Air Toxic Advisory Committee

Program Orientation

Dec. 17, 2014

Air Quality Division
Portland, Oregon

State of Oregon Department of Environmental Quality

Introductions

- Member introductions
- General information on ATSAC goals
- ATSAC Charter and Rules of Conduct
- Explanation of hand-out materials
- Quick overview of today's agenda

Outline of DEQ Presentation

- DEQ AQ Programs
- ATSAC
- Air Toxics approach
- Air Toxics Benchmarks (aka, ABCs)
- ID of Air Toxics to Be Considered for Review
- Short-Term Guidelines

Air Toxics – What are they?

- Pollutants known or suspected to cause cancer or other serious health effects
  - Includes Hazardous Air Pollutants (HAPs) pursuant to CAA section 112(b)
  - Federal program lists 188 HAPs
  - Federal program lists seven National Ambient Air Quality Standards (NAAQS) for lead, carbon monoxide, nitrogen dioxide, ozone, particulate matter 2.5, particulate matter 10, and sulfur dioxide

Oregon's Air Toxics Program

Federal Technology-Based Standards
(MACT – Stationary Sources)

Oregon Title V, ACDP and General Permit Programs

Federal Risk-Based Program
(Urban Air Toxics, NATA, Residual Risk)

Oregon Air Toxics Rules

Geographic Program

Safety Net Program

Source Category Strategies and Rules

Federal Mobile Source Program

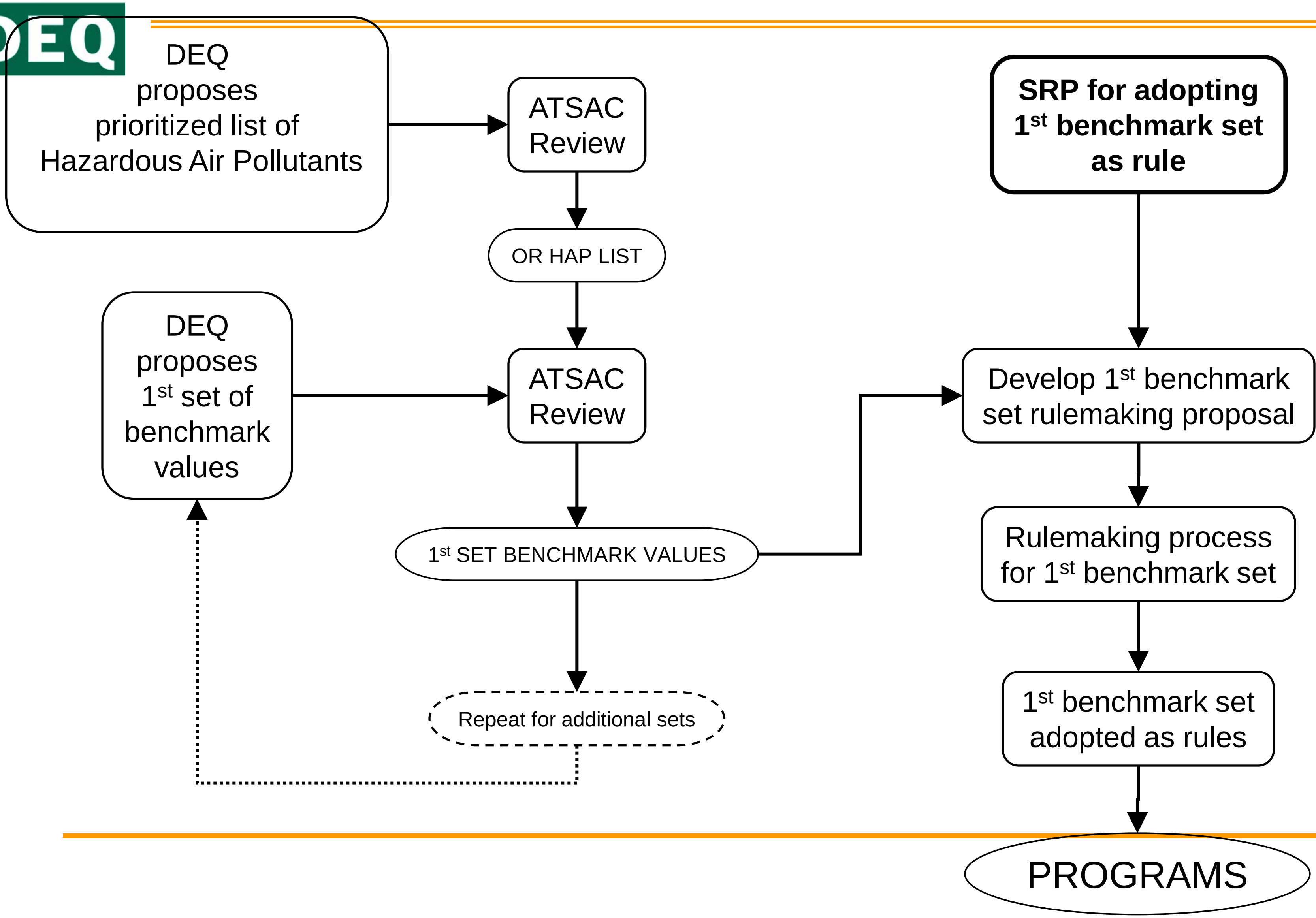
Federal Engine and Fuel Standards

Voluntary Diesel Retrofit Program

Oregon Clean Diesel Initiative

Air Toxics = Pollutants known or suspected to cause cancer or other serious health effects

Benchmark adoption process



Air Toxics Science Advisory Committee (ATSAC)

- 7 members representing 6 specific technical disciplines related to air toxics
  - Required disciplines stipulated by rule
- Will provide DEQ with sound scientific and technical advice
  - No management or policy recommendations
  - Not a stakeholder forum
  - Use best available science
- Appointed by DEQ Director with concurrence from EQC

ATSAC Members 2014 - 2015

Member	Affiliation	Expertise
Dr. William Lambert	Oregon Health Sciences University (OHSU)	Toxicology, Epidemiology, Public health mediciine
Dr. Kent Norville	Air Sciences	Air pollution modeling and monitoring
