Airports and Air Toxics

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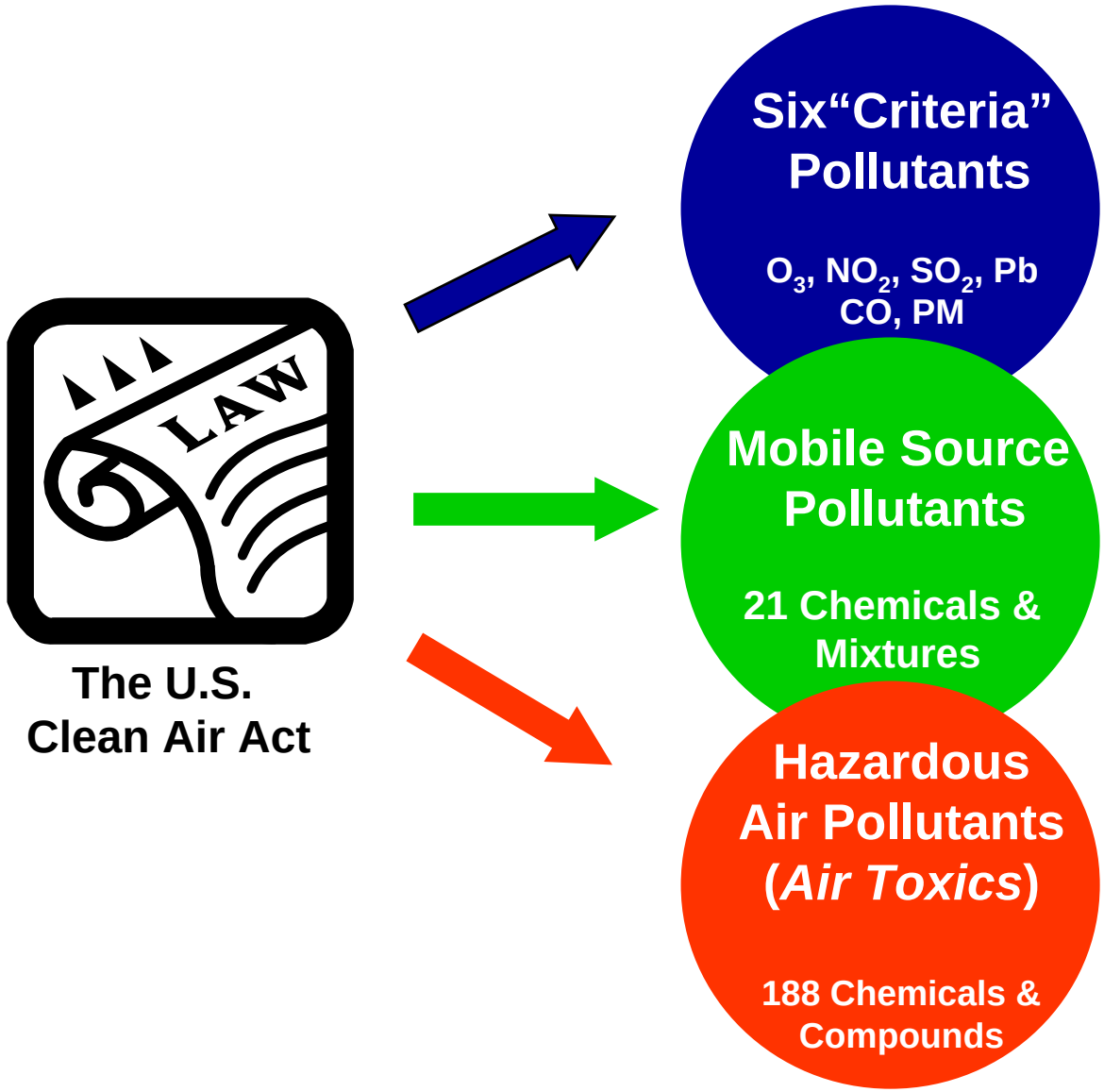
Good Afternoon!

- What are air toxics?
- Where do they come from and how can they harm us?
- How do airports contribute to air toxics?
- What meaningful assessments can be done?

What do we mean by “Air Toxics?”



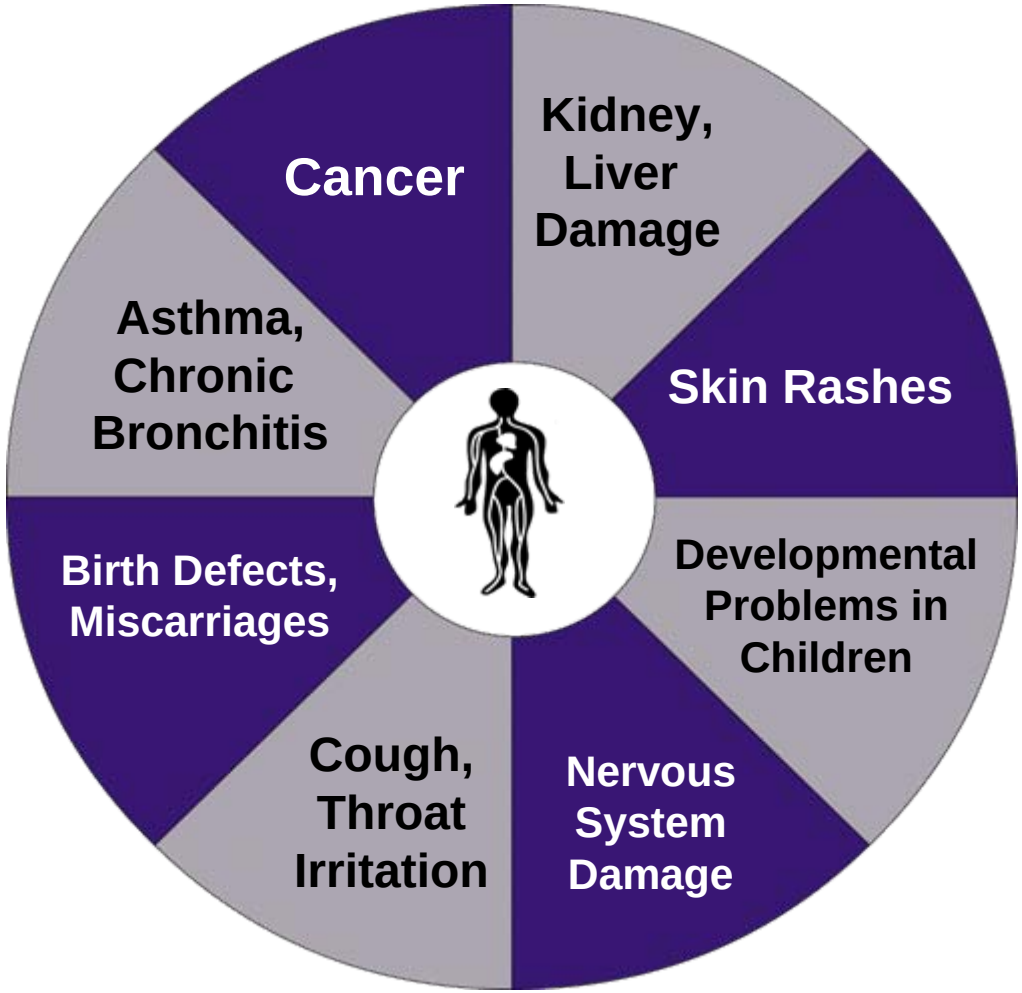
What kinds of chemicals are air toxics?

