Notice of Proposed Rulemaking

Oregon Air Toxics Program: Benchmarks

Rule Caption
This rule will establish health-based ambient benchmarks for Oregon's air toxics program.

Background
The Oregon Department of Environmental Quality (DEQ) is proposing to adopt ambient benchmarks for 49 air toxics. Air Toxics are pollutants known or suspected to cause cancer or other serious health effects. They include, but are not limited to, "hazardous air pollutants" (HAPs) listed by the U.S. EPA pursuant to section 112(b) of the Federal Clean Air Act.

Ambient benchmarks are concentrations of air toxics that serve as goals in the Oregon Air Toxics Program. They are based on levels protective of human health considering sensitive populations, like the elderly and children. They are not enforceable regulatory standards, but rather serve as goals or reference values by which air toxics problems can be identified, evaluated and addressed.

The ambient benchmarks are an essential science-based step forward for Oregon's air toxics program. In the future, ambient benchmarks will support scientifically sound evaluation and decision-making. Together with emission measurements and estimates, these benchmarks will allow DEQ to better understand air toxics problems throughout the state.

Why are rule changes needed?
Historically, the absence of federal standards or uniform reference values for air toxics has prevented the Department from making a scientifically sound evaluation of potential health risk from air toxics in Oregon. The Oregon Air Toxics Program remedied the lack of uniform reference values by prescribing a process to develop and finalize the ambient benchmarks.

The Air Toxics Program (OAR 340-246-0090) requires that, once ambient benchmarks for air toxics have been established by a technical advisory committee, the Department propose them for adoption as administrative rules. The ambient benchmarks proposed in this rulemaking will function within Oregon's existing air toxics program as the scientific basis for, and clean air goals within, other facets of the program. These include Geographic Air Toxics Emissions Reduction Planning and the Source Category Strategy and Safety Net programs.

Who may be affected?
The proposed rules establish ambient benchmark concentrations only as reference values for the purposes of identifying, evaluating, and addressing air toxics problems. Adopting ambient benchmarks does not impose any new regulatory requirements, but does enable future work to develop air toxics strategies and to track progress. The effect of any future strategies that may be proposed by DEQ would be addressed at that time through a public process.

How was this proposal developed?
In October 2003, the Environmental Quality Commission (EQC) adopted the Oregon State Air Toxics Program (OAR 340-246-0010 through 0230). This rule required DEQ to form, with the concurrence of the EQC, an Air Toxics Science Advisory Committee (ATSAC). The purpose of the ATSAC is to provide DEQ, and in its jurisdiction, the Lane Regional Air Pollution Authority, with advice on the state air toxics program that is scientifically and technically sound, independent, balanced, and timely.

The ATSAC was formed in September 2004. Members were selected for their relevant air toxics experience in toxicology, environmental science or engineering, risk assessment, epidemiology and biostatistics, public health medicine, and air pollution modeling, monitoring, meteorology or engineering (ATSAC membership can be found in attachment F).

State of Oregon
Department of Environmental Quality

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www.deq.state.or.us/aq/hap

Additional Materials Attached
- A: Proposed rule changes (including ambient benchmarks)
- B: Statement of Need and Fiscal Impact
- C: Land Use Evaluation Statement
- D: Response to Questions Addressing Federal Requirements
- E: Summary of ATSAC Deliberations on Benchmark Development
- F: ATSAC Membership

Last Updated: 01Feb06
By: B. Hope
DEQ 05-AQ-002

Over the past year, ATSAC's efforts have focused on reviewing and making recommendations regarding ambient air toxics benchmarks. In public meetings held approximately monthly between September 2004 and December 2005, the ATSAC reviewed benchmarks for the air toxics they had determined to be a priority in Oregon. Representing a wealth of expertise in diverse technical disciplines, ATSAC reached consensus recommendations for 49 priority air toxics. The resulting ambient benchmarks are shown in Attachment A. A summary of ATSAC's deliberations can be found in Attachment E.

In performing their work, the ATSAC relied upon credible information from a variety of peer-reviewed and technical documents, the most important being those from the: (1) U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS), (2) California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (CalEPA, OEHHA), and (3) U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR).

Copies of the documents relied upon in the development of this rulemaking proposal can be reviewed at the Department of Environmental Quality's office at 811 S.W. 6th Avenue, Portland, Oregon. Please contact Bruce Hope for times when the documents are available for review. Information about Oregon's Air Toxics program, is also available online at: www.deq.state.or.us/aq/hap/.

How to Comment

The Department is seeking comment on proposed ambient benchmarks (Attachment A). Comments on the proposed rulemaking may be submitted in writing via mail, fax, or e-mail at anytime prior to the comment deadline of April 4, 2006. Written and oral comments can be submitted during any of the public hearings specified below. It is not necessary to attend a hearing in order to comment. Written comments received prior to the deadline are treated equally with oral comments. Written comments may be mailed to Bruce Hope, Oregon DEQ, Air Quality Division, 811 SW Sixth Avenue, Portland, OR 97204 . Written comments may be faxed to Bruce Hope at (503) 229-5675, or emailed to hope.bruce@deq.state.or.us (E-mail comments are dated upon receipt at DEQ's servers. If there is a delay between servers, they may not be received before the deadline.)

