Fairbanks PM_{2.5} Planning 1st in Series: Overview & Emission Inventory Development

July 7, 2011





- 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

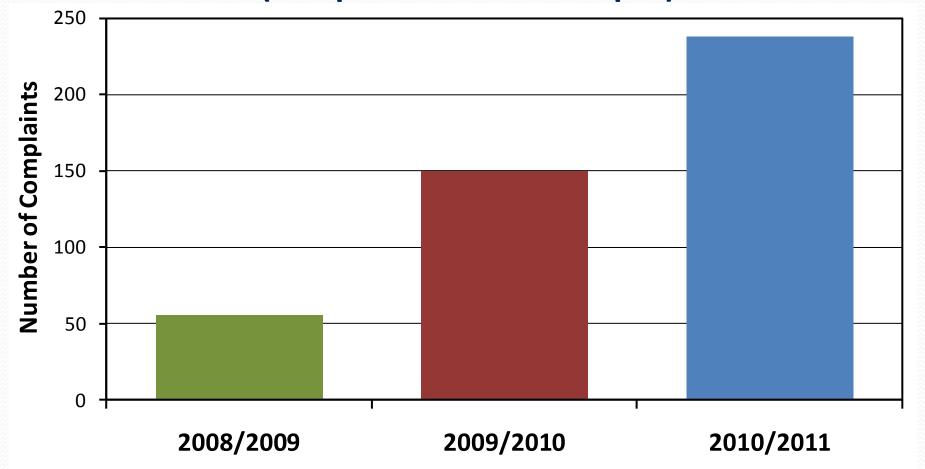
Keeping Our Eye on the Ball – Particle Pollution and Public Health (cont.)

- Risks identified through Thousands of scientific studies published and peer reviewed
- Health effects associated with <u>short-term exposure</u> 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.

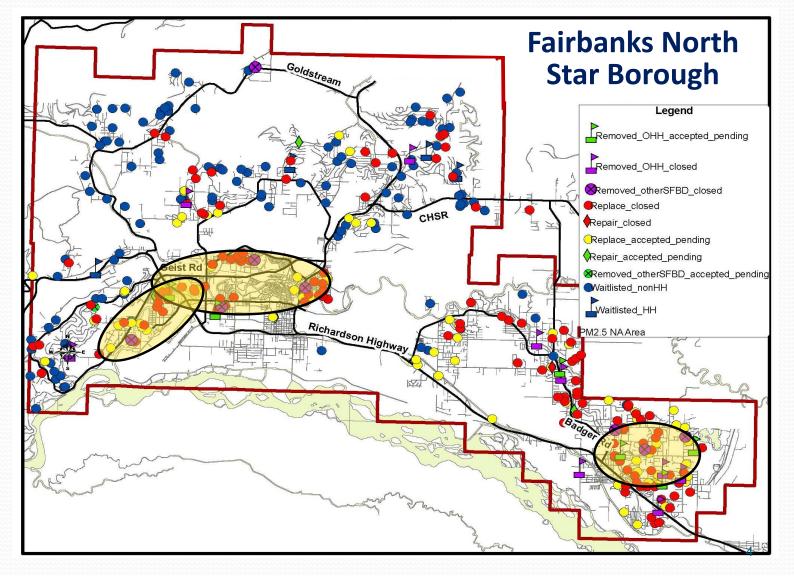
Keeping Our Eye on the Ball – Particle Pollution and Public Health (cont.)

- Health effects associated with <u>long-term exposure</u> 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

