

Fairbanks PM_{2.5} Planning

1st in Series:

Overview & Emission Inventory Development

July 7, 2011

Overview

- Trends in complaints and PM_{2.5} concentrations
- Methods available to quantify benefits of controls in PM_{2.5} concentrations
- Studies undertaken to represent Borough activity/conditions
- Schedule to prepare Plan
- Control measure choices

Overview (cont.)

- Series of Assembly Briefings Planned:
 - ❖ Overview & emission inventory development (today)
 - ❖ Modeling/Source appointment
 - ❖ Regulatory framework
 - ❖ Control Measures
 - ❖ Progress towards attainment

Keeping Our Eye on the Ball – Particle Pollution and Public Health

It's not about regulation – It's about a serious health risk

We have real people with real health problems

“Sensitive Groups” – who are we protecting?

Alaska's future – *our children*

Alaska's pioneers – *our elders*

Keeping Our Eye on the Ball – Particle Pollution and Public Health (cont.)

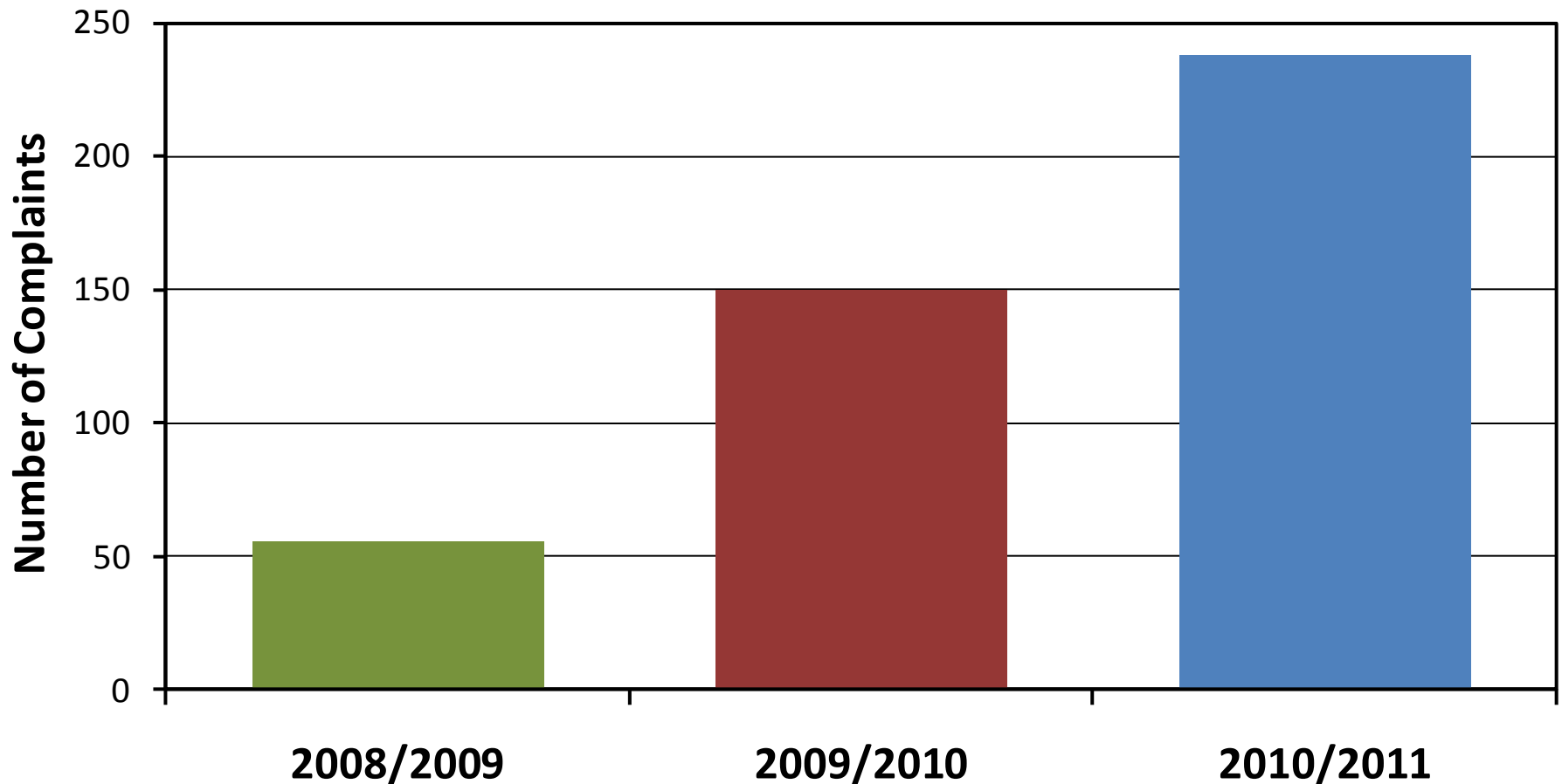
- Risks identified through Thousands of scientific studies published and peer reviewed
- Health effects associated with short-term exposure to fine particles include:
 - ❖ Premature death in people with heart and lung disease
 - ❖ Changes in heart rate variability; Irregular heartbeat; Non-fatal heart attacks
 - ❖ Increased hospital admissions, emergency room visits and doctor's visits for respiratory diseases
 - ❖ Increased respiratory symptoms such as coughing, wheezing and shortness of breath
 - ❖ Lung function changes, especially in children and people with lung diseases such as asthma.

Keeping Our Eye on the Ball – Particle Pollution and Public Health (cont.)