- Volatile Organic Compounds (VOCs) & Carbonyls
  - **Benzene**
  - **Acetonitrile**
  - **Methylene chloride**
  - **Vinyl chloride**
  - **Formaldehyde**
  - **Acetaldehyde**
- Semivolatile Organic Compounds (SVOCs)
  - **Dioxin**
  - **Polynuclear aromatic hydrocarbons**
  - **PCBs**
- Pesticides
  - **Lindane**
  - **2,4-D**
  - **Methoxychlor**
- Inorganic Compounds
  - **HCl**
  - **Hydrazine**
  - **H_2SO_4**
  - **Phosgene**
- Metal Compounds
  - **Lead**
  - **Mercury**
  - **Arsenic**
- Miscellaneous Others
  - **Radionuclides (e.g., radon)**
  - **Glycol ethers**
  - **Fine mineral fibers**

Why are air toxics a problem?

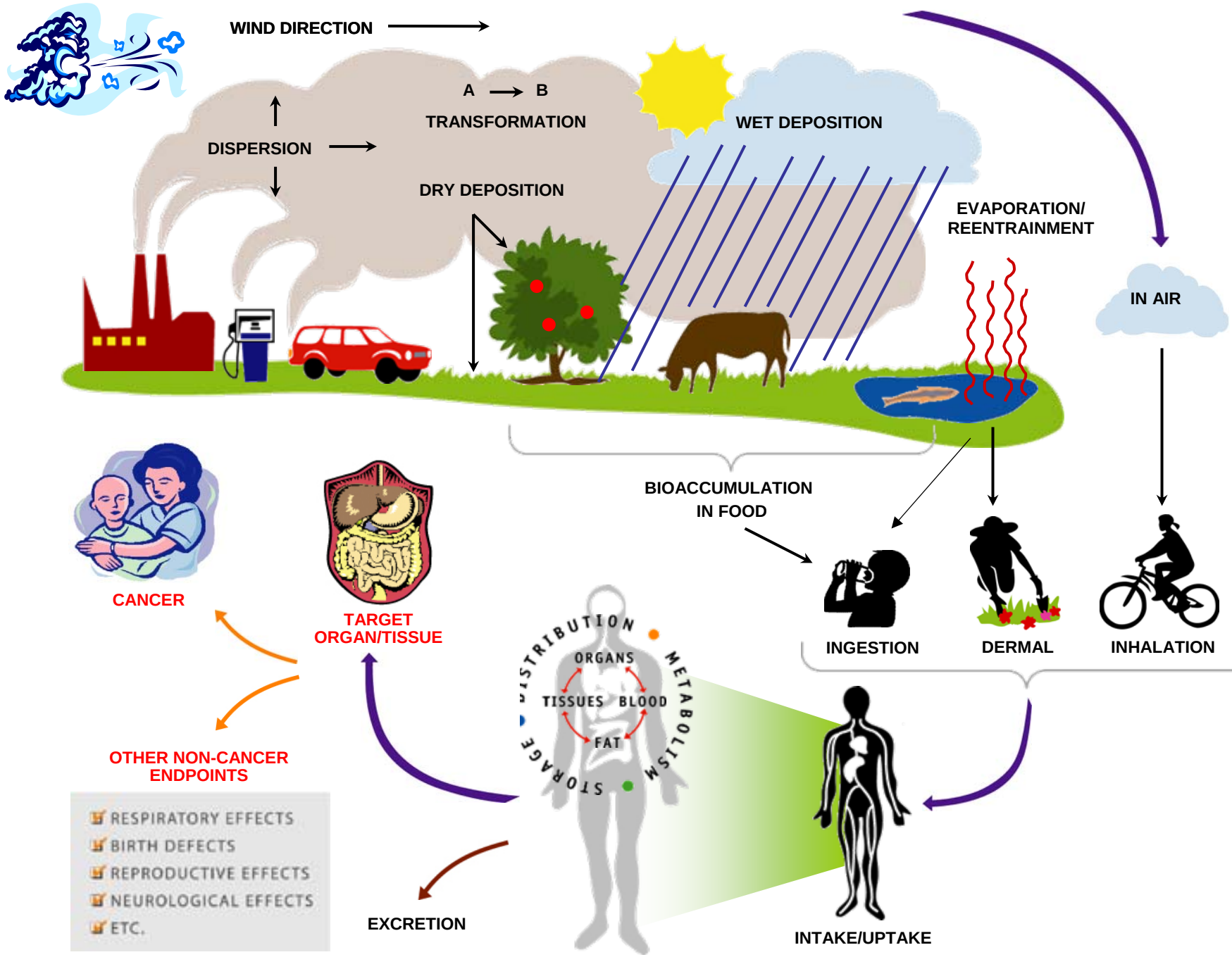
Millions of Sources

Many are Highly Toxic



Some Persist & Bioaccumulate

Sources/Populations Colocated


WIND DIRECTION
A → B
TRANSFORMATION
DISPERSION
DRY DEPOSITION
WET DEPOSITION
EVAPORATION/
REENTRAINMENT
IN AIR
BIOACCUMULATION
IN FOOD
CANCER
TARGET
ORGAN/TISSUE
INGESTION
DERMAL
INHALATION
DISTRIBUTION
METABOLISM
STORAGE
ORGANS
TISSUES
BLOOD
FAT
OTHER NON-CANCER
ENDPOINTS
RESPIRATORY EFFECTS
BIRTH DEFECTS
REPRODUCTIVE EFFECTS
NEUROLOGICAL EFFECTS
ETC.
EXCRETION
INTAKE/UPTAKE

There Are Sources Everywhere!

Courtesy of Sustaining the Environment and Resources for Canadians

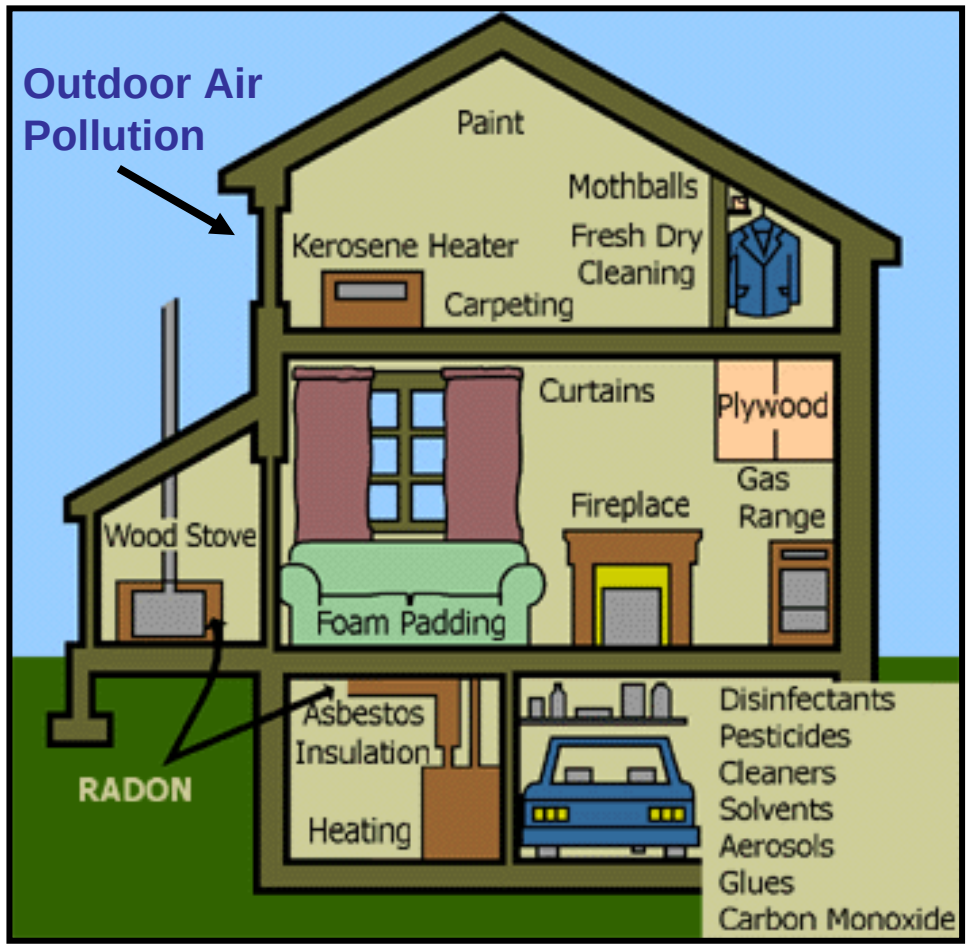
Including Airports!

Indoor Sources

Indoor air can become contaminated from numerous sources

Indoor air can have significantly higher concentrations of air toxics than outdoor air (on average, 2 to 5 times more)

EPA currently does not regulate indoor sources of air toxics



Major Sources

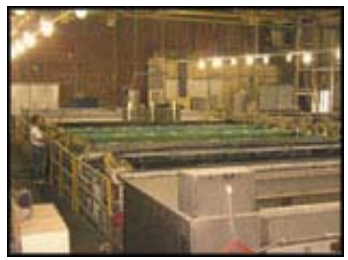
Stationary sources that release ≥10 tons per year (TPY) of any one HAP or ≥ 25 TPY of a combination of HAPs

EPA has listed 174 major source categories for regulation

Area Sources

Stationary sources that emit <10 tons per year of a single air toxic, or <25 tons per year of a combination of air toxics

