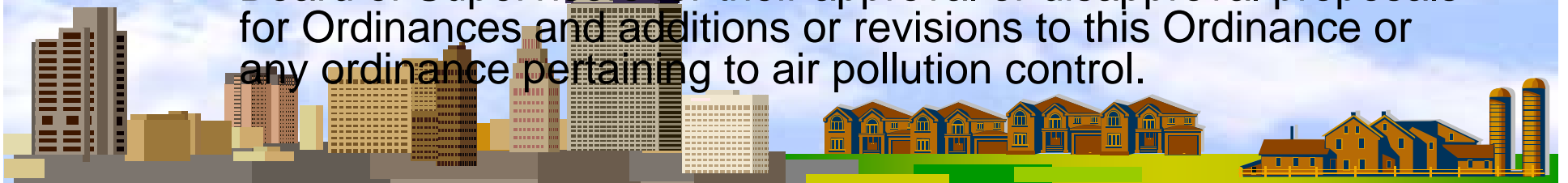
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Linn County Air Quality Ordinance

10.22 Enforcement

- It shall be the duty of the Air Pollution Control Officer to enforce the provisions of this Ordinance. Specific powers and duties of the Air Pollution Control Officer related to this Ordinance shall include the power to:
 - Supervise the execution of this Ordinance pertaining to air pollution.
 - Institute complaints against all persons violating any provisions of this Ordinance; institute necessary legal proceedings to prosecute violations of this Ordinance; issue citations to persons committing county infractions and compel the prevention and abatement of air pollution or nuisance arising there from.
 - Prepare and present to the Board of Health and the Linn County Board of Supervisors for their approval or disapproval proposals for Ordinances and additions or revisions to this Ordinance or any ordinance pertaining to air pollution control.





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Revising Existing Rules

- Section 10.8 was adopted circa 1976 to regulate boiler emissions and bring air quality into compliance with National Ambient Air Quality Standards.
- EPA reviewed and approved current standard and incorporated into State Implementation Plan for Air Quality making it “federally enforceable.”
- EPA does not allow relaxation of existing rules if they that act will result in degradation of air quality.
- Linn County will need to prove to EPA that higher allowable rate for OWBs will not degrade air quality.





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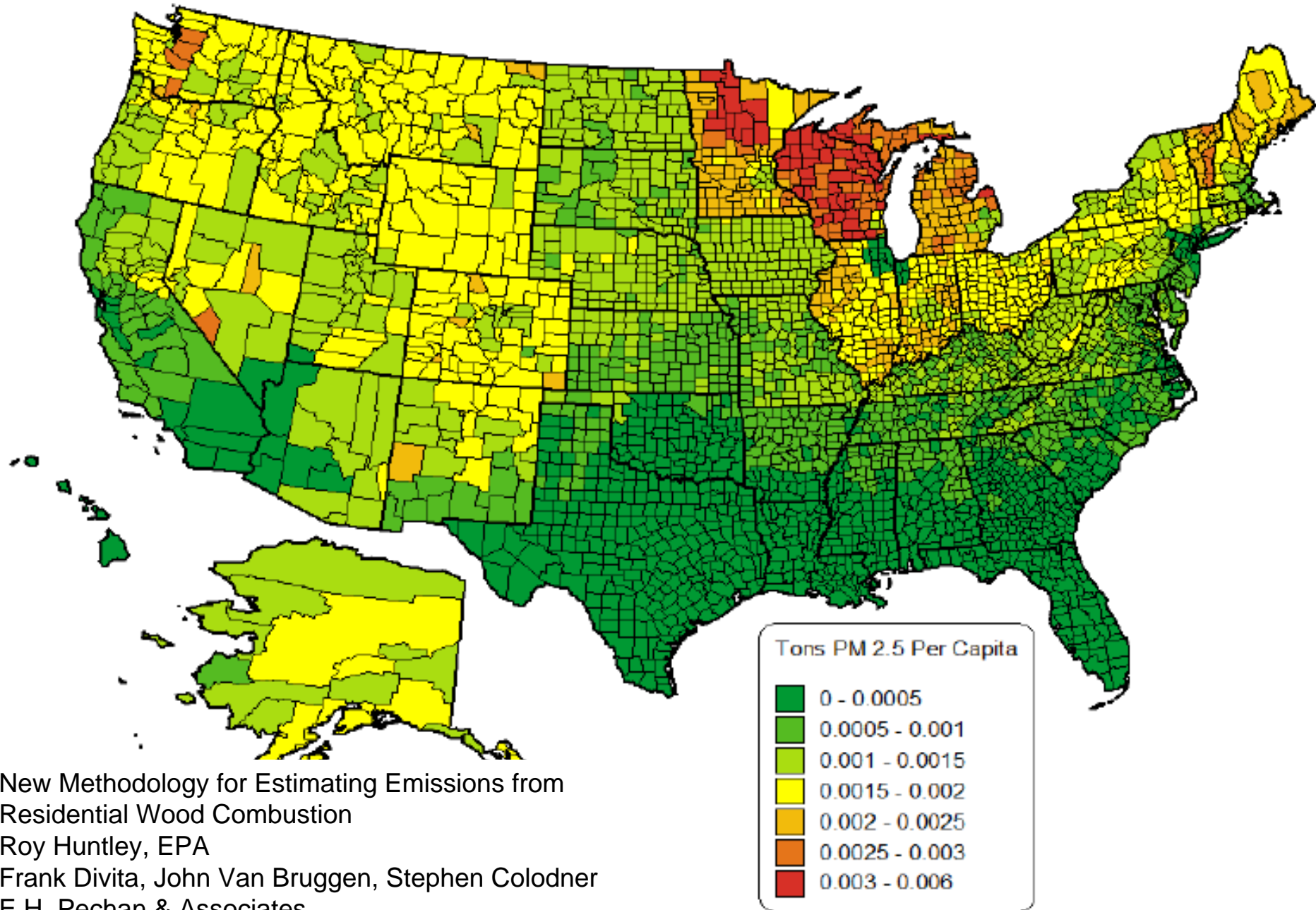
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Boiler Emission Rates