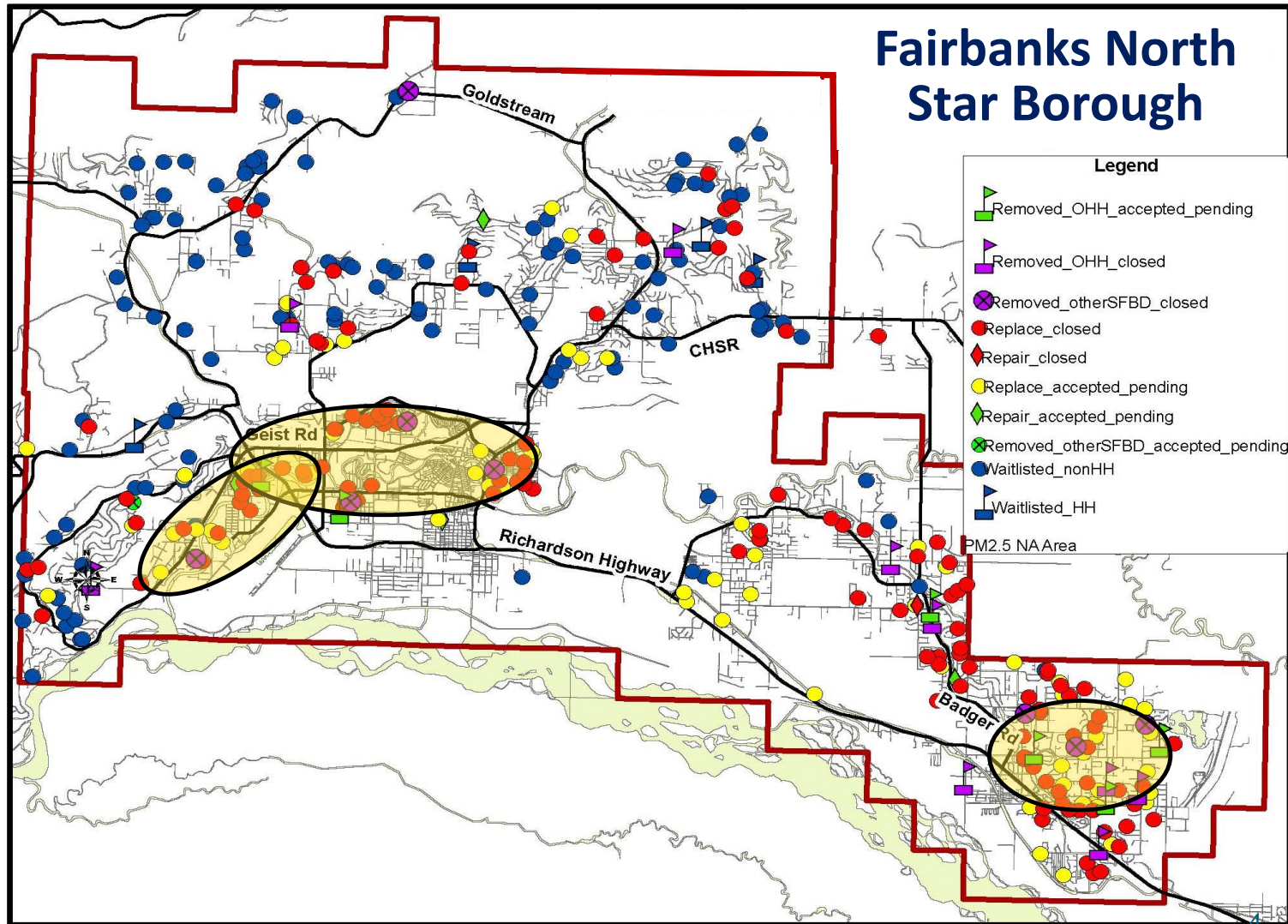
- Health effects associated with long-term exposure to fine particles include:
 - ❖ Premature death in people with heart and lung diseases, including death from lung cancer
 - ❖ Reduced lung function
 - ❖ Development of chronic respiratory disease in children
 - ❖ Reduced IQ

Trend in Winter Air Quality Complaints

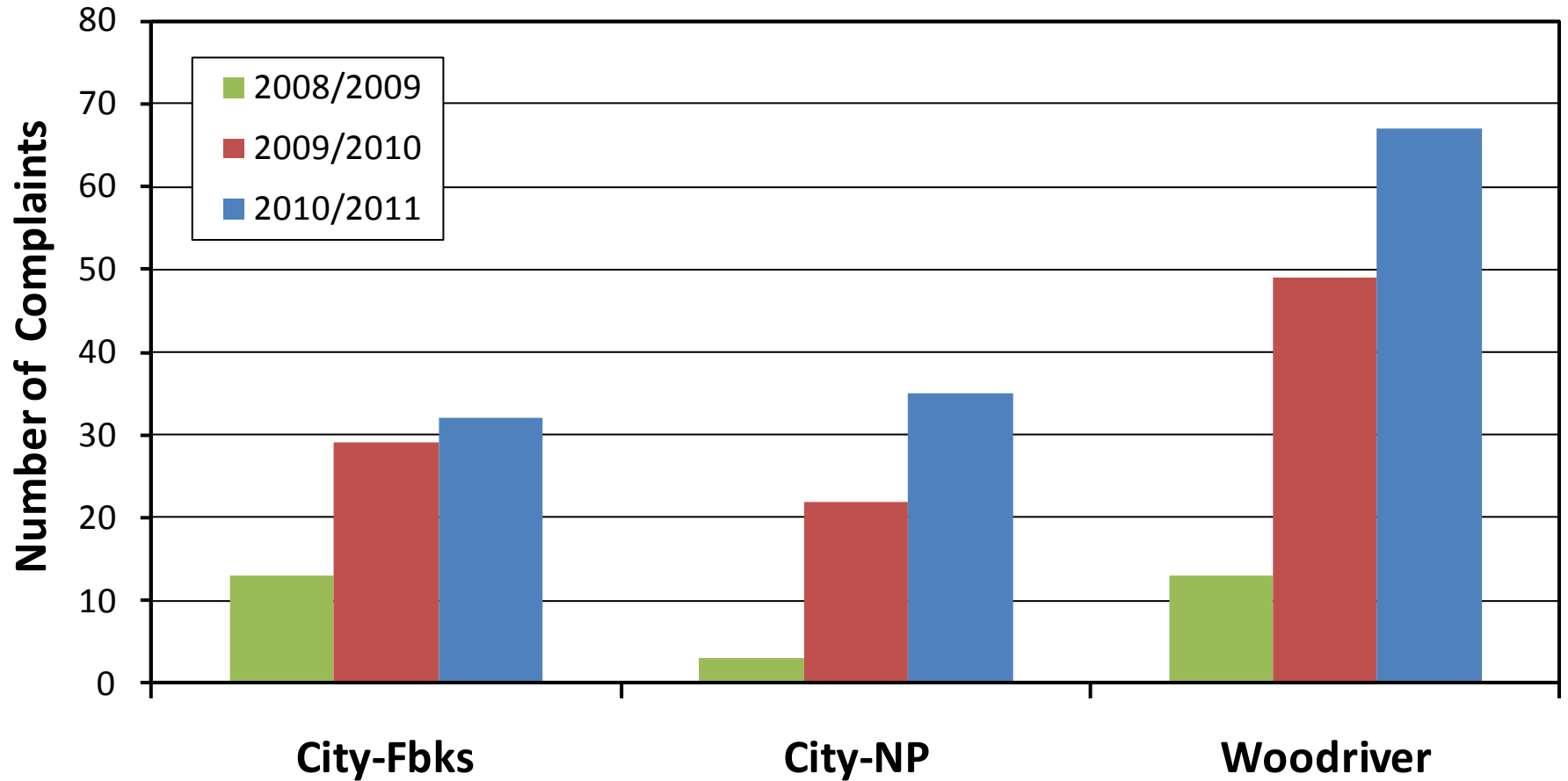
(1 September and 30 April)