Dr. Dean Atkinson	Portland State University (PSU)	Environmental science and engineering, Air Pollution monitoring, modeling
Dr. David Farrer	Oregon Health Authority (OHA)	Toxicology, Epidemiology/biostatistics, Risk assessment, Public health
Mr. Max Hueftle	Lane Regional Air Protection Agency (LRAPA)	Environmental science and engineering, Air Pollution monitoring, modeling
Dr. Kim Anderson	Oregon State University (OSU)	Toxicology, Environmental Science, Public health
Dr. Bruce Hope	CH2MHill	Toxicology, Risk assessment, Biostatistics, Environmental science

ATSAC Activities

- Official meetings
  - First meeting: December 17, 2014, 9 am to Noon
  - All meetings will be open to the public; final 15 minutes reserved for public questions, comments
  - First meeting triggers a schedule for benchmark development
- Initial tasks will thus include -
  - Working with DEQ to prioritize air toxics for ambient benchmark development
  - Reviewing and commenting on ambient benchmark concentrations proposed by DEQ

Public involvement

- 13 ATSAC public meetings - Portland: Dec. 2014 - Dec. 2015
  - ATSAC website with work product updated frequently http://www.deq.state.or.us/aq/toxics/atsac.htm
  - GovDelivery (Topic: Air Toxics State-wide)
  - ATSAC meetings scheduled 1 year in advance
- Public information session TBD
- Public comment period: Likely late summer 2015, to be followed by public hearing(s)

Air toxics for Oregon

- Prioritized on basis of 5 criteria (in rule) -
  - Effects
    - **Toxicity (i.e., non-cancer); Potency (i.e., cancer)**
  - Exposure and number of people at risk
  - Impact on sensitive human populations
  - Number and degree of ambient benchmark exceedances
    - **NATA benchmarks as point of reference (×1, ×10)**
  - Potential to cause harm through persistence or bioaccumulation

Identifying Oregon’s air toxics - historical

- 52 benchmarks were eventually developed
- Started with 262 air toxics from Oregon’s emissions inventory for 1999 (circa 2004)
- Identified 164 air toxics for prioritization
  - Removed if < 1lb emissions, criteria pollutants
- Identified 55 air toxics as “priority”
  - rule defines how to prioritize
- Examined and discussed each one
  - 6 dropped due to lack of toxicological data