Public hearings

Public hearings will be held at three locations throughout the state in March 2006. Each hearing will begin with a brief overview of the proposed rule changes, followed by the opportunity for members of the public to provide oral and written comment. All comments will be recorded and reviewed by DEQ.

March 28, 2006
Department of Environmental Quality
Conference Room 3A
811 SW Sixth Avenue, Portland
6:00 to 8:00 p.m.

March 29, 2006
Jackson County Courthouse Auditorium
10 S. Oakdale, Medford
6:00 to 8:00 p.m.

March 30, 2006
Department of Environmental Quality
Conference Room
2146 NE Fourth Avenue, Bend
6:00 to 8:00 p.m.

Comment deadline is April 4, 2006

All comments are due to DEQ by close-of-business (5 p.m.), April 4, 2006. DEQ cannot consider comments from any party **received** after this deadline for public comment.

How will rules be adopted?

DEQ will prepare a response to all comments received during the public hearing and comment period and may modify the proposed rules. DEQ plans to recommend that the EQC adopt the rules at their August 10-11, 2006 meeting. DEQ will notify persons of the time and place for final EQC action if they submit comments during the hearing or comment period or request to be placed on DEQ's mailing list for this rulemaking.

Alternative formats/accommodations

Please notify DEQ of any special physical or language accommodations needed for the hearings as far in advance as possible. Alternative formats of this document can be made available by contacting William Knight at DEQ's Office of Communications & Outreach, Portland, at (503) 229-5317.

Attachment A - Proposed Rule Changes (underlined)

340-246-0090

Ambient Benchmarks for Air Toxics

(1) Purpose. Ambient benchmarks are concentrations of air toxics that serve as goals in the Oregon Air Toxics Program. They are based on human health risk and hazard levels considering sensitive populations. Ambient benchmarks are not regulatory standards, but reference values by which air toxics problems can be identified, addressed and evaluated. The Department will use ambient benchmarks as indicated in these rules, to implement the Geographic, Source Category, and Safety Net Programs. Ambient benchmarks set by the procedures described in this rule apply throughout Oregon, including that area within the jurisdiction of the Lane Regional Air Pollution Authority. Ambient benchmarks are subject to public notice and comment before adoption by the Commission as administrative rules.

(2) Establishing Ambient Benchmarks

(a) The Department will consult with the ATSAC to prioritize air toxics for ambient benchmark development. Highest priority air toxics are those that pose the greatest risk to public health.

(b) To prioritize air toxics, the Department will apply the criteria described in OAR 340-246-0090(2)(c) to modeling, monitoring, and emissions inventory data.

(c) Ambient benchmark prioritization criteria will include at least the following:

(A) Toxicity or potency of a pollutant;

(B) Exposure and number of people at risk;

(C) Impact on sensitive human populations;

(D) The number and degree of predicted ambient benchmark exceedances; and

(E) Potential to cause harm through persistence and bio-accumulation.

(d) The Department will develop ambient benchmarks for proposal to the ATSAC based upon a protocol that uses reasonable estimates of plausible upper-bound exposures that neither grossly underestimate nor grossly overestimate risks.

(e) Within three months of the first meeting of the ATSAC, the Department will propose ambient benchmark concentrations for the highest priority air toxics for review by the ATSAC. The Department will propose additional and revised air toxics ambient benchmarks for review by the ATSAC based on the prioritization criteria in OAR 340-246-0090(2)(c). Once the ATSAC has completed review of each set of proposed ambient benchmarks, the Department will, within 60 days, begin the process to propose ambient benchmarks as administrative rules for adoption by the Environmental Quality Commission.

(f) If the Department is unable to propose ambient benchmarks to the ATSAC by the deadlines specified in OAR 340-246-0090(2)(e), the ATSAC will review the most current EPA ambient benchmarks. If EPA ambient benchmarks are not available, the ATSAC will review the best available information from other states and local air authorities.

(g) The ATSAC will consider proposed ambient benchmarks and evaluate their adequacy for meeting risk and hazard levels, considering human health, including sensitive human populations, scientific uncertainties, persistence, bio-accumulation, and, to the extent possible, multiple exposure pathways. The ATSAC will conduct this review consistent with the criteria in OAR 340-246-0090(2)(c) and (d). The ATSAC will report these findings to the Department. If the ATSAC unanimously disagrees with the Department's recommendation, the Department will re-consider and re-submit its recommendation at a later date.

(h) The ATSAC will complete review of and report findings on each set of ambient benchmarks as expeditiously as possible, but no later than 12 months after the Department has proposed them. If the ATSAC is unable to complete review of ambient benchmarks within 12 months after the Department's proposal, the Department will initiate rulemaking to propose ambient benchmarks.

(i) The Department will review all ambient benchmarks at least every five years and, if necessary, propose revised or additional ambient benchmarks to the ATSAC. At its discretion, the Department may review and propose a benchmark for review by the ATSAC at any time when new information is available.

(3) Ambient Benchmarks. Benchmark concentrations are in units of micrograms of air toxic per cubic meter of ambient air, on an average annual basis. The Chemical Abstract Service Registry Number (CASRN) is shown in parentheses.