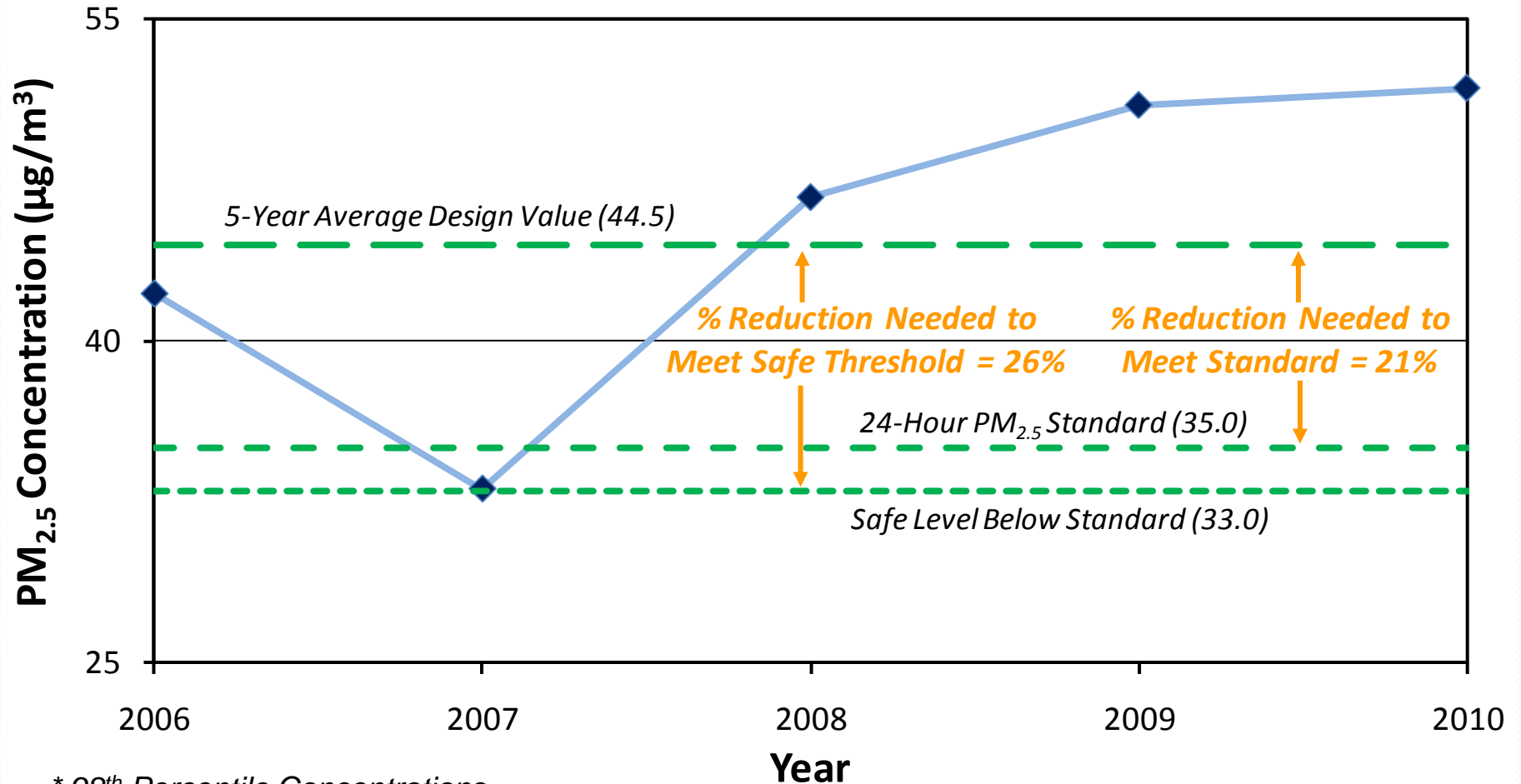
Wood Stove Change Out Program & Related Hot Spots



Trends in Winter Air Quality Hot Spot Complaints



Fairbanks PM_{2.5} Design Values* (2006-2010)