- EPA Voluntary Partnership Program for Hydronic Heaters
 - Phase 1 units emit less than 0.60 lb/MMBtu
 - Phase 2 units emit less than 0.32 lb/MMBtu and 18 grams per hour
- EPA states unqualified units emit on average = 2.0 lb/MMBtu (e.g. 1 MMBtu/hr unit would emit 2.0 lb/hr).



Per Capita PM 2.5 Emissions from Residential Wood Combustion



New Methodology for Estimating Emissions from Residential Wood Combustion
Roy Huntley, EPA
Frank Divita, John Van Bruggen, Stephen Colodner
E.H. Pechan & Associates



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Estimating PM_{2.5} Emissions

PM 2.5 Emissions from Residential Wood Combustions

Per Capita Emissions 0.00125 Average tons/person

Linn County Population 201,853 2006 Estimated Census

Linn County Total 252 tons/yr





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Estimating PM_{2.5} Emissions

PM_{2.5} Emissions from Unqualified Outdoor Wood Boilers

| | Single-Unit | Multi-Unit | |
|----------------------------|-------------|------------|-------------|
| Residential Heat Demand | 100 | 300 | MMBtu/yr |
| Efficiency | 60% | 60% | |
| Emissions | 333 | 1000 | lbs/yr/unit |
| Number in Linn County | 150 | 50 | |
| Total | 25 | 25 | tons/yr |
| Total Outdoor Wood Boilers | | 50 | tons/yr |





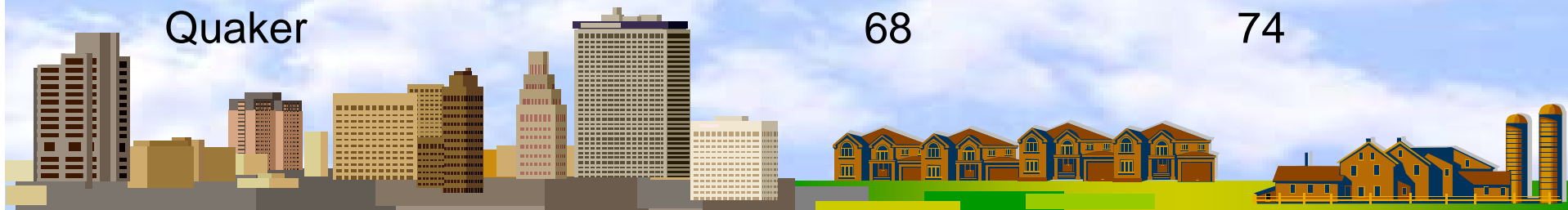
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Estimating PM_{2.5} Emissions