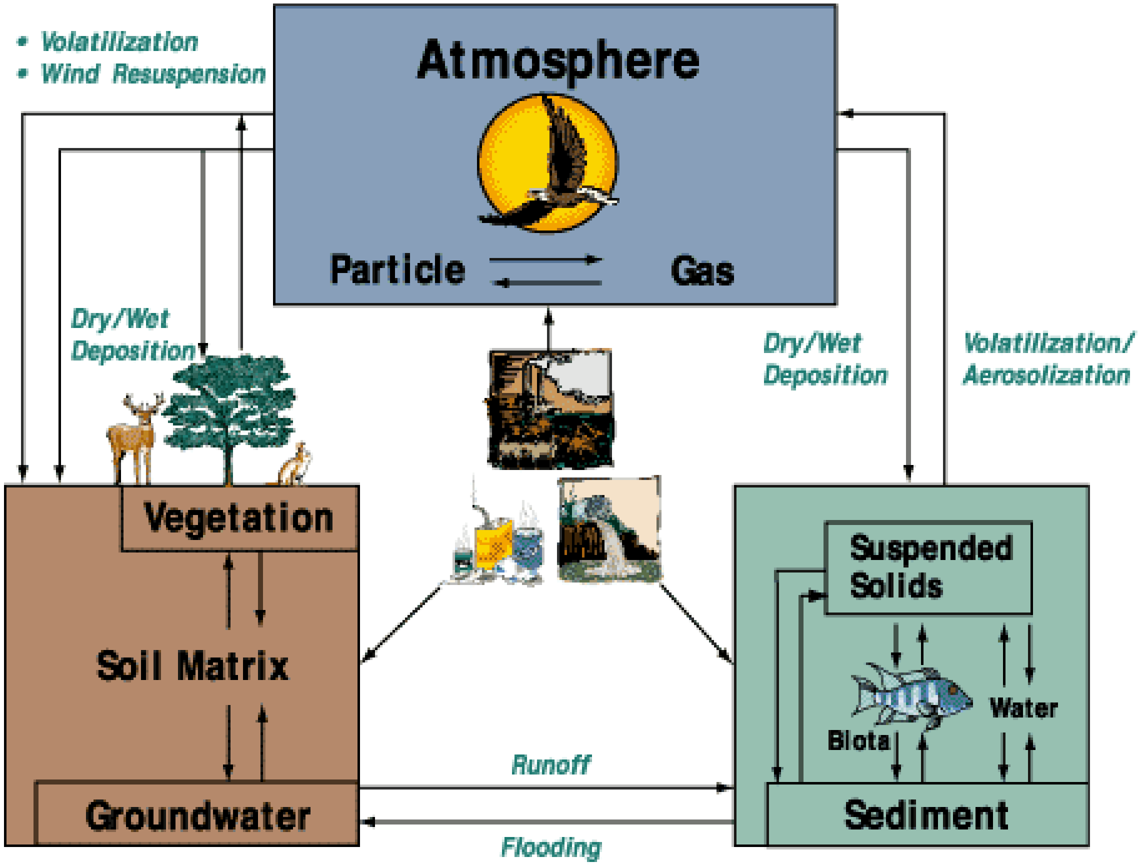
Types of air toxics

- Non-carcinogens
  - Toxicological endpoints other than cancer (e.g., mortality, reproductive, developmental, etc.)
- Carcinogens
  - Toxicological endpoint is some type of cancer
  - Many chemicals are toxic, but not all toxic chemicals are carcinogens
  - Can be differing interpretations of what's a carcinogen
    - **U.S. EPA's Integrated Risk Information System (IRIS) is de facto standard**

Multimedia air toxics

- Majority of air toxics are dispersed through only one exposure route - inhalation
- A few (called “multimedia”) may not remain as vapor and can be deposited to land and water, thus dispersing via other exposure routes
  - Drinking contaminated water
  - Ingestion of food contaminated internally (via bioaccumulation) or externally (e.g. unwashed food)
  - Incidental ingestion of, or dermal contact with, contaminated soil (important for children)

Multimedia air toxics



Multimedia air toxics (CA)

- AS IDENTIFIED BY CALIFORNIA'S HOT SPOTS PROGRAM
  - Based more on potential for deposition than for bioaccumulation
- 4,4'-methylene dianiline
- Creosotes
- Diethylhexylphthalate
- Hexachlorocyclohexanes
- PAHs
- PCBs
- Cadmium & compounds
- Chromium VI & compounds
- Inorganic arsenic & compounds
- Beryllium & compounds
- Lead & compounds
- Mercury and compounds
- Nickel
- Dioxins and furans

What are the air toxics benchmarks?

- **Goals for Oregon's program**
  - Adopted in rule, but NOT enforceable standards
  - Intended to help identify, evaluate, and address air toxics problems (Geographic, Source Category and Safety Net Programs)

- **Benchmark values must represent a**
  - Cancer risk $\leq 1 \times 10$-6 (one-in-a-million)
  - Non-cancer threat (HQ) ≤ 1
    - Emphasize protecting human populations who have an increased susceptibility to the adverse effects of air toxics

How did we decide on the benchmarks?