(a) The ambient benchmark for acetaldehyde (75-07-0) is 0.45 micrograms per cubic meter.

(b) The ambient benchmark for acrolein (107-02-8) is 0.02 micrograms per cubic meter.

(c) The ambient benchmark for acrylonitrile (107-13-1) is 0.015 micrograms per cubic meter.

(d) The ambient benchmark for ammonia (7664-41-7) is 200.0 micrograms per cubic meter.

(e) The ambient benchmark for arsenic (7440-38-2) is 0.0003 micrograms per cubic meter.

(f) The ambient benchmark for benzene (71-43-2) is 0.45 micrograms per cubic meter.

(g) The ambient benchmark for beryllium (7440-41-7) is 0.00042 micrograms per cubic meter.

(h) The ambient benchmark for 1,3-butadiene (106-99-0) is 0.033 micrograms per cubic meter.

(i) The ambient benchmark for cadmium and cadmium compounds (7440-43-9) is 0.00056 micrograms per cubic meter.

(j) The ambient benchmark for carbon disulfide (75-15-0) is 800.0 micrograms per cubic meter.

(k) The ambient benchmark for carbon tetrachloride (56-23-5) is 0.067 micrograms per cubic meter.

(l) The ambient benchmark for chlorine (7782-50-5) is 0.2 micrograms per cubic meter.

(m) The ambient benchmark for chloroform (67-66-3) is 98.0 micrograms per cubic meter.

(n) The ambient benchmark for chromium, hexavalent (18540-29-9) is 0.000083 micrograms per cubic meter.

(o) The ambient benchmark for cobalt and cobalt compounds (7440-48-4) is 0.1 micrograms per cubic meter.

(p) The ambient benchmark for 1,4-dichlorobenzene (106-46-7) is 0.091 micrograms per cubic meter.

(q) The ambient benchmark for 1,3-dichloropropene (542-75-6) is 0.25 micrograms per cubic meter.

(r) Diesel particulate matter (none) is 0.1 micrograms per cubic meter. The benchmark for diesel particulate matter applies only to such material from diesel-fueled internal combustion sources.

(s) The ambient benchmark for dioxins and furans (1746-01-6) is 0.000000026 micrograms per cubic meter. The benchmark for dioxin is for total chlorinated dioxins and furans as 2,3,7,8-TCDD toxicity equivalents.

(t) The ambient benchmark for ethylene dibromide (106-93-4) is 0.002 micrograms per cubic meter.

(u) The ambient benchmark for ethylene dichloride (107-06-2) is 0.04 micrograms per cubic meter.

(v) The ambient benchmark for ethylene oxide (75-21-8) is 0.011 micrograms per cubic meter.

(w) The ambient benchmark for formaldehyde (50-00-0) is 3.0 micrograms per cubic meter.

(x) The ambient benchmark for n-hexane (110-54-3) is 7000.0 micrograms per cubic meter.

(y) The ambient benchmark for hydrogen chloride (7647-01-0) is 20.0 micrograms per cubic meter.

(z) The ambient benchmark for hydrogen cyanide (74-90-8) is 9.0 micrograms per cubic meter.

(aa) The ambient benchmark for hydrogen fluoride (7664-39-3) is 14.0 micrograms per cubic meter.

(bb) The ambient benchmark for lead and lead compounds (7439-92-1) is 0.5 micrograms per cubic meter.

(cc) The ambient benchmark for manganese and manganese compounds (7439-96-5) is 0.2 micrograms per cubic meter.

(dd) The ambient benchmark for mercury (7439-97-6) is 0.3 micrograms per cubic meter. The benchmark for mercury applies to all of its inorganic forms.

(ee) The ambient benchmark for methyl bromide (74-83-9) is 5.0 micrograms per cubic meter.

(ff) The ambient benchmark for methyl chloride (74-87-3) is 90.0 micrograms per cubic meter.

(gg) The ambient benchmark for methyl chloroform (71-55-6) is 1000.0 micrograms per cubic meter.

(hh) The ambient benchmark for methylene chloride (75-09-2) is 2.1 micrograms per cubic meter.

(ii) The ambient benchmark for naphthalene (91-20-3) is 0.03 micrograms per cubic meter.

(jj) The ambient benchmark for nickel and nickel compounds (7440-02-0) is 0.0042 micrograms per cubic meter.

(kk) The ambient benchmark for phosphine (7803-51-2) is 0.8 micrograms per cubic meter.

(ll) The ambient benchmark for phosphoric acid (7664-38-2) is 10.0 micrograms per cubic meter.

(mm) The ambient benchmark for polychlorinated biphenyls (1336-36-3) is 0.01 micrograms per cubic meter. The benchmark for polychlorinated biphenyls is for total congeners.

(nn) The ambient benchmark for polycyclic aromatic hydrocarbons (50-32-8) is 0.0009 micrograms per cubic meter. The benchmark for polycyclic aromatic hydrocarbons is for total benzo(a)pyrene toxicity equivalents.

(oo) The ambient benchmark for tetrachloroethylene (127-18-4) is 0.17 micrograms per cubic meter.

(pp) The ambient benchmark for toluene is (108-88-3) is 400.0 micrograms per cubic meter.