PM_{2.5} Actual Emissions from Local Industries

| | 2008 | 2007 |
|-----------------------|------|------|
| ADM | 124 | 128 |
| Alliant-6th St. | 45 | 110 |
| Alliant-Prairie Creek | 147 | 385 |
| Cargill Corn | 23 | 31 |
| Cargill East Bean | NR | 64 |
| Cargill West Bean | NR | 14 |
| General Mills | 84 | 80 |
| Penford | 46 | 55 |
| PMX | NA | 24 |
| Quaker | 68 | 74 |





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Modeling Air Impacts of OWBs

- Linn County performed air dispersion computer modeling to predict concentrations of particulate matter after release from the OWB stack.
 - Regulatory model developed by EPA and AMS, codified in Federal Regulation.
 - Well established and used for industrial sources prior to construction of emission sources.
 - OWB modeling based on knowledge of boiler exhaust characteristics, atmospheric sciences and local meteorological data to determine transport of pollutants.





Linn County Monitored
Particulate Matter Concentration
= 29 ug/m^3

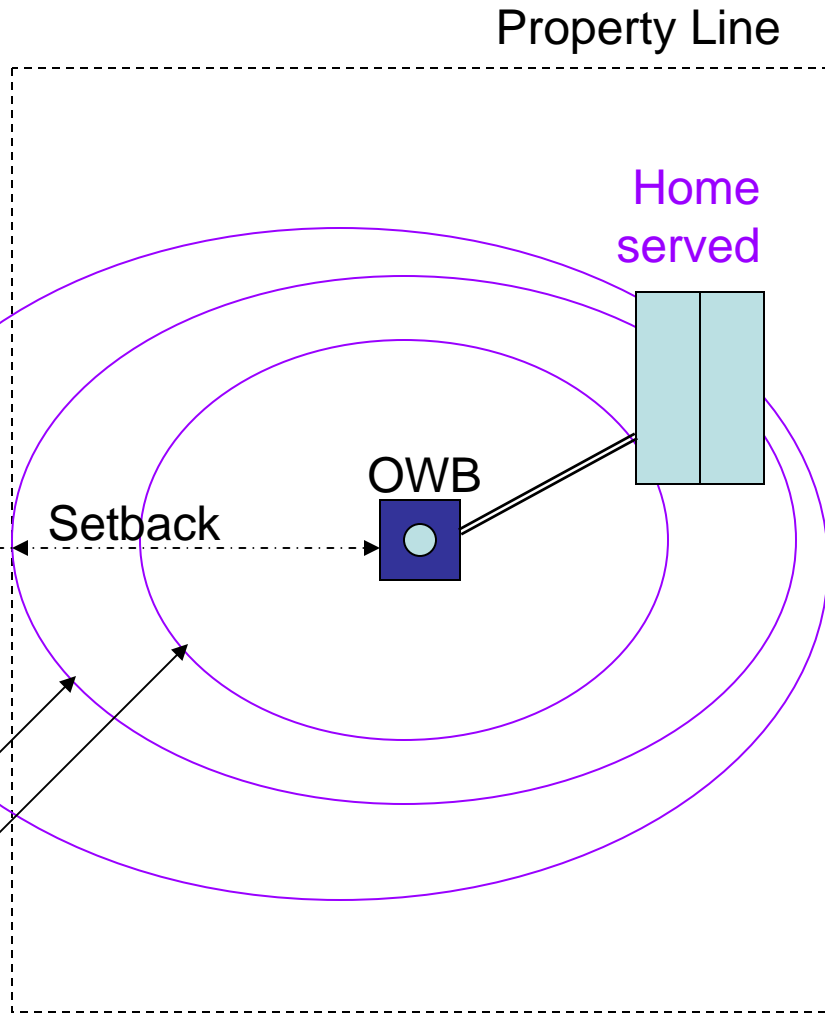
500,000 Btu/hr OWB Emission Rate

Unqualified Unit, 1 lb/hr

Phase 1 Unit, 0.30 lb/hr

Phase 2 Unit, 0.16 lb/hr

Nearest residence not
otherwise served



Unqualified Unit = $+6 \text{ ug/m}^3$

Phase 1 Unit = $+6 \text{ ug/m}^3$

Phase 2 Unit = $+6 \text{ ug/m}^3$

Linn County Monitor + OWB < 35 ug/m^3 to comply with ambient air quality standards