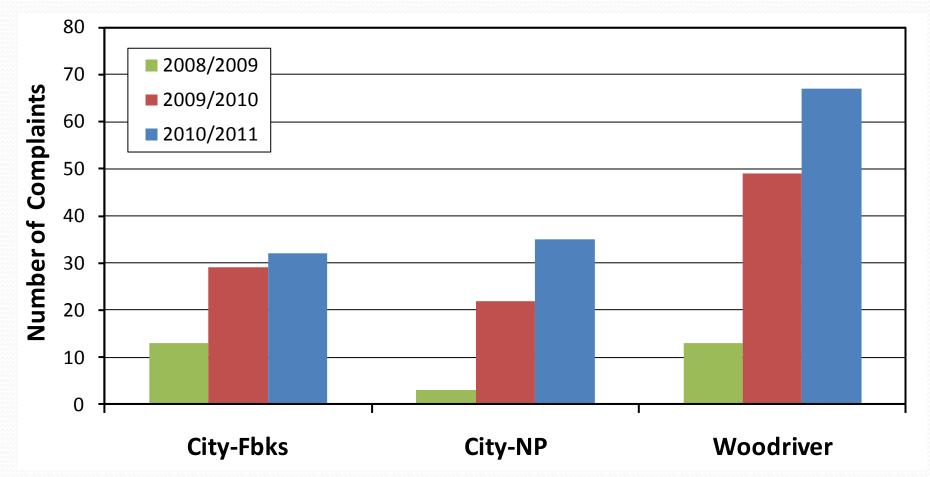
Trend in Winter Air Quality Complaints (1 September and 30 April)



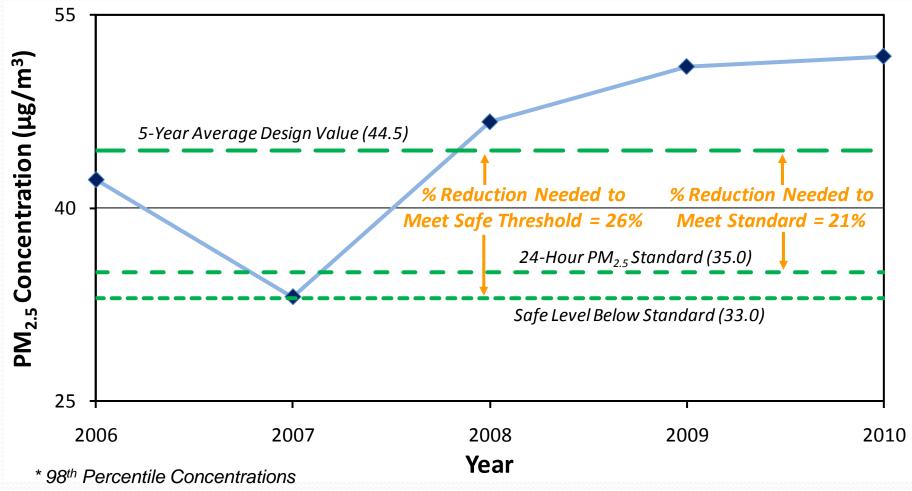
Wood Stove Change Out Program & Related Hot Spots



Trends in Winter Air Quality Hot Spot Complaints



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



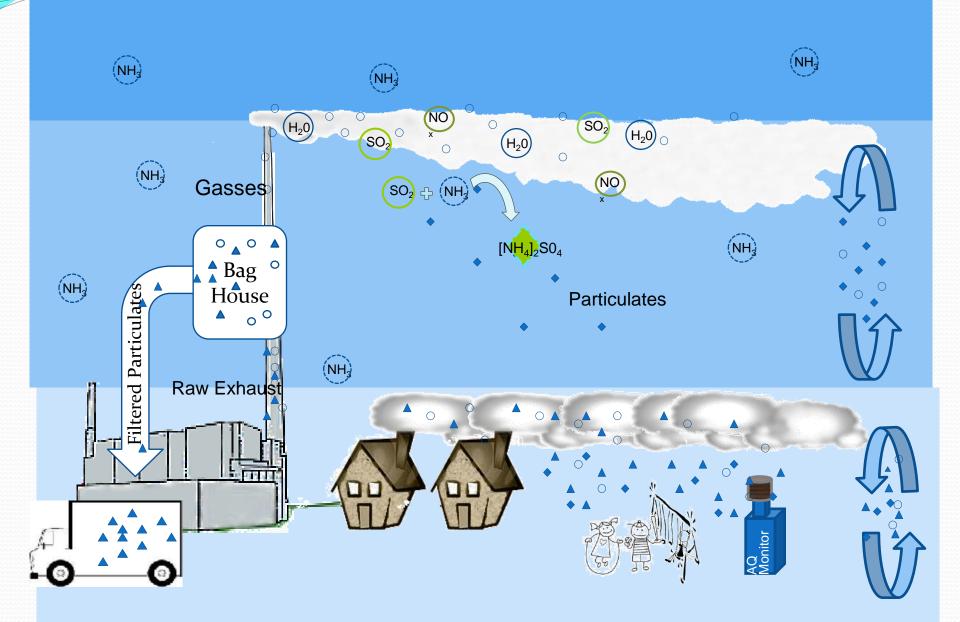
Design Value Issues

- Trend is in the wrong direction
- Assessment of progress towards attainment is <u>not</u> based on simple mass <u>but</u> 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