(qq) The ambient benchmark for toluene diisocyanate, 2,4- & 2,6 mixture is (26471-62-5) is 0.07 micrograms per cubic meter.

(rr) The ambient benchmark for trichloroethylene is (79-01-6) is 0.5 micrograms per cubic meter.

(ss) The ambient benchmark for vinyl chloride is (75-01-4) is 0.11 micrograms per cubic meter.

(tt) The ambient benchmark for white phosphorus is (7723-14-0) is 0.07 micrograms per cubic meter.

(uu) The ambient benchmark for xylenes (1330-20-7) is 700.0 micrograms per cubic meter.

(vv) The ambient benchmark for hydrogen sulfide (7783-06-4) is 2.0 micrograms per cubic meter.

(ww) The ambient benchmark for methanol (67-56-1) is 4000.0 micrograms per cubic meter.

Attachment B -Statement of Need and Fiscal Impact

DEPARTMENT OF ENVIRONMENTAL QUALITY
Chapter 340
Proposed Rulemaking
STATEMENT OF NEED AND FISCAL AND ECONOMIC IMPACT
This form accompanies a Notice of Proposed Rulemaking

Rule Caption	This rule will establish health-based ambient benchmarks for Oregon's air toxics program.
Title of Proposed Rulemaking	**Oregon Air Toxics Program: Benchmarks**
Need for the Rule(s)	The Oregon Department of Environmental Quality (DEQ) is proposing to adopt ambient benchmarks as administrative rules for a specified group of air toxics. OAR 340-246-0090(2)(e) requires that, once ambient benchmarks for air toxics have been established as defined in OAR 340-246-0090(2)(a-d), they be adopted as administrative rules. Ambient benchmarks are concentrations of air toxics that serve as goals in the Oregon Air Toxics Program. They are based on levels protective of human health considering sensitive populations. Ambient benchmarks are not enforceable regulatory standards, but rather "standard reference values" by which air toxics problems can be identified, addressed and evaluated.
Documents Relied Upon for Rulemaking	The Department relied on the Air Toxics Science Advisory Committee's consensus recommendations for ambient benchmarks. The Air Toxics Science Advisory Committee relied upon credible information from a variety of peer-reviewed and technical documents, the most important being those from the: (1) U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS), (2) California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (CalEPA, OEHHA), and (3) U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR).
Fiscal and Economic Impact	
Overview	Adoption of the benchmarks will not, in and of itself, have a direct fiscal or economic impact. But, because their adoption will move the air toxics program itself forward, their adoption is expected to eventually cause some indirect impacts. However, these impacts are so indirect and dependent upon future decisions as to be unquantifiable at the time of benchmark adoption. The proposed rules are limited to adopting ambient benchmarks as administrative rules. The ambient benchmarks proposed in this rulemaking will function within Oregon's existing air toxics program (per OAR 340-246) as triggers for, and clean air goals within, other facets (Geographic Air Toxics Emissions Reduction Planning, Source Category Strategy, Safety Net) of the program. The proposed rules make ambient benchmark concentrations available only as reference values for the purposes of identifying, evaluating, and addressing air toxics problems. They are only a single component of the overall air toxics program. Any specific implementation, compliance, enforcement, financial, land use, or resource issues are expected to be associated with the existing overall program and subsequent community emission reduction planning (per OAR 340-246), and not with adoption of these ambient benchmarks. ORS 183.335(2)(b)(G) requests public comment on whether other options should be considered for achieving the rule's substantive goals while reducing negative economic impact of the rule on business.

	The substantive goal of this rulemaking is to establish ambient reference values (air toxics benchmarks) for the purposes of identifying, evaluating, and addressing air toxics problems. These benchmarks will provide a scientific basis for, and clean air goals within, other facets of the air toxics program (i.e. Geographic Air Toxics Emissions Reduction Planning, Source Category Strategy, Safety Net). Other than requirements placed upon the Department, the fiscal and economic impacts of adopting the proposed air toxics benchmarks are mostly secondary. Secondary impacts will not be specifically identified until local advisory committees develop local emission reduction plans, the Department develops source category strategies, or the Department identifies sources subject to the Safety Net Program. Local emission reduction plans and source category strategies can be voluntary (incentives and education) or mandatory (ordinances and regulations). If local emission reduction plans recommend state regulations, the Department will perform a fiscal and economic impact analysis for each proposed rule. In addition, any source category strategy proposed as a rule will also receive a fiscal and economic impact analysis.	
General public	No direct or indirect fiscal or economic impacts.	
Small Business **(50 or fewer employees - ORS 183.310(10))**	a) Estimated number and types of businesses impacted	None
	b) Additional reporting requirements	None
	c) Additional equipment and administration requirements	None
	d) Describe how businesses were involved in this rulemaking.	No businesses are directly or indirectly impacted fiscally or economically by this rulemaking and no businesses were directly involved in this rulemaking.
Large Business	No direct or indirect fiscal or economic impacts.	
Local Government	No direct or indirect fiscal or economic impacts.	
State Agencies		
DEQ	Adopting ambient benchmarks as administrative rules will have no impact on FTE's, revenues, or expenses.	
Other agencies	No direct or indirect fiscal or economic impacts.	
Assumptions	The primary assumption is that any fiscal and economic impacts will result from the operation of Oregon's air toxics program, which follows benchmark adoption, and not from simply adopting ambient benchmarks as administrative rules.	
Housing Costs	The Department has determined that this proposed rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.	
Administrative	The Department used the Air Toxics Science Advisory Committee to establish	

Attachment B -Statement of Need and Fiscal Impact

Rule Advisory Committee	the ambient benchmarks to be adopted as administrative rules.