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Factors Considered in Ambient Air Modeling

- Emission source characteristics
 - Emission rate
 - Exhaust temperature
 - Stack configuration, including height
- Local meteorological data
 - 5 years data obtained from EI Airport
- Terrain effects including nearby buildings
- Physics of plume dispersion
- Current pollution levels (background)
- Does not consider multiple units in one area





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Moving Forward

- Take input and prepare options/
recommendations for Linn County Board of
Health to consider to amend most recent draft
ordinance.
 - Amnesty or grandfathering of existing units
 - Update setbacks, stack heights, and best
management practices base on input from public
including owners, manufacturers, and those
concerned about health impacts.
- Board of Supervisors vote on ordinance with
three readings that includes formal public
comment period.





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Forum Discussion

- Many states and industry best practices included the following measures:
 - Stacks to be 2 feet above eave of building served by OWB.
 - Use of setbacks measured to nearest residence not served by OWB.
 - Seasonal limits on uncertified boilers.
 - Visible emission standard (opacity, may be useful too for resolving nuisances).
 - Best management practices (clean dry wood).





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Air Quality Contact Information

Linn County Public Health Department

501 13th Street NW

Cedar Rapids, IA 52405

319-892-6000

www.linncleanair.org

Jim Hodina 892-6010

james.hodina@linncounty.org





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Additional Slides from April 6 Town Hall Meeting Not in April 7 Presentation





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PM Adverse Health Effects

- According to the American Academy of Pediatrics, children and infants are among the most susceptible to many air pollutants.
- Studies estimate that thousands of elderly people die prematurely each year from exposure to fine particles.
- People can reduce their exposure to air pollution by checking their daily air quality forecast and adjusting strenuous outdoor activities when an unhealthy AQI is forecast.





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Air Quality Results

- For various sizes of boilers and stack heights, determined the distance from the source that the emissions would no longer exceed the NAAQS.
- Used these distances to define the required setback distances for an OWB.
- Offer to do case-by-case analysis for any boiler to provide more accuracy.





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Modeled Emission Rates

- Some qualified units tested better than Phase 1 but not quite at Phase 2 standards.
- Many manufactures have not released data on their outdoor wood boiler emissions.
- Assumes laboratory conditions rather than real world operations.
 - We can model actual firing (e.g. amount of wood per day) if data can be made available.
 - Assumes good combustion practices followed such as well seasoned hardwood.





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Definition of Ambient Air

- Can a modified definition of ambient air be accepted where an existing OWB does not meet the distances found in the model?
 - EPA is clear that in an industrial setting ambient air starts at the fence line.
 - Future use of neighboring property unclear when not under control by owner.
 - Industrial source will be present for long time while existing OWB likely will be replaced at end of life or upon property transfer.
 - Adjacent sources do get special consideration where impacts are mutual.





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Alternatives for Setback Distances

- Consent by neighbors of OWB owners who do not meet setbacks at property line.
 - OWB cannot be more than 150 feet from building. Technical limits on moving OWB.
 - When adjacent property is not residential.
 - Is it binding or can it be withdrawn?
 - Consent “expires” upon compliance with ordinance at time of replacement or sale of property.
 - Consent of 100% or is a lesser standard acceptable upon a hearing from Board of Health.





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Modifying Stacks

- Stack height adjustments result in shorter setbacks.
 - Significant ground level effects occur when stack is obstructed or at or below roof level.
 - Some manufactures offer stack modification kits and others do not.
 - Could there be operational or warranty issues?
 - Retrofit emissions controls not widely available today





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Good Combustion Practices

- Operate according to manufacturer's instructions.
- Never start a fire with gasoline, kerosene, charcoal starter, or a propane torch.
- Do not burn any wood that does not meet the definition of clean wood.
- Build hot fires. A smoldering fire is not an efficient fire.
- Keep the doors of your hydronic heater closed unless you are loading or stoking the live fire.
- Regularly remove ashes from your hydronic heater into a metal container with a cover.





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Seasonal Considerations

- Seasonal operating factors
 - Limited use for hot water and not heating (24-48 hours per week).
 - Excessive dampering of boiler creates inefficient combustion and excessive smoke.
 - Public is more apt to be outdoors and impacted by outdoor wood smoke.
 - Would a seasonal restriction in ordinance be practical and how would it look?