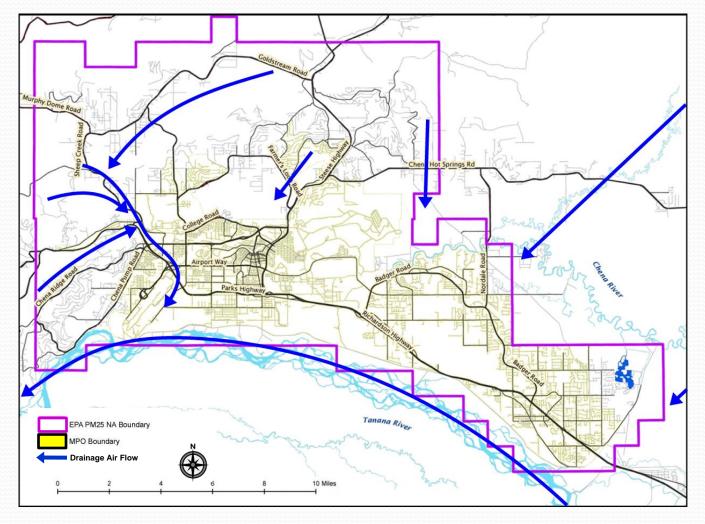
Fairbanks PM_{2.5} Modeling

- Analytical framework needed to assess how changes in emitted chemical compounds translate into ambient concentrations and design values
- Key inputs are accurate representations of <u>meteorology</u> and <u>emissions</u>
- 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