Prepared by	Printed name	Date
Approved by DEQ Budget Office	Printed name	Date

Attachment C - Land Use Evaluation Statement

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY

Rulemaking Proposal
for
OREGON AIR TOXICS PROGRAM: BENCHMARKS

Land Use Evaluation Statement

Rule Caption: This rule will establish health-based ambient benchmarks for Oregon's air toxics program.

1. Explain the purpose of the proposed rules.

The Oregon Department of Environmental Quality (DEQ) is proposing to adopt ambient benchmarks for a specified group of air toxics as administrative rules. OAR 340-246-0090(2)(e) requires that, once ambient benchmarks for air toxics have been established as defined in OAR 340-246-0090(2)(a-d), they be adopted as administrative rules. Ambient benchmarks are concentrations of air toxics that serve as goals in the Oregon Air Toxics Program. They are based on levels protective of human health considering sensitive populations. They are not enforceable regulatory standards, but rather "standard reference values" by which air toxics problems can be identified, addressed and evaluated. The proposed rules are limited to adopting ambient benchmarks as administrative rules. The ambient benchmarks proposed in this rulemaking will function within Oregon's existing air toxics program (per OAR 340-246) as triggers for, and clean air goals within, other facets (Geographic Air Toxics Emissions Reduction Planning, Source Category Strategy, Safety Net) of the program.

2. Do the proposed rules affect existing rules, programs or activities that are considered land use programs in the DEQ State Agency Coordination (SAC) Program?

Yes No__☑_

a. If yes, identify existing program/rule/activity:

b. If yes, do the existing statewide goal compliance and local plan compatibility procedures adequately cover the proposed rules?

Yes_ No_____ (if no, explain):

c. If no, apply the following criteria to the proposed rules.
The proposed rules are not reasonably expected to have significant effects on resources, objectives or areas identified in the statewide planning goals; or present or future land uses identified in acknowledged comprehensive plans.

In the space below, state if the proposed rules are considered programs affecting land use. State the criteria and reasons for the determination.

Not applicable

3. If the proposed rules have been determined a land use program under 2. above, but are not subject to existing land use compliance and compatibility procedures, explain the new procedures the Department will use to ensure compliance and compatibility.

Not applicable

Attachment D - Response to Questions Addressing Federal Requirements

Relationship to Federal Requirements

Rule Caption: This rule will establish health-based ambient benchmarks for Oregon’s air toxics program.

Answers to the following questions identify how the proposed rulemaking relates to federal requirements and potential justification for differing from federal requirements. The questions are required by OAR 340-011-0029.

1. Are there federal requirements that are applicable to this situation? If so, exactly what are they?

There are no federal requirements for air toxics benchmarks, however there are federal data on the toxicity of various air pollutants. The proposed rules reflect the scientific consensus of DEQ’s Air Toxics Science Advisory Committee (ATSAC), which reviewed existing federal air toxics reference values in order to establish air toxics benchmarks for Oregon that reflect the best available science. In some cases ATSAC recommended using existing federal values, while, in other cases, ATSAC recommended different values based on newer science. ATSAC also recommended establishing reference values for pollutants not covered by the federal program. The proposed Oregon toxics benchmarks allow the Department to begin addressing threats to public health from toxic air pollutants that remain after the performance- and technology-based strategies of the federal air toxics program have been applied.

2. Are the applicable federal requirements performance based, technology based, or both with the most stringent controlling?

The federal program has both performance and technology-based requirements, but does not establish health-based benchmarks.

3. Do the applicable federal requirements specifically address the issues that are of concern in Oregon? Was data or information that would reasonably reflect Oregon's concern and situation considered in the federal process that established the federal requirements?

No. The federal program does not establish uniform health-based benchmarks.

4. Will the proposed requirement improve the ability of the regulated community to comply in a more cost effective way by clarifying confusing or potentially conflicting requirements (within or cross-media), increasing certainty, or preventing or reducing the need for costly retrofit to meet more stringent requirements later?

Not applicable. Adopting ambient benchmarks does not impose any regulatory requirements.

5. Is there a timing issue which might justify changing the time frame for implementation of federal requirements?

Not applicable.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

Not applicable

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources? (level the playing field)

Yes, the proposed benchmarks set common goals for the state.

8. Would others face increased costs if a more stringent rule is not enacted?

No.

9. Does the proposed requirement include procedural requirements, reporting or monitoring requirements that are different from applicable federal requirements? If so, Why? What is the "compelling reason" for different procedural, reporting or monitoring requirements?

No.

10. Is demonstrated technology available to comply with the proposed requirement?

Not applicable

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost effective environmental gain?

Yes, the benchmarks are integral to DEQ's efforts to decrease air toxics emissions through voluntary and community based pollution reduction projects.