* 98th Percentile Concentrations

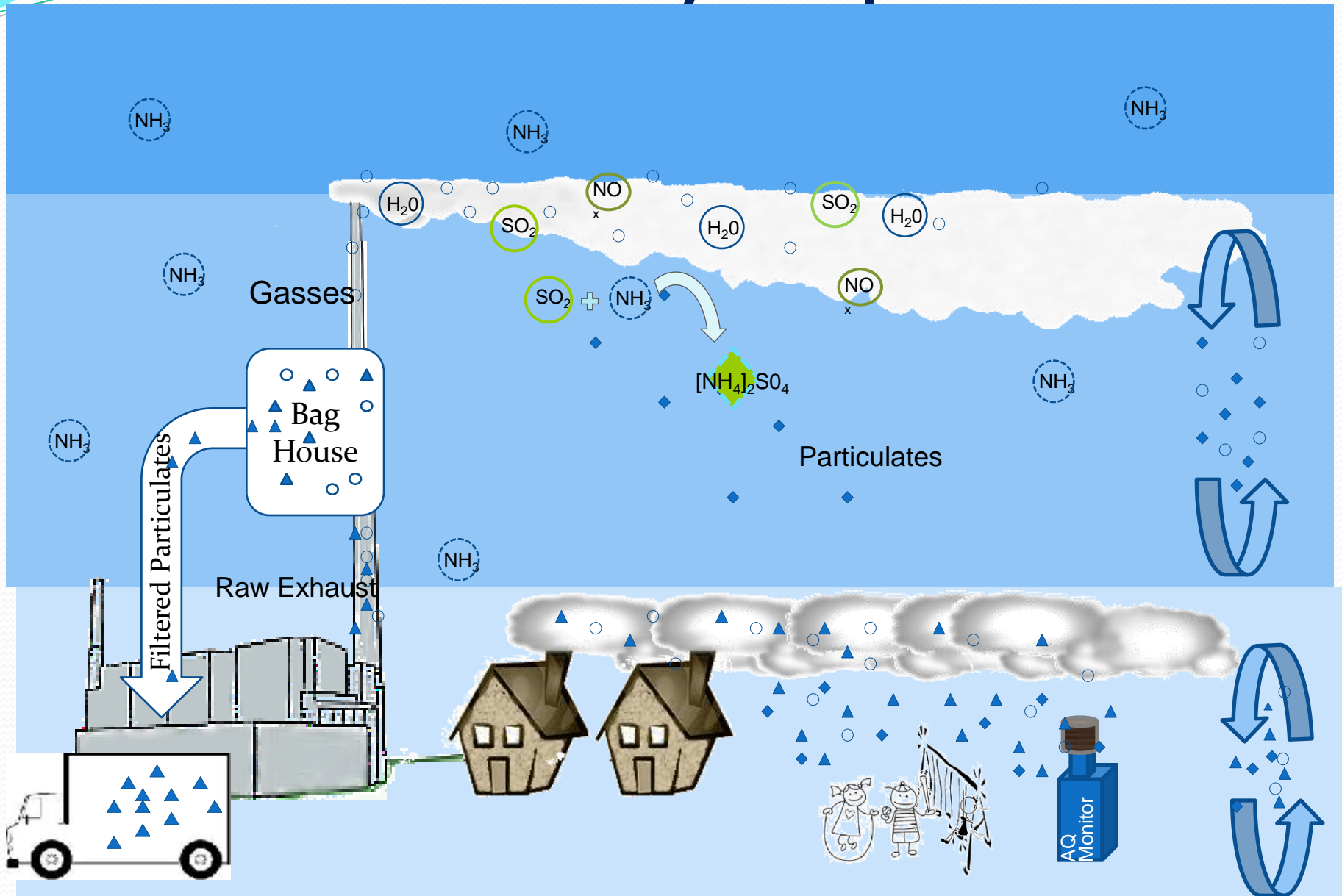
Design Value Issues

- Trend is in the wrong direction
- Assessment of progress towards attainment is **not** based on simple mass **but** changes in chemical compounds
 - ❖ Different sources emit different chemical compounds
 - ❖ Some compounds are emitted as fine particles (primary)
 - ❖ Some are emitted as gases that transform into particles in the atmosphere (secondary)
 - ❖ Controls have different effects on different compounds and related transformation processes

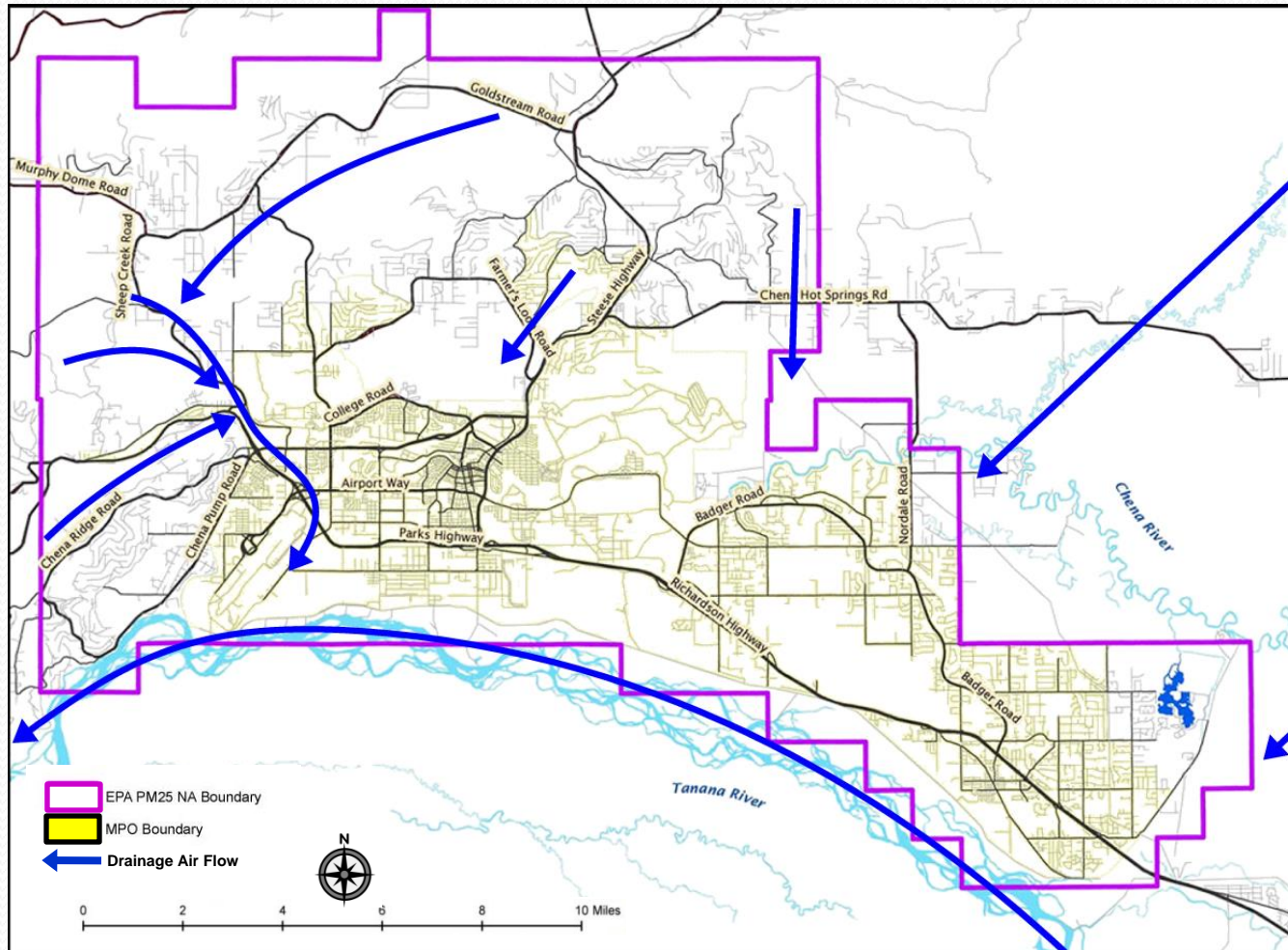
Fairbanks PM_{2.5} Modeling

- Analytical framework needed to assess how changes in emitted chemical compounds translate into ambient concentrations and design values
- Key inputs are accurate representations of meteorology and emissions
- Due to complexity of the chemistry, a variety of models are being pursued
 - ❖ Several universities (UAF, etc.)
 - ❖ Contractors and consultants