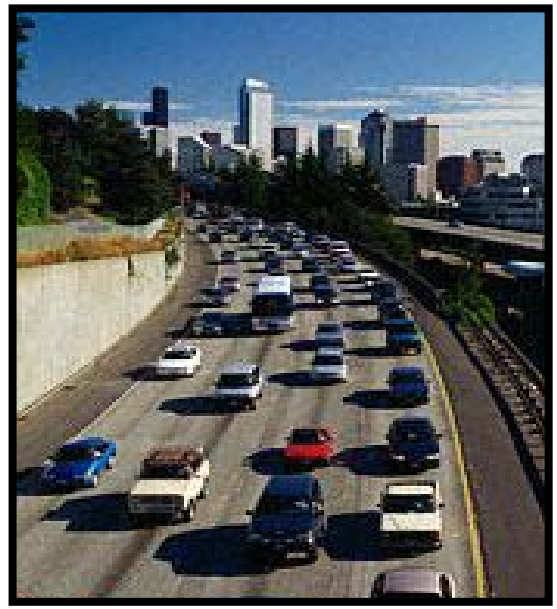
- **Area sources tend to be smaller facilities**
  - ✓ **Gasoline stations**
  - ✓ **Dry cleaners**
  - ✓ **Paint shops**
  - ✓ **Small electroplaters**



- **EPA has listed 70 area source categories to be regulated**

Mobile Sources

Much of the historical focus of mobile source emissions reduction has been on on-road cars, trucks, and their fuels



Non-road engines are also significant sources of air toxics and are coming under increasing focus

So, what about airports?

- **Off-Road Mobile Sources**
  - Aircraft
  - Ground Support Equipment (GSE)
  - Construction Equipment
- **On-Road Mobile Sources**
  - Cars, Trucks, Buses, Shuttles
- **Large Stationary Sources**
  - Boilers, Generators

Airport Sources - continued

- **Smaller Sources**
  - Maintenance
  - Painting/depainting
  - Tanks
  - Kitchens
  - Chemical milling
  - Parts cleaning
  - Grounds keeping and other maintenance
  - Electroplating
  - Etc.