Attachment E - Summary of ATSAC deliberations on benchmark development

This is an edited and annotated summary, arranged by air toxic, of the Air Toxics Science Advisory Committee's discussions on selection of ambient benchmarks for use in Oregon. It is drawn from the notes prepared for ATSAC meetings held between March and January, 2006.

1	***Acetaldehyde***
	Both USEPA[1] (IRIS[2]) and OEHHA[3] have cancer and non-cancer values for this air toxic; these values are very close. The cancer studies led to a value based on the NOAEL[4], adjusted with uncertainty factors. The IRIS value was agreed to based on the Committee's established practices.[5] It was also noted that background levels are close to this benchmark concentration and that guidance from DEQ[6] will be needed when it is used in air quality management. It was the consensus of the Committee to accept the IRIS value (0.45 µg m^{-3}) as Oregon's interim ambient benchmark for acetaldehyde.
2	***Acrolein***
	Although the USEPA (IRIS) and OEHHA values differed by only a factor of three, it was noted that the USEPA value had been more recently derived from the same NOAEL, but using different uncertainty factors. USEPA OAQPS[7] has adopted the IRIS value. It was also pointed out that while OEHHA expressed concern about children having a greater sensitivity to this air toxic, they did not produce a new number based on that concern. It was the consensus of the Committee to accept the IRIS value (0.02 µg m^{-3}) as Oregon's interim ambient benchmark for acrolein.
3	***Arsenic***
	Because the USEPA IRIS and OEHHA values for this well-studied Class A[8] carcinogen were within an order of magnitude, the higher unit risk estimate (from OEHHA) was used. [9] It was the consensus of the Committee to accept the OEHHA value (3.0×10^{-4} µg m^{-3}) as Oregon's interim ambient benchmark for elemental arsenic only.[10]
4	***Benzene***
	With good information available for both cancer and non-cancer effects of this air toxic, the Committee focused on its cancer effects. IRIS provides a range for the unit risk estimate (this range translates to a benchmark range of 0.13 µg m^{-3} to 0.45 µg m^{-3}) but offers no guidance about how this range should be used. The OEHHA value is more than an order of magnitude lower than the lower end of the IRIS range (0.03 µg m^{-3} vs. 0.13 µg m^{-3}). Following its established practices,[5, 9] the Committee chose a value at the high end of the IRIS range. It was the consensus of the Committee to accept the IRIS value (0.45 µg m^{-3}) as Oregon's interim

1 U.S. Environmental Protection Agency

2 Integrated Risk Information System, considered a "gold standard" of toxicological information for regulatory purposes.

3 The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment.

4 No-Observed-Adverse-Effect-Level.

5 The Committee generally preferred to use toxicological information from IRIS. When that source was unavailable for a given air toxic, their preferences were (in order): (a) OEHHA reference exposure levels (REL) and unit risk estimates (URE), (b) Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRL), and (c) other scientifically-credible sources (e.g., the World Health Organization (WHO)).

6 Oregon Department of Environmental Quality.

7 U.S. EPA's Office of Air Quality Planning and Standards.

8 U.S. EPA's old (1986) weight-of-evidence classification system for carcinogens: Class A = known human carcinogen; Class B1 = probable human carcinogen with limited epidemiological evidence; Class B2 = probable human carcinogen with inadequate human data but sufficient evidence of carcinogenicity in animals; Class C = possible human carcinogens; Class D = not classifiable as human carcinogens.

9 The Committee noted early on that toxicological values (particularly for non-carcinogens) within an order-of-magnitude are possibly indistinguishable. Because of this lack of distinction, it became the Committee's general practice, if values from similarly credible sources were within an order of magnitude, to select the higher value as the benchmark.

10 This is an instance where the committee chose to override its toxicological information hierarchy[5] in favor of a the larger of two values, from equally credible sources, that were within an order-of-magnitude of one another.[9]