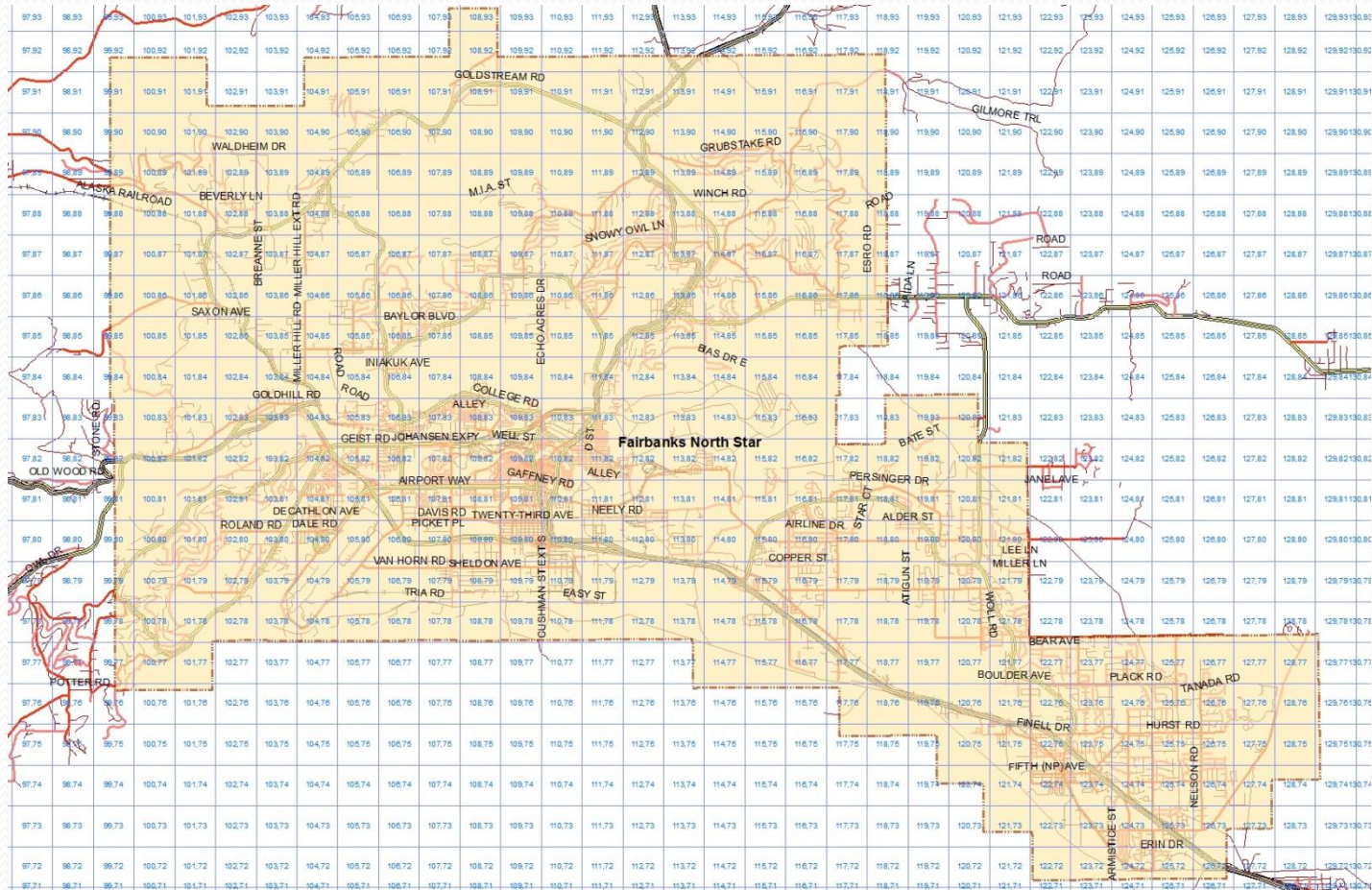
What models try to represent



Fairbanks PM_{2.5} Nonattainment Area

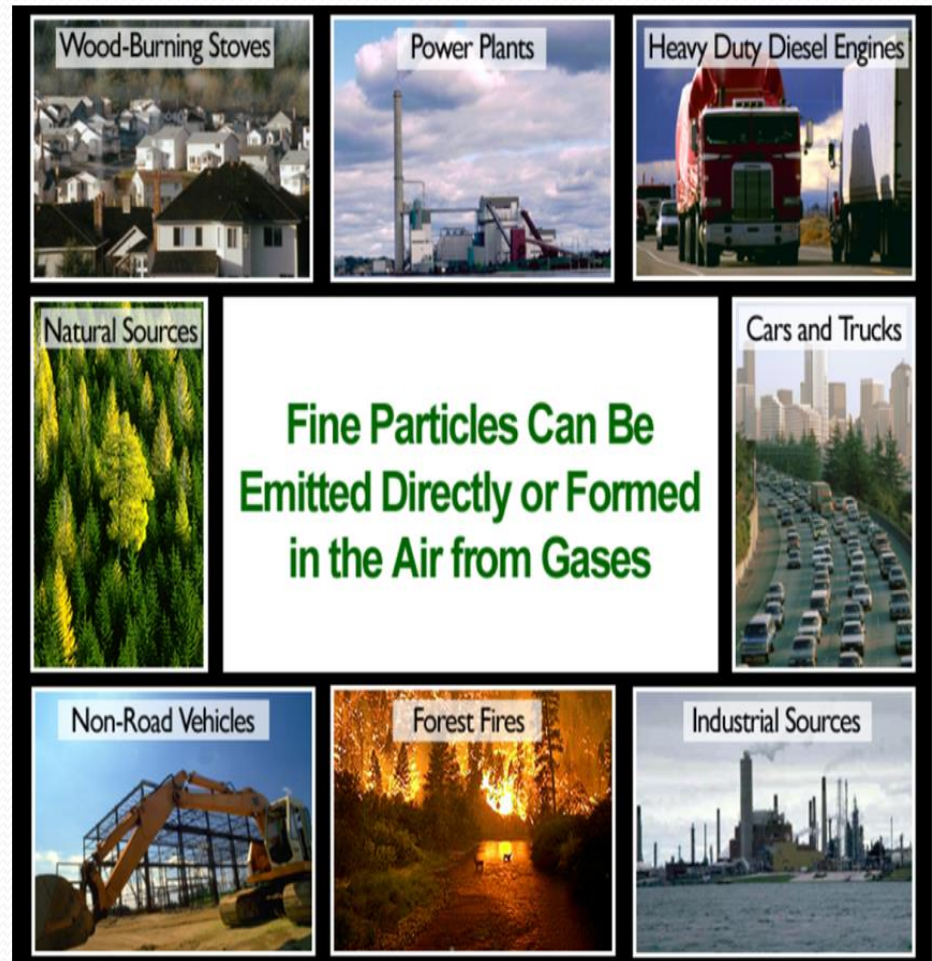


Fairbanks PM_{2.5} Nonattainment Area Modeling Grid



Fine Particulate Matter Sources

- Fine particulates are typically formed as a result of fuel combustion
- Particles can be directly emitted from sources like diesel trucks and solid-fuel burning stoves or they can form when gases emitted from power plants, industries and automobiles react in the air.