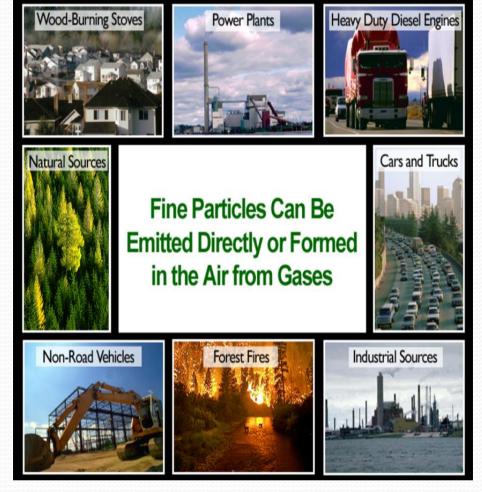


Fairbanks PM_{2.5} Nonattainment Area Modeling Grid

97,93	98,93	1000	100.93	101,93	102,93	103,93	104,93	105,93	106,93	107.98	108,93	109,93	110,93	111,93	112,93	113,93	114,93	119/92	116.30	117,93	118,93	119,93	120,93	121,93	122,93	125,93	124,93	125,93	126,93	127,93	128,93	129,93130
97,92	96.92	99,92	100.92	101,92	102,92	103,92	104,92	105,92	106,92	107.92	108,92	109,92	110,92	111,92	112,92	11398	102	115,92	110.92	117,92	118.92	119,92	120,92	121,92	122,92	123,92	124,92	125,92	126,92	127,92	128,92	129,92130
97,91	98,91	99,91	100,91	101,91	102,91	103,91	104,91	105,91	106,91		OLDSTF 108,91			111,91	112,91	113,91	114,91	115,91	116,91	117,91	113,91	119.91	128-91	121,91	122,91	123,91	124,91	125,91	126,91	127,91	128,91	129,9113
97 90	98,90	99,90	100,90	101,90	102,90 WALDHE	103,90	104,90	105,90	106,90	107.90	108,90	109,90	110,90	111,90	112,90	113,90	114.90 GRUBST	115.90	. 116.90	117,90	118.90	119,90	120,90	MORE 1 121,90	RL 122,90	123,90	124,90	125,90	126,90	127,90	128,90	129,9013
97.55 	30.35	98.89	100,89	101,89	102,89	103,89	104,89	105,89	106,89	107,89	108.89 MIA-S	109,89 ST	110,89	111,89	11289	11389	114.89	115,89	110.89	117,89	118.89	119,89	120,89	121,89	122,99	123,89	124,89	125,89	126,89	127,89	128,89	129,8913
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97,86	96,80	99,80	100,86	101,98	V maker	103,80	104,88	105,80	106.80	107,86	108,80	109,86 0	110,86	115,80	112,86	112,80	114.88	115,80	110,80	117,80	11001	10707		RA	ROAD	23,86	12900	and	120,80	127,86	128,86	129,8013
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State S	56,79	90.00	100.79	101,79	102,79	103,79	104/79	105,79	AN HOR 106,79	107,79	108,79	AVE 109,79	110,79	111.79	112,79	113,79	11479	CO 17879	PPER ST	4	118,79		12079	MILLER		123,79	124,79	125,79	126,79	127,79	128,79	129,791
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97.76	IS 76	RD -	100,76	101,76	102,76	103,76	104,76	105,76	105,76	107,76	108,76	109,76	110,76	111,76	112,76	113,76	114,76	115,76	116,76	17.76	118,76	11978	B(121.76		AFI	124,70	TA	NADA RI		128,76	129,761
17.75	EP?	59.75	100.75	101.75	102.75	103,75	104,75	105.75	106.75	107.75	108.75	109.75	110,75	111.75	112,75	113,75	114.75	115.75	116,75	117.75	118,75	119.75	120.75	F#	VELL DR	123,75	124.75	URST R	D 12075	127.75	128,75	129,751
7,74	98,74	99,74	100,74	101,74	102,74	103,74	104,74	105,74	106,74	107,74	108,74	109,74	110,74	111,74	112,74	113,74	114,74	115,74	116,74	117,74	118,74	1	120 74		H (NP)A	NIT V	12474	125,74 0		127.74		129,741
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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

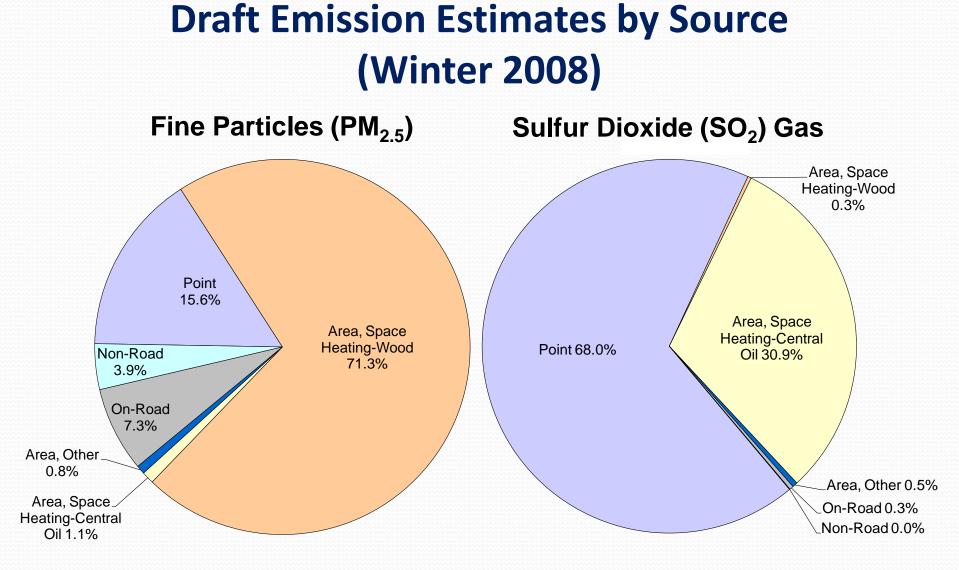
Residential Space Heating & Motor Vehicles