	ambient benchmark for benzene.
5	***1,3-Butadiene***
	This air toxic has both cancer and non-cancer effects but the benchmark was based on cancer. The USEPA IRIS unit risk estimate was considered more appropriate since it was derived from a human study and done more recently (2004 vs. 2001) than the OEHHA risk estimate. It was the consensus of the Committee to accept the IRIS value (0.033 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for 1,3-butadiene.
6	***Cadmium Compounds***
	The Committee focused on cancer effects although this air toxic also has non-cancer effects. Both USEPA IRIS and OEHHA based their values on the same study but used different adjustments for uncertainty. Following their established practices,[5] the IRIS value was chosen. A separate CASRN[11] (1306-19-0) was added for cadmium fumes (CdO). It was the consensus of the Committee to accept the IRIS value ($5.6 \times 10^{-4}\ \mu g\ m^{-3}$) as Oregon's interim ambient benchmark for both cadmium and cadmium oxide.
7	***Carbon Tetrachloride***
	The Committee focused on cancer effects although this air toxic also has non-cancer effects. Following their established practices,[5] it was the consensus of the Committee to accept the USEPA IRIS value ($6.7 \times 10^{-2}\ \mu g\ m^{-3}$), rather than the slightly higher OEHHA value ($2.4 \times 10^{-2}\ \mu g\ m^{-3}$), as Oregon's interim ambient benchmark for carbon tetrachloride.[12]
8	***Hexavalent Chromium***
	The benchmark values used by OEHHA and USEPA IRIS for Cr VI embed assumptions about the proportion of Cr III to Cr VI in air samples. At present, DEQ monitors for total chromium and has only just begun to perform analyses that can differentiate Cr VI. There is thus some uncertainty about the proportion of Cr VI in Oregon air samples. Following their established practices,[5] it was the consensus of the Committee to accept the IRIS value ($8.3 \times 10^{-5}\ \mu g\ m^{-3}$), rather than the lower OEHHA value ($0.7 \times 10^{-5}\ \mu g\ m^{-3}$), as Oregon's interim ambient benchmark for hexavalent chromium, because it was felt that the IRIS value, although higher, would still be adequately protective.
9	***Ethylene Dibromide***
	The Committee discussed the difference between values representing the central tendency versus the reasonable upper bound. The USEPA IRIS value represents the reasonable upper bound and is based on a more recent (2004) review than is the OEHHA value (2001). Following their established practices,[5] it was the consensus of the Committee to accept the U.S USEPA IRIS value ($2.0 \times 10^{-3}\ \mu g\ m^{-3}$) as Oregon's interim ambient benchmark for ethylene dibromide.
10	***Ethylene Dichloride***
	Values put forth by USEPA IRIS and OEHHA rely upon the same animal oral dosing studies, but OEHHA used a different statistical analysis and produced a slightly lower number. Following their established practices,[5] it was the consensus of the Committee to accept the IRIS value ($4.0 \times 10^{-2}\ \mu g\ m^{-3}$) as Oregon's interim ambient benchmark for ethylene dichloride.
11	***Formaldehyde***
	USEPA has stated on several occasions that it will revise the unit risk estimate currently in IRIS (dating from 1991) to that resulting from the 2004 CIIT study (OAQPS is already using the CIIT value). This basically reflects a down-grading of formaldehyde as a carcinogen. Several options were offered for how the Committee might respond to this pending change: (a) use the existing

[11] Chemical Abstract Service Registration Number
[12] This is an instance where the Committee's toxicological hierarchy preference[5] trumped its higher value[9] preference.

	IRIS value, but flag it to be revised when USEPA actually changes this value, (b) use the new value from the CIIT study, or (c) use the OEHHA value. After some discussion, the Committee decided to base its recommendation on the OEHHA non-cancer reference concentration, which is lower than the value which would result from adoption of the CIIT unit risk estimate. This approach allows Oregon to both recognize the eventual change in IRIS and maintain an adequate level of protection. It was the consensus of the Committee to accept the OEHHA non-cancer RfC value of 3 µg m^{-3} as Oregon's interim ambient benchmark for formaldehyde.
12	***Lead***
	Lead is unique because it is a criteria pollutant with a NAAQS[13], an air toxic, B2 carcinogen,[8] and has not been found to have a threshold level for adverse effects. The NAAQS for lead is 1.5 µg m^{-3} averaged over a calendar quarter. OEHHA uses this same value but averaged over a month instead of a quarter. Oregon's air toxics rules do not require that the benchmark value default to the NAAQS. OEHHA has the only value for lead as a carcinogen, based on testing with organic lead. Concern was expressed over using a value for organic lead as the benchmark because it may be overly protective when applied to emissions of inorganic lead (the predominant form in Oregon). The Committee discussed whether it should recommend different values for different forms of lead. Washington and a number of other states have different values depending on the form of lead; these values range from 0 to 0.5 µg m^{-3}. It was further noted that ATSAC must also consider lifetime effects, cancer, and cardiovascular effects of low level exposures. In this context, the toxicological studies behind the federal NAAQS are becoming increasingly dated and may not indicate values low enough to protect children from neurobehavioral effects. Further investigation by Committee members indicated that lead was a weak carcinogen. After some discussion, it was decided that lead's non-cancer effects were more likely to be more immediate and significant. A white paper prepared by Dr. Bart Ostro (OEHHA, 2000) gave a value of 0.5 µg m^{-3} as an annual average air exposure that would be protective (i.e., equates to blood lead levels < 10 µg dl^{-3}) for approximately 90% of exposed children. It was also noted that WHO[14] recommended a standard in the range of 0.5 to 1.0 µg m^{-3} and that New Zealand's "Review of Ambient Air Quality Guidelines" (2000) described their rationale for setting their ambient standard at 0.5 µg m^{-3}. An issue was raised about focusing only on the inhalation exposure pathway. The Committee agreed that the benchmark concentration should assume that inhalation is the only exposure and that an annual standard lower than the NAAQS was appropriate. It was the consensus of the Committee to select an annual average value of 0.5 µg m^{-3} as Oregon's interim ambient benchmark for lead.[15]
13	***Manganese Compounds***
	These air toxics are considered non-carcinogenic, based on worker (occupational) studies. The difference between the USEPA IRIS and OEHHA values derives from the use of different uncertainty factors (there is also an ATSDR MRL close to the EPA value). It was pointed out that this discrepancy was due to the two agencies relying on studies with different routes of exposure, oral and inhalation, and the difference in impact these exposures have on the human body. The Committee discussed the difficulties in converting oral doses to inhalation doses.[16] Following their established practices,[9] it was the consensus of the Committee to use the higher OEHHA value of 0.2 µg m^{-3} as Oregon's interim ambient benchmark for manganese.
14	***Nickel Compounds***
	Both OEHHA and USEPA agree that nickel and its compounds should be considered as carcinogenic. The potency values derived independently by each agency are almost identical.