Local Fairbanks PM_{2.5} Sources

- Residential and Commercial Space Heating



- Motor Vehicles, Aircraft, Rail, and Heavy Equipment



- Local Industry and Power Generation

A little more Local Fairbanks PM_{2.5} Sources

Residential Space Heating & Motor Vehicles



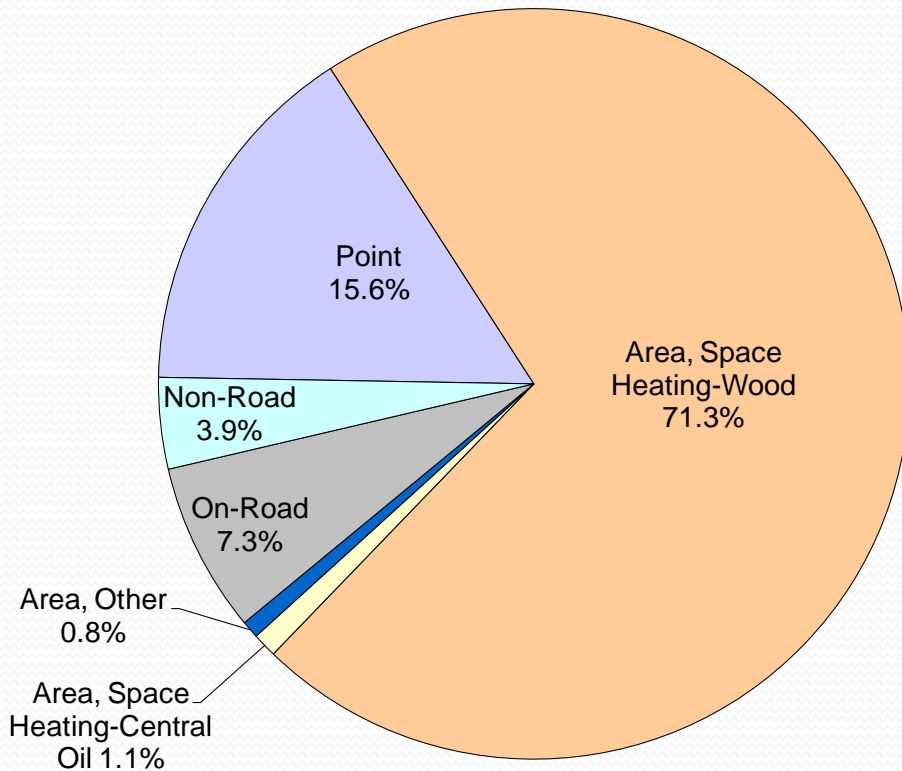
A little more Ingenuity

- Residential and Commercial Space Heating & Motor Vehicles

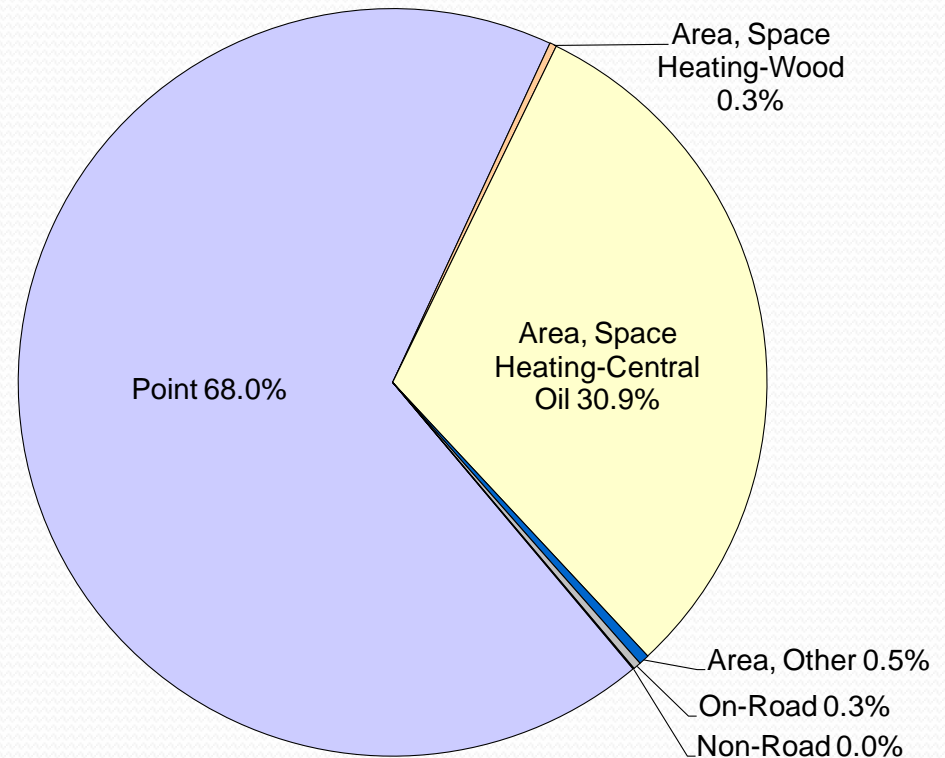


Draft Emission Estimates by Source (Winter 2008)

Fine Particles (PM_{2.5})



Sulfur Dioxide (SO₂) Gas



Studies Conducted to Improve Fairbanks Emission Estimates

- Telephone survey of space heating by zip code
- Space heating appliance survey
- Wood storage and drying time
- Laboratory measurements of vehicle emissions
- Survey of emissions from each point source in the area
- Laboratory measurements of emissions from fuels used in Fairbanks homes
- Particle into liquid sampler (PILS) measurements of ambient aerosols