A little more Ingenuity

Residential and Commercial Space Heating & Motor Vehicles





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

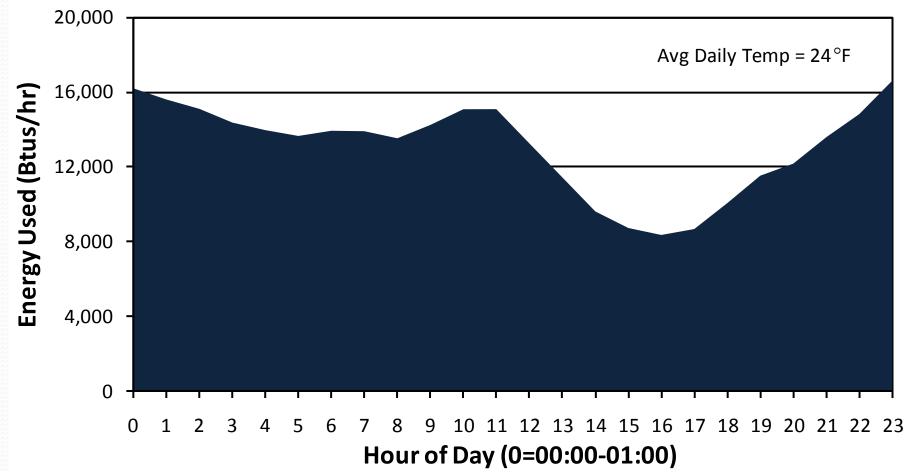
2011 Home Heating Survey Device Counts

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

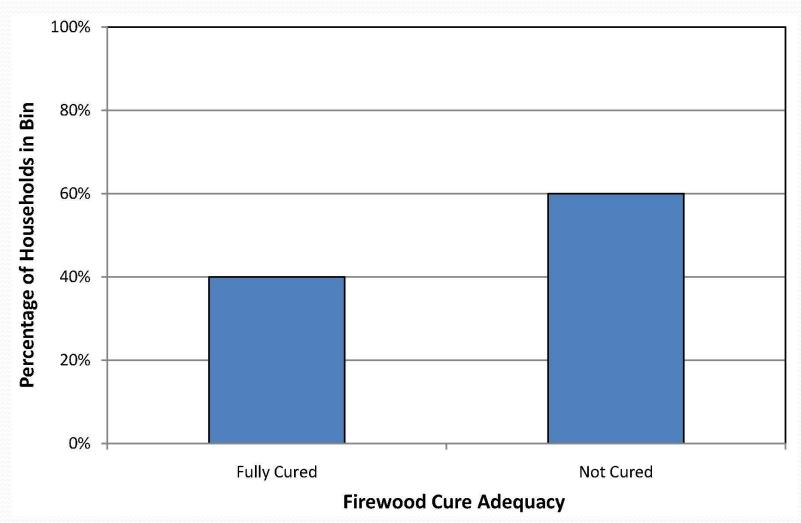
Studies Conducted to Improve Fairbanks Emission Estimates

- Telephone survey of space heating by zip code
- Space heating appliance survey
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- 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
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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

Task Name	DIEN	201 1 A M J			EM	20 A M I	12	ON	20 1 A M I		JEM	201	4 J A S O N
INVENTORY DEVELOPMENT											5 1 10		
SPECIAL STUDIES/DATA ANALYSIS													
Workshop													
Symposium - Prep, Meeting & Summary			i	1									
REGULATORY MODELING		•											
CMAQ		÷ 1											
Receptor Modeling	Ú.												
Dispersion Modeling		•	-										
Probabilistic Modeling		•	_					빈					- <u></u>
CONTROL MEASURE ANALYSIS		•						AT					ATTAINMENT DATE
Identify/Assess Preliminary Strategies													
Economic Analysis of Fuel Price Shifts								5					1
Assess Potential Borough Benefits								DO					Ψ
Stakeholder Interaction	1							SIP					Z
Public Process								S					Ā
Regulation Development													E
SIP DEVELOPMENT													► <mark>`</mark> <
Background Documentation													
Inventory Documentation													
Modeling Documentation										1			
Initial Regulation Analysis													
Final Regulation Analysis													
Weight of Evidence													
Control Measure Documentation													
Attainment Documentation													
Public Notice - SIP													
PCC Meetings		- -											
Suggested Meetings			· K										
Assembly Meetings													
Suggested Meetings			•			•							
State Public Comment and Adoption Process													
Prepare Regulation/Plan for State Public Comment													
State Public Comment Period	-												
Prepare State Package for Adoption								L					
Department of Law Review and Subsequent Adoptions													
File Regulations at Lt. Governor													
Transmit SIP to EPA for Approval							<u> </u>	!					

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



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