- Air Toxics Science Advisory Committee (ATSAC) examined 164 pollutants present in Oregon considering:
  - **Toxicity (i.e., non-cancer); Potency (i.e., cancer)**
  - **Exposure and number of people at risk**
  - **Impact on sensitive human populations**
    - **California's child protection act**
  - **Number and degree of NATA exceedances**
  - **Persistence or bioaccumulation**
- "Priority" air toxics selected for benchmark development
  - **Inhalation exposures only**
  - **Hierarchy of toxicological information**
  - **EPA>ICalEPA>ATSDR>Other**
  - **Other factors equal, select higher value**
  - **Average annual concentrations**

How can we use the benchmarks?

- Compare to an annual average concentration from dispersion modeling
  - If below benchmark, we can say there is likely no problem
  - If above benchmark, we can say there is heightened concern and a need for more information (like running an exposure model using local census data)
    - If exposure model shows concentrations above benchmark, we can estimate increased risk

How can we use the benchmarks? (continued)

- Compare to monitored data with caution
  - **Need long-term data**
  - **Same steps as above**
  - Geographic and Source Category Programs

- Risk assessment with location-specific modeled or monitored estimates of concentration
  - Safety Net Program

What NOT to do with the benchmarks

- Call them standards
  - Or say they're enforceable
- Use them as permit requirements
- Compare them to single measurements or concentrations with unrelated space and time assumptions
- Use them to prove there is a problem without considering exposure

Why the benchmarks are GREAT!

- Developed by respected committee
- Huge advance towards informed estimates of air toxics risk
  - Go from saying “We don’t know.” to “Here is what we do know, and these are the uncertainties.”
- By providing goals, could encourage sources to develop more information
  - Industrial sources can estimate off-site concentrations resulting from their emissions and compare to benchmarks for risk information
- Allow us to measure progress

Developing benchmarks

- Scientific uncertainty must be considered
- Risk must not be grossly over- or under-estimated
- For inhalation exposures only
  - Initial consideration of other exposure routes
- Must be compared to annual average concentrations only
- Toxicity information preference hierarchy
  - U.S. EPA > CalEPA > ATSDR > Other

Benchmark use in Oregon

- Simple comparison of modeled or monitored concentration of an air toxic to its ambient benchmark concentration
  - Geographic & Source Category Programs
- Risk assessment with location-specific modeled or monitored estimates of concentration
  - Safety Net Program
- Key role of measurement and monitoring

Ambient benchmarks

- Represent goals for the air toxics program
  - Developed by DEQ, reviewed ATSAC
  - Enacted as rules but are not regulatory standards
  - Only use is to help identify, address, and evaluate air toxics problems
- Values will be selected to achieve (by rule)
  - A cancer risk = 1 × 10-6
  - A non-cancer threshold (HQ) = 1
    - **Protect human populations who have an increased susceptibility to the adverse effects of air toxics**

Ambient Benchmark Concentration (ABC)

A health-based concentration of a toxic chemical in air that a person could breath for a lifetime without:

-- any signficant non-cancer effects

-- increasing their potential cancer risk by > 1 in 1,000,000

Selected solely on the basis of health protectiveness, without regard for economics or engineering feasibility

Benchmark development - historical

- Most were straightforward
- Several were particularly challenging
  - Formaldehyde
  - Diesel particulate matter
  - Polycyclic aromatic hydrocarbons (PAHs)
    - **Polycyclic organic matter (POM)**
  - Those exploiting multiple pathways
    - **Dioxins & Furans; Mercury; PCBs**
- Some values varied with respect to U.S. EPA

Toxicity Factors Used in Calculation of ABCs

- Reference concentration (RfC)
  - No appreciable risk of deleterious effects during a lifetime of continuous inhalation exposure
- Unit risk estimate (URE)
  - Upper-bound excess lifetime cancer risk resulting from continuous exposure at 1 μg/m3 in air
- Sources (examples)
  - U.S. EPA
  - California ARB

Non-cancer benchmark

- "…concentration of an air toxic in outdoor air that would result in ... a non-cancer hazard quotient of one."

$$HQ = ABC_{NC} / RfC = 1$$
$$\therefore \quad ABC_{NC} = RfC$$

- Reference concentration (RfC)
  - **No appreciable risk of deleterious effects during a lifetime of continuous inhalation exposure**