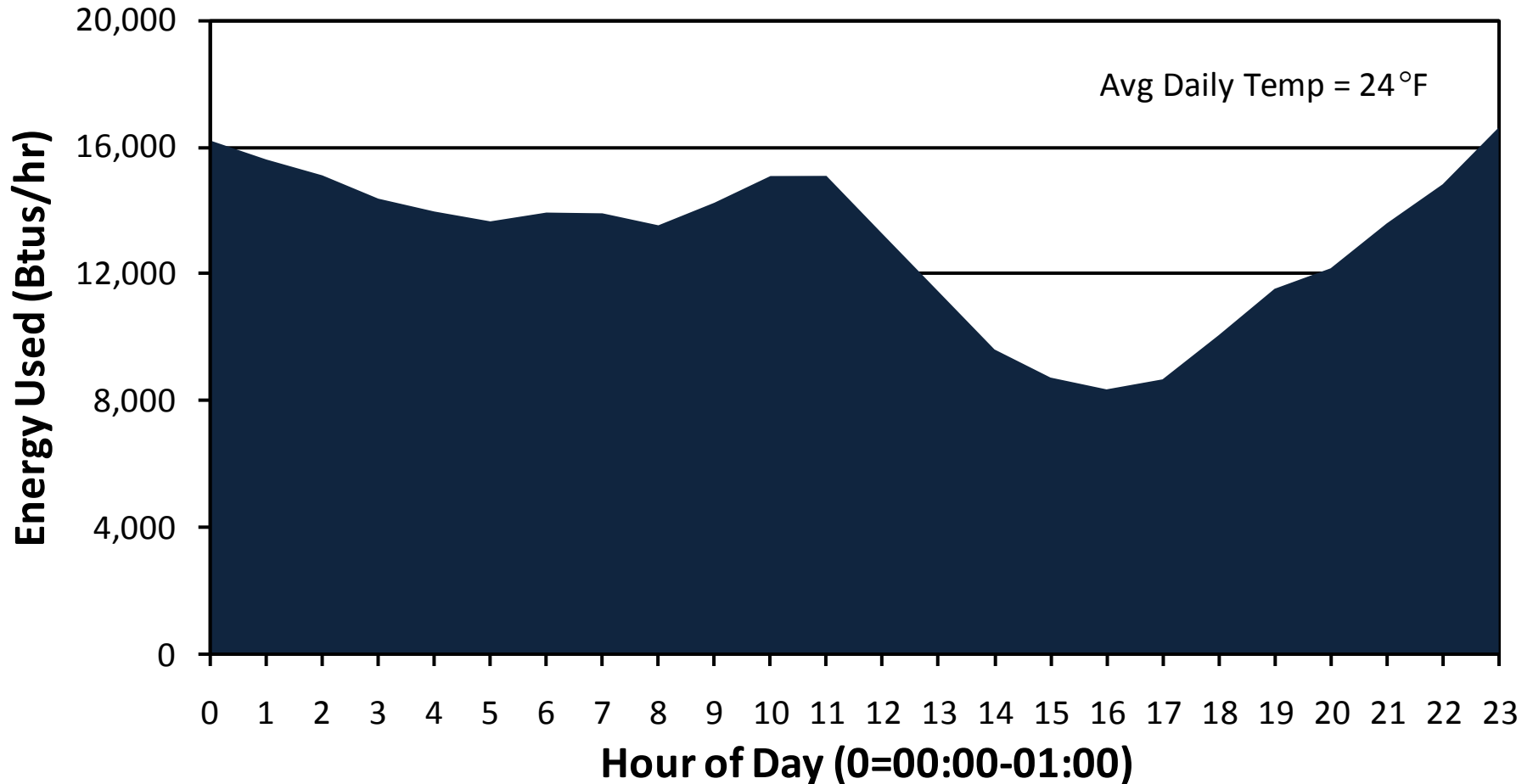
2011 Home Heating Survey Device Counts

Statistic	Parameter	Survey Results	
Total Estimated Devices for Fairbanks	Wood	8,623	22.53%
	Central Oil	20,265	52.70%
	Portable	1,294	2.95%
	Direct Vent	4,635	10.80%
	Natural Gas	1,006	2.60%
	Coal Heat	359	0.82%
	District Heat	755	2.22%
	Electric Device	683	1.62%
	Other	1,509	3.75%
	Total	39,129	100%

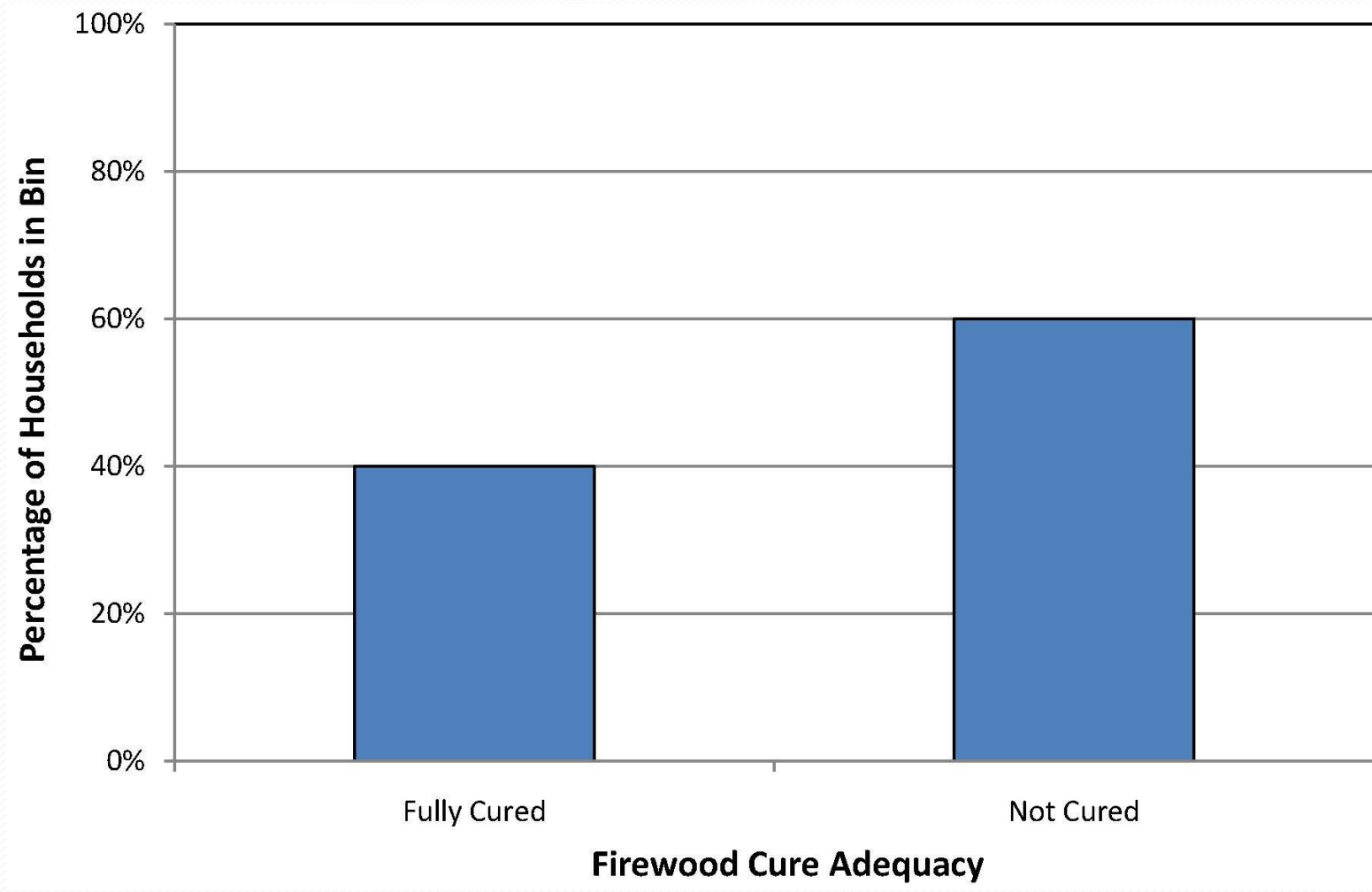
Studies Conducted to Improve Fairbanks Emission Estimates

- Telephone survey of space heating by zip code
- Space heating appliance survey
- Wood storage and drying time
- Laboratory measurements of vehicle emissions
- Survey of emissions from each point source in the area
- Laboratory measurements of emissions from fuels used in Fairbanks homes
- Particle into liquid sampler (PILS) measurements of ambient aerosols

Pilot Study Diurnal Profile of Wood Heating Only (Weekday, Average Day Temperature)