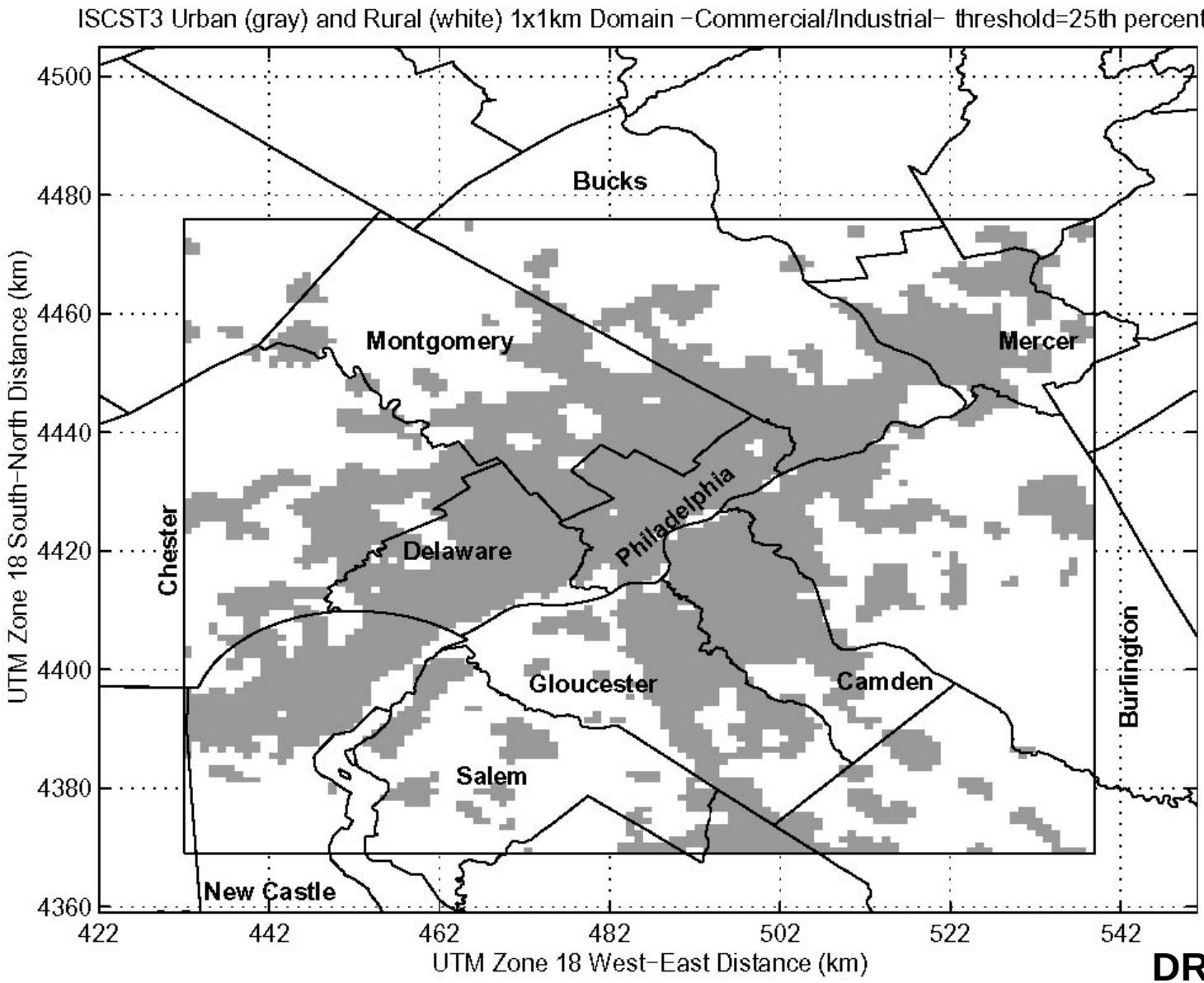
Some Recent Airport Experiences

Draft Results from the *Air Toxics Assessment The City of Philadelphia*

Alan J. Cimorelli, James D. Smith & Alvaro Alvarado
EPA Region 3

Collaborators: Brian Rehn, EPA Region III
Madeleine Strum and Joe Touma, OAQPS

Emissions Modeling Grid & Urban/Rural Land Use