Calculation of Non-cancer ABC for Ammonia and Phosphine

As shown in previous slide, each ABC will equal the non-cancer toxicity value chosen in 2010 by the ATSAC. So:

- Ammonia = OEHHA REL of 200 ug/m^3 = ABC$_{NC}$ of 200 ug/m^3
- Phosphine = 1995 USEPA IRIS RfC of 0.3 ug/m^3 = ABC$_{NC}$ of 0.3 ug/m^3

Ambient benchmark (Cancer)

- "…the concentration of an air toxic in outdoor air that would result in ... an excess lifetime cancer risk level of one in a million (1×10^{-6})."

$$Risk = C_{air} \cdot URE = 1 \times 10^{-6}$$

- Unit risk estimate (URE)
  - Upper-bound excess lifetime cancer risk resulting from continuous exposure at 1 $\mu g/m^3$ in air

$$URE = (CPF \cdot IR)/(BW \cdot CF)$$

Cancer benchmark

- "…concentration of an air toxic in outdoor air that would result in ... an excess lifetime cancer risk level of one in a million (1×10^{-6})."

$$ABC_C = 1 \times 10^{-6} / URE$$

Calculation of Cancer ABC for Arsenic

- In 2010, the ATSAC chose the 1997 IRIS URE of 0.0043 per (ug/m^3) to represent most credible cancer toxicity value for Arsenic.

- Thus: ABCC for Arsenic = 1 x 10-6 / 0.0043 (ug/m3)-1 = **0.0002 ug/m3**

Hierarchy of Toxicity Information Sources – *2004 through 2010*

- U.S. EPA, Integrated Risk Information System (IRIS);
- U.S. EPA, Office of Research and Development (ORD);
- California EPA, Office of Environmental Health Hazard Assessment (OEHHA) / Air Resources Board (ARB) adopted values;
- California EPA OEHHA / ARB proposed values;
- CDC, Agency for Toxic Substances and Disease Registry (ATSDR);
- U.S. EPA, Health Effects Assessment Summary Tables (HEAST)
- U.S. EPA, Office of Air Quality Planning and Standards (OAQPS).

Proposed Hierarchy of Toxicity Information Sources – *2014 and 2015*

- U.S. EPA, Integrated Risk Information System (IRIS);
- U.S. EPA, Provisional Peer Reviewed Toxicity Values for Superfund (PPRTV);
- World Health Organization(WHO)/International Agency for Research on Cancer (IARC);
- California EPA, Office of Environmental Health Hazard Assessment (OEHHA) / Air Resources Board (ARB) adopted values;
- California EPA OEHHA / ARB proposed values;
- CDC, Agency for Toxic Substances and Disease Registry (ATSDR);
- U.S. EPA, Office of Air Quality Planning and Standards (OAQPS).

Old vs. Proposed Hierarchy

OLD

- USEPA IRIS
- OEHHA/ARB adopted
- OEHHA/ARB proposed
- CDC/ATSDR
- USEPA OAQPS

PROPOSED

- USEPA IRIS
- USEPA PPRTVs
- WHO/IARC
- OEHHA/ARB adopted
- OEHHA/ARB proposed
- CDC/ATSDR
- USEPA OAQPS

ABC Review: Information Available for Use by ATSAC

Draft list of chemicals with ABCs that may need review, or new chemicals that may need to have ABCs assigned to them, obtained via:

1. Review of toxicity values used to generate the 2010 ABCs
2. Informal survey of DEQ AQ staff
3. Review of 2005 NATA data

Use Toxicity Values that are Current

- Extremely important to make sure you are using the most-current version available for each toxicity value data source.
- Even if you've previously checked for updates on your toxicity sources, RE-CHECK one last time to make sure no further updates have occurred -- that is, when you're ready to make decisions based on that information.

Summary of 2005 NATA Data

Reasons for use of NATA data that was collected in 2005:

NATA data made available appx every 3 years.

Lag between time data is collected and when it is published after comprehensive review, correction, and interpretation. In the past, lag of 3 years.

NATA did not publish data from 2008.

2011 NATA data is still in draft form, may become available in 2015.

Short-Term Guidelines

- A guideline that is protective of people exposed to contaminants in air for less than a year (short term)
- Draft STGs are available internally, but a math error needs to be corrected
- Original approach needs to be re-evaluated
- Not required by rule (question raised by members of the public)
- Last few ATSAC meetings in 2015?

In Conclusion

- Wrap up
- Plans for next meeting
- Technical information needed for next meeting
- Questions, concerns from committee
- Questions, concerns from audience