Summary of Firewood Cure Adequacy



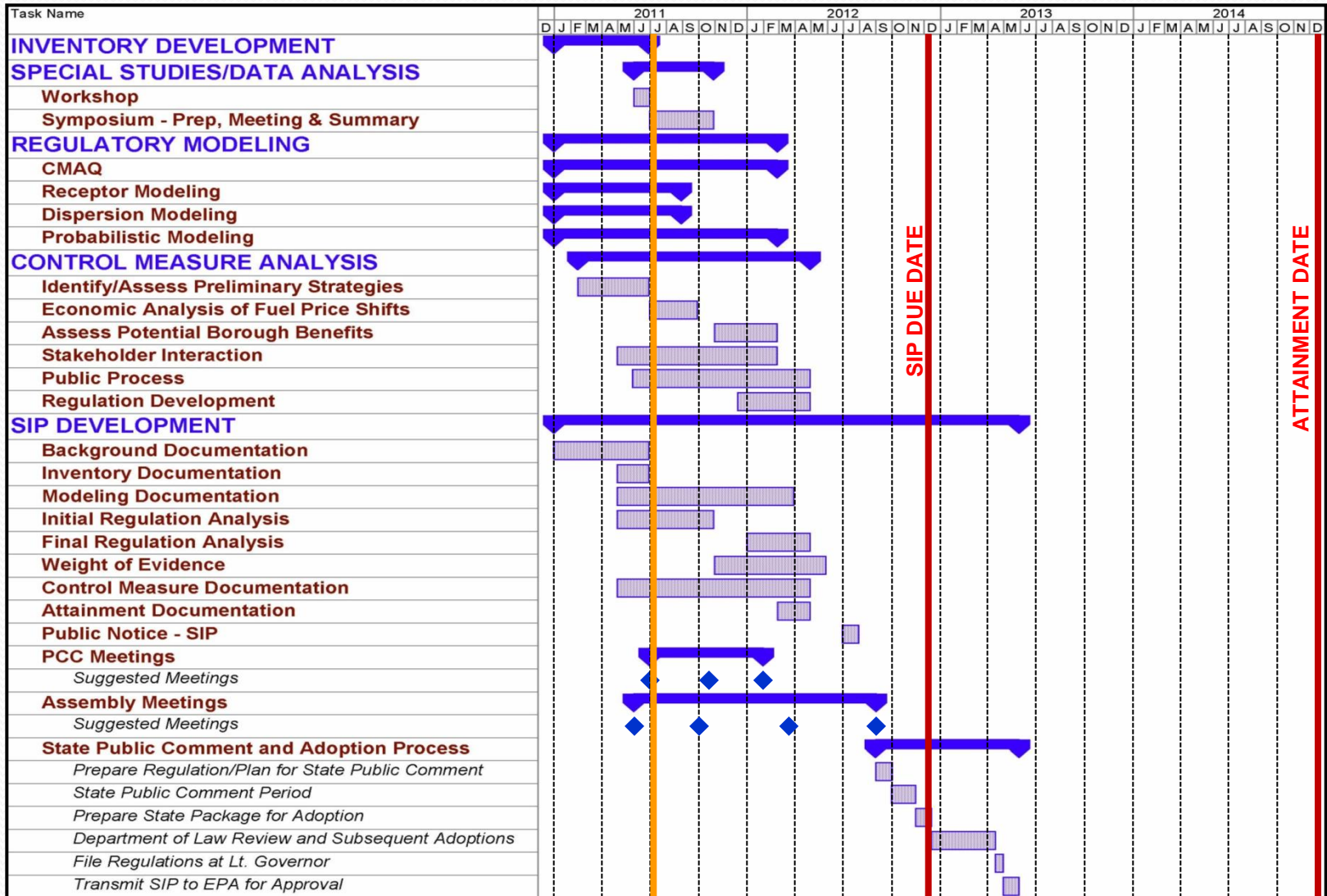
Studies Conducted to Improve Fairbanks Emission Estimates

- Telephone survey of space heating by zip code
- Space heating appliance survey
- Wood storage and drying time
- Laboratory measurements of vehicle emissions
- Survey of emissions from each point source in the area
- Laboratory measurements of emissions from fuels used in Fairbanks homes
- Particle into liquid sampler (PILS) measurements of ambient aerosols

Local Study Results Improve Borough Emission Estimates

- Suggest that wood emissions are greater than in previous estimates
- Suggest that motor vehicle emissions are less than in previous estimates
- Daily profiles from most sources will be improved
- Chemical profiles for space heating fuels will be more representative of Borough fuels
- Improved emission estimates will improve model performance

Fairbanks PM_{2.5} SIP Schedule



CURRENT DATE

Control Measure Issues

- Existing control programs include:
 - ❖ Wood stove change out
 - ❖ Limit locations where new OWBs can be installed
 - ❖ Burn dry wood
 - ❖ Public education
- How far will existing measures take us towards meeting EPA standards?
- Best estimate, without modeling, suggests minimum of 2,600 uncertified wood stoves would need to be changed out to meet EPA PM_{2.5} standard
 - ❖ Reductions from 200 stoves changed out to date cannot be seen in the monitoring data
 - ❖ Dry wood burning, OWB installation limits and public education are new and no estimates of benefits are available

Control Measure Issues (cont.)

- Additional control measures will be needed to ensure attainment
- Since EPA has limits on voluntary measure benefits, additional resources and authority will be need to implement controls
- Looking for input from public and Assembly on which measures to use

Public Education

- Critical to changing behavior and reducing air pollution
- Health effects
 - ❖ Reduce impacts on people in Borough
 - ❖ Improve quality of life
 - ❖ Avoid decisions to no longer live here
- CCHRC studies provide local data to guide better wood burning
 - ❖ When to cut wood
 - ❖ Time needed to dry wood
 - ❖ Cost of burning wet wood
 - ❖ Use moisture meters
- What can public do to reduce pollution?
 - ❖ Wood stove change out program
 - ❖ Burn dry wood (Split, Stack, Store & Save)
 - ❖ Switch to cleaner fuels during poor air quality

Options to Reduce Air Pollution

- Local options
 - ❖ Wood burning limits (sale of dry wood, etc.)
 - ❖ Shift to #1 heating oil as Borough has
 - ❖ Diesel retrofits
- State options
 - ❖ Wood burning limits (curtailment during episodes)
 - ❖ OWB standards
 - ❖ Limit wood cutting on public lands to only taking split wood
 - ❖ Permitted facility emission controls
 - ❖ Large scale natural gas availability (e.g., pipeline)
- Federal options
 - ❖ Tighter wood stove standards (technology forcing)
 - ❖ National standards on fuels & equipment
 - ❖ Additional funds for local programs
- Have to work together to assemble a mix of acceptable measures₄₁

Next Steps

- Series of Assembly Briefings Planned:
 - ❖ Overview & emission inventory development (today)
 - ❖ Modeling/Source appointment
 - ❖ Regulatory framework
 - ❖ Control Measures
 - ❖ Progress towards attainment
- Questions or Feedback Welcome