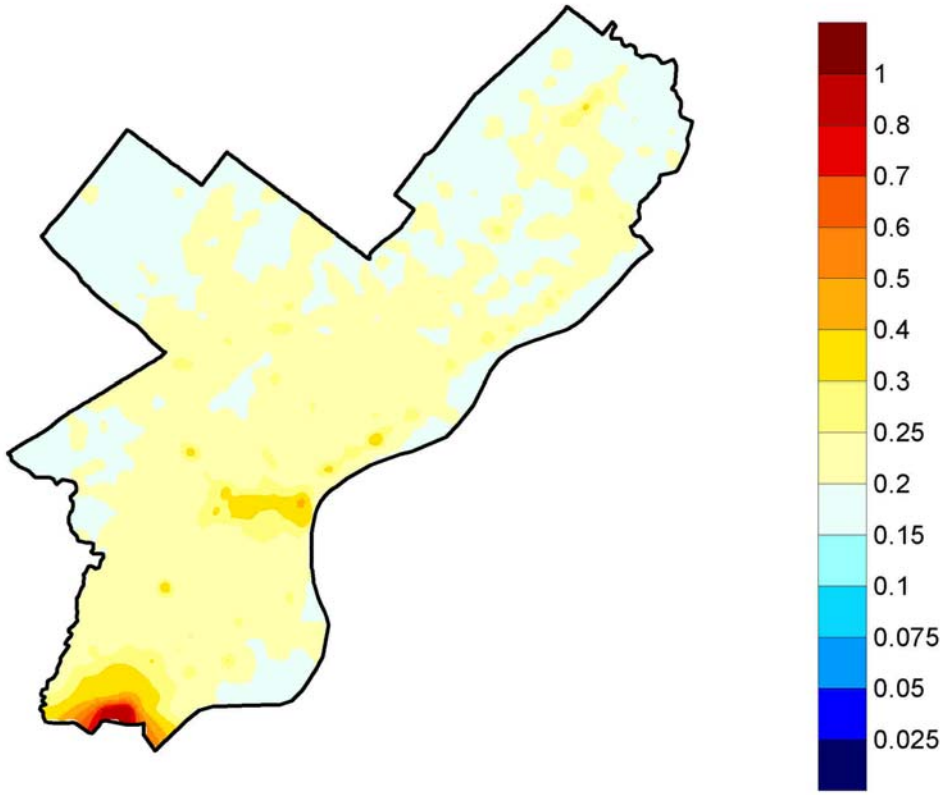


DRAFT

1,3 Butadiene: Primary + Background*

Maximum = 0.94 ug/m^3
Mean = 0.22 ug/m^3

RfC = 2 ug/m^3
1E-06 Risk = 0.03 ug/m^3



*Point and non-point, mobile and non-road
Background = 0.1 ug/m^3

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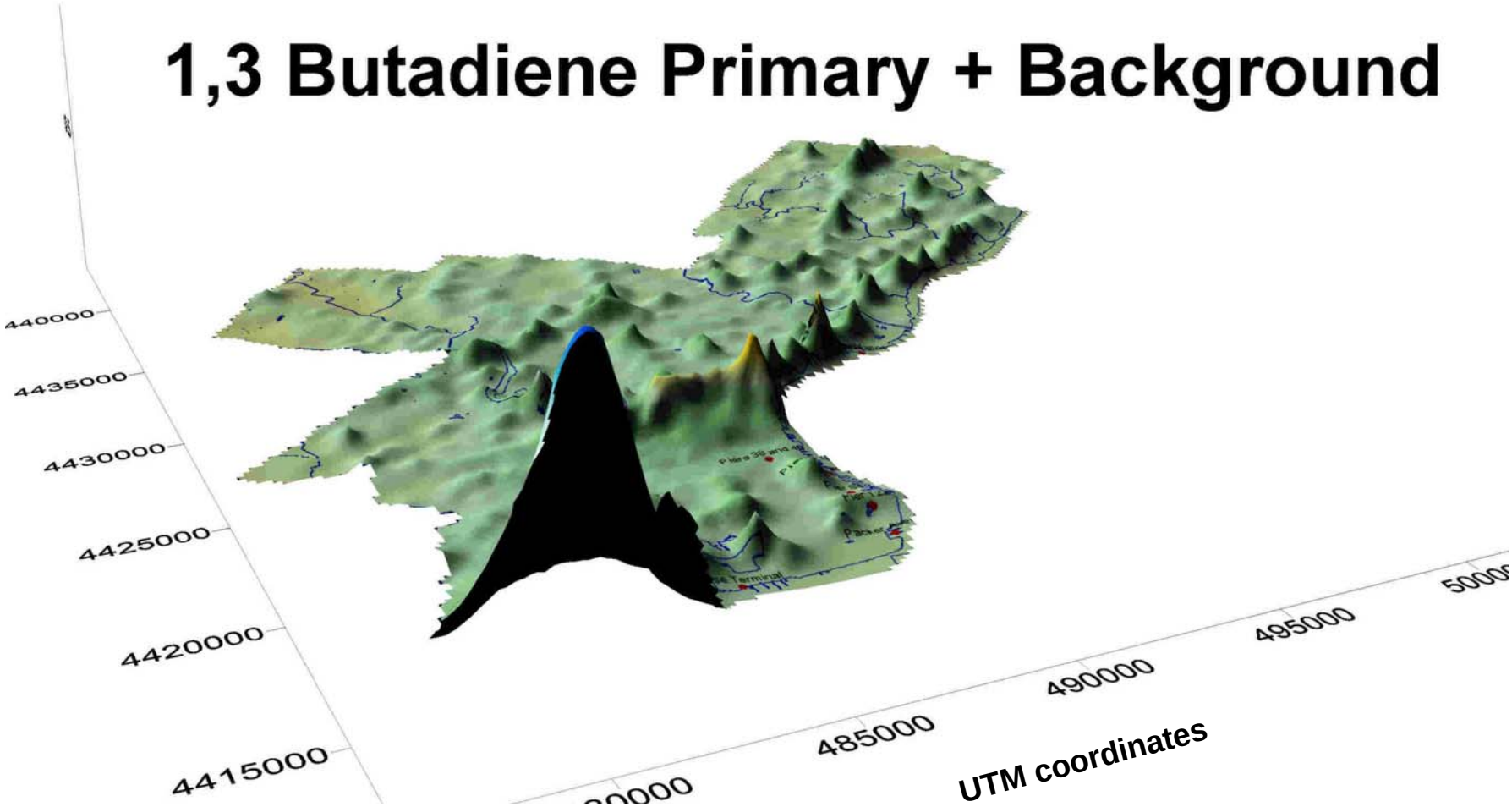
Concentration Surface



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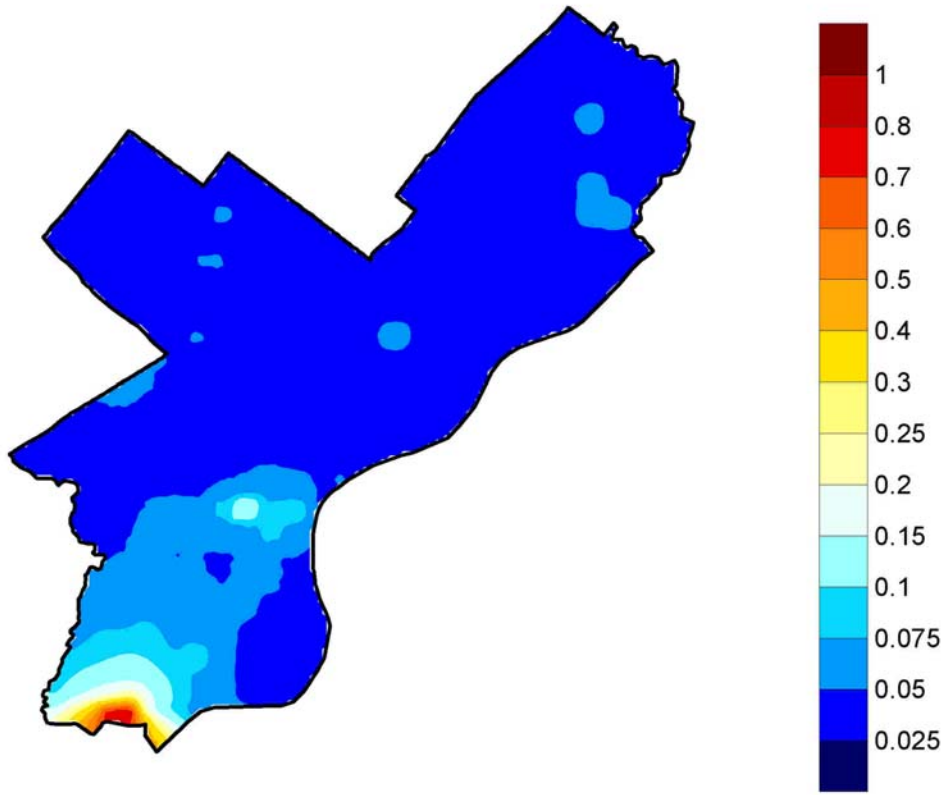
1,3 Butadiene: Non Road Only

Maximum = 0.80 ug/m³
Mean = 0.05 ug/m³

RfC = 2 ug/m³
1E-06 Risk = 0.03 ug/m³



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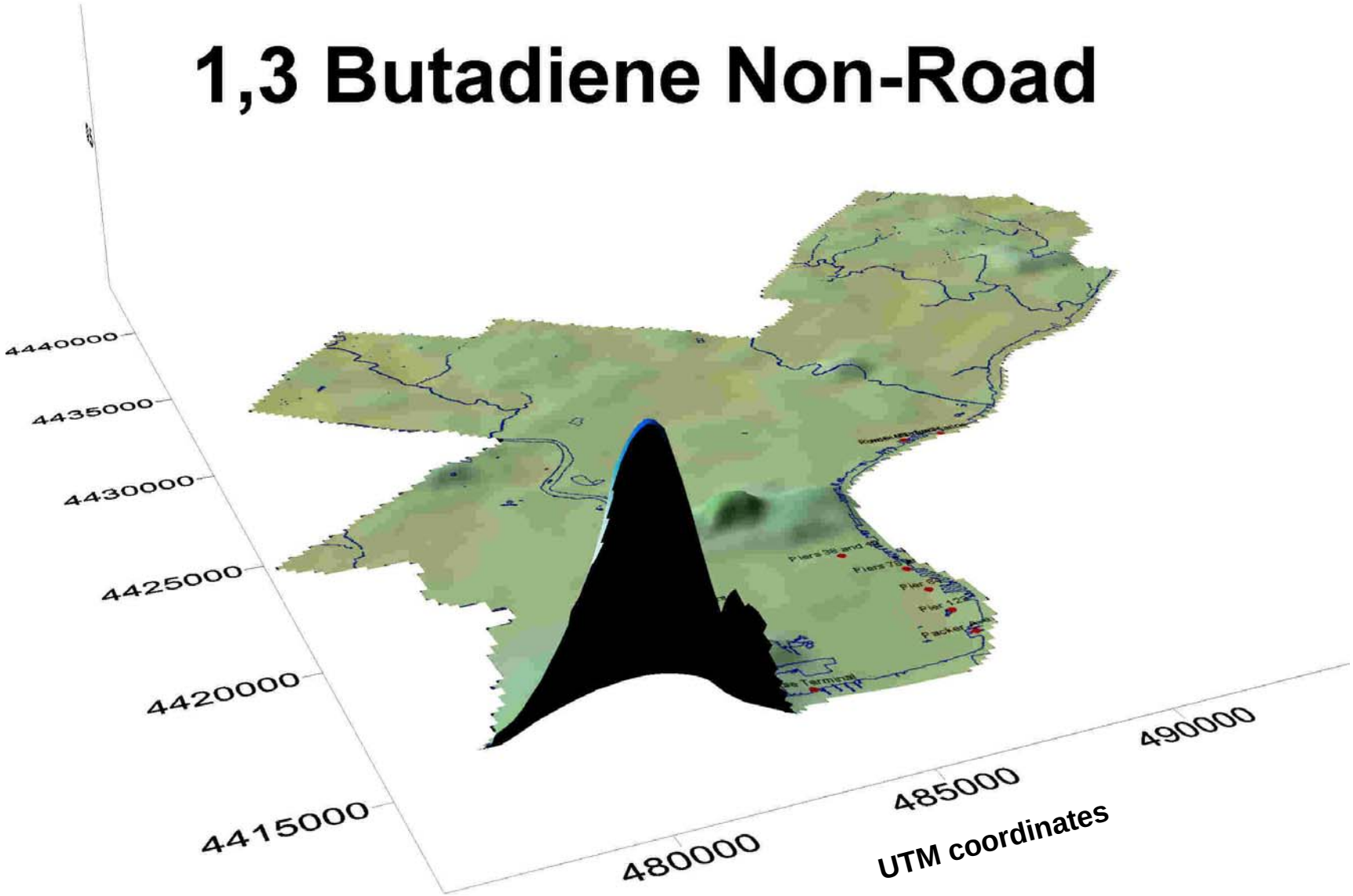
Concentration Surface



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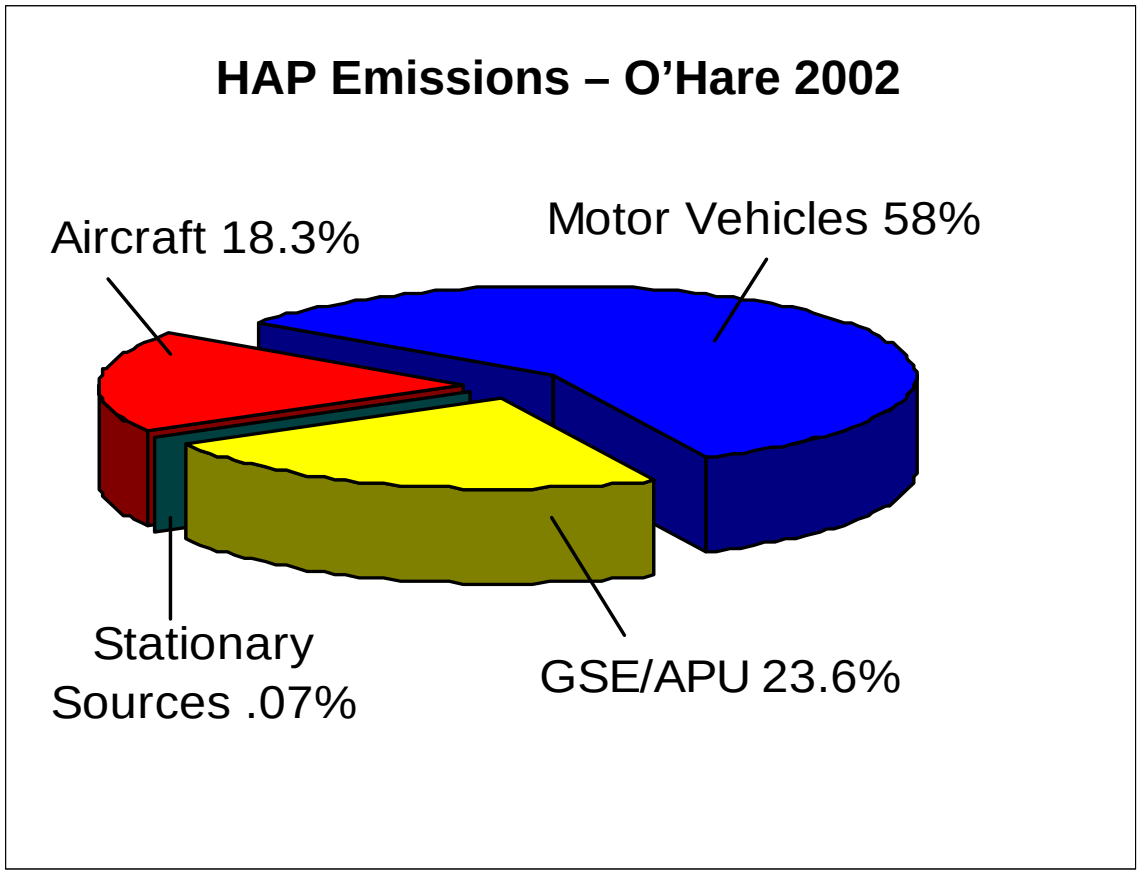
O'Hare Modernization Program
Richard M. Daley, Mayor

O’Hare



HAP	tons/yr
1,3-butadiene	19.6
Acetaldehyde	12.3
Acrolein	2.1
Arsenic	0.01
Benzene	66.3
Chromium VI	.004
Diesel PM	40.0
Formaldehyde	62.3
Naphthalene	3.2
Toluene	136.9
Nickel	.01
Total	**342.8**

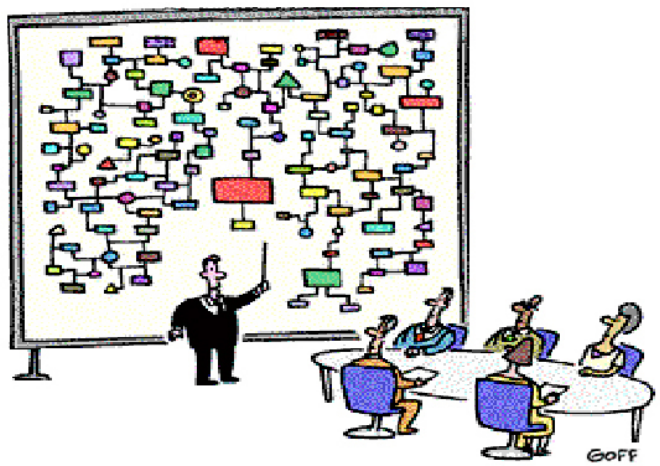
From Draft EIS, Feb. 2005

O’Hare EIS HAP Assessment Drivers

- **11 of the 66 HAPs from O’Hare sources contribute 99% to the total tox-weighted emissions**
- **Toxicity-weighted HAPs at the top (current conditions):**
  - Diesel PM: diesel GSE, on-road vehicles
  - Formaldehyde, 1,3-butadiene: aircraft
  - Toluene, Benzene: on road vehicles, gas GSE
- **Increases of most interest (airport expansion):**
  - 1,3-butadiene, formaldehyde, acrolein: aircraft
  - Diesel PM: construction equipment

So….what do we know?

- **Airport air emissions** - A complex mix of chemicals and sources
- **The urban soup –** While airport emissions usually occur within the context of a larger urban area with its own complex set of emission sources, the growing weight of evidence suggests that *they can have an important impact* on the local environment
- **Uncertainties** – Emission profiles for commercial jet aircraft with commercial fuel are currently lacking

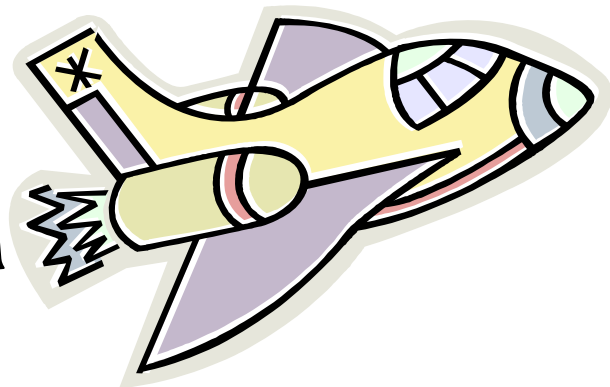


What do we know (cont)?

Recent literature searches indicate approximately 200 compounds potentially associated with aircraft exhaust

- Benzene
- PAHs
- Aldehydes
- Acetone
- Acetylene
- Chromium
- Xylenes
- Mercury
- Nickel
- Toluene
- Phenols
- Cresol
- Etc.

Better Data



Why do airport air toxics assessments?

- **The Air Toxics Strategy (required under the Clean Air Act):**
  - **Provides an integrated strategy for reducing cumulative public health risks in urban areas posed by the aggregated exposures to air toxics from all sources**
- **National Environmental Policy Act:**
  - **Analyze and publicly disclose direct, indirect and cumulative environmental and social impacts of major federal actions**

Transportation Research Board's "Critical Issues in Aviation & the Environment" (8/04)

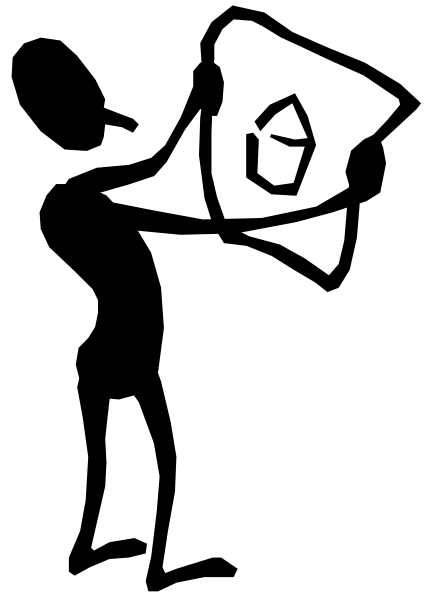
- **HAPs figure prominently alongside PM and criteria pollutants in Air Quality chapter**

- **HAPs & PM: Calls for improved quantification tools, models, data collection, engine sampling, standardized assessment guidelines, determine need for risk characterization and risk management framework**

What are some possible approaches for evaluating airport air toxics?

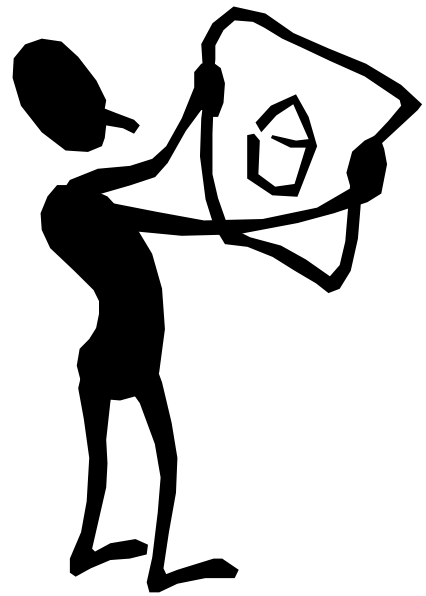
- **Approaches can run from fairly simple screening level approaches (e.g., toxicity-weighting of emissions) to more complex assessments (a modeling risk assessment)**

- **The approach selected depends on a number of factors**
  - The goals of the assessment
  - The needs of the decision makers
  - The required data quality objectives
  - The resources available for the project
  - Etc.



For example, when a modeling risk assessment approach is selected....

- Develop the best inventory of HAP emissions possible from readily available data (both site-specific and literature)
- Perform air dispersion modeling at specified receptor locations
- Characterize risks and evaluate uncertainties
- Identify sources and chemicals posing exposures of concern
- Identify risk mitigation measures for these significant sources and chemicals



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