13 National Ambient Air Quality Standard

14 World Health Organization.

15 This is an example of where the Committee reached a decision by relying upon credible sources from further along its information hierarchy.

16 Due to the uncertainties involved in trans-route extrapolations, the Committee ultimately decided to make it a general practice not to use values based on oral-to-inhalation conversions.

	After a brief discussion, it was the consensus of the Committee to use 0.0043 $\mu g\ m^{-3}$ (based on the USEPA IRIS value[5]) as Oregon's interim ambient benchmark for nickel.
15	***Tetrachloroethylene***
	This air toxic, commonly referred to as perchloroethylene or PERC, is considered a Class B2/C carcinogen.[8] Animal data indicate its potential as a human carcinogen but to date no human study has supported this conclusion. The Committee wondered why better, and more recent, data weren't available for such a commonly used solvent. It was suggested that a lack of clear evidence for human carcinogenicity was likely related to the difficulty of isolating the effect of PERC on human cancer incidence, given the many probable confounding factors in earlier worker studies. The Committee concluded that PERC was probably a human carcinogen, based on it being identified as such by a number of agencies, and ought to be treated that way. Following their established practices,[5] it was the consensus of the Committee to use the higher OEHHA value of 0.17 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for tetrachloroethylene.
16	***Toluene***
	This air toxic is a non-carcinogen. During the discussion it was noted that, in addition to USEPA IRIS and OEHHA values, toluene has an ATSDR chronic inhalation MRL of 306 $\mu g\ m^{-3}$. Following their established practices,[5] it was the consensus of the Committee to accept the IRIS value (400 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for toluene.
17	***2,4- & 2,6-Toluene Diisocyanate***
	This air toxic is a mixture of two isomers 2,4- and 2,6- isomer, with a unique CASRN. The measurability of this air toxic is still being researched by DEQ. It was noted that measurability, as well as other pragmatic factors, could be considered by the Committee when setting a benchmark. It was also noted that this compound has a CalEPA OEHHA cancer URE of $1.1 \times 10^{-5}\ (\mu g\ m^{-3})^{-1}$, that would result in a benchmark of 0.09 $\mu g\ m^{-3}$. Based on these discussions and their established practices,[5] it was the consensus of the Committee to accept the USEPA IRIS value for the mixture of the two isomers (0.07 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for toluene diisocyanate.
18	***Trichloroethylene***
	Trichloroethylene is a commonly used solvent and a substantial quantity is estimated to be released in Oregon.[17] Again, the committee wondered why more recent information on its toxicological properties was not available, especially from USEPA. The IRIS value was withdrawn in the late 1980s and it is unfortunate that it has not been replaced. The OEHHA determination of the carcinogenicity and potency value is based on older animal studies. It was noted that these studies gave a "mixed bag" of results with some species showing carcinogenic effects and others not. It was also noted that humans metabolize chlorinated solvents such as this differently than animals. However, it was pointed out that, although its cancer potency has been difficult to quantify, multiple respected national and international bodies believe there is reasonable evidence that this air toxic is a human carcinogen. Following their established practices,[5] it was the consensus of the Committee to use OEHHA's value of 0.5 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for trichloroethylene.
19	***Vinyl Chloride***
	There is medium to high confidence that this chemical is a human carcinogen and so the Committee focused on its carcinogenic potency. It was pointed out that the USEPA and the OEHHA potency values were almost an order of magnitude different and that they were based on different cancer endpoints; one using liver cancer and the other lung cancer. It was also

[17] The Committee relied on emission estimates from the 1999 Emission Inventory (EI) for Oregon, prepared by DEQ.

	noted that this chemical was identified by USEPA, in its latest addition to its risk assessment guidance,[18] as an Early Life Stage toxin. As such, any risk assessment must include an additional safety factor to protect this sensitive group. The Committee considered both of these issues carefully. First, they concluded that the OEHHA analysis of both liver and lung effects resulted in very similar potency values. Second, they determined that the IRIS value differed from the OEHHA value primarily because OEHHA had incorporated a sensitive population safety factor equivalent to the one that USEPA recommended for early life exposures. It was the consensus of the Committee to use a value of 0.11 μg m^{-3} (based on IRIS) as Oregon's interim ambient benchmark for vinyl chloride, with the proviso that the Early Life Stage guidance be followed whenever this value is used in a risk assessment.
20	***Xylenes***
	This common solvent and component of gasoline is estimated to have some of the highest emissions of any air toxic in the state.[17] There is medium to good certainty from animal and human studies that this air toxic is not a carcinogen. Although their respective values are within a factor of ten, the IRIS value is based on a NOAEL in an animal study while the OEHHA value is based on a LOAEL[19] in a human study. Following their established practices,[9] it was the consensus of the Committee to use the OEHHA RfC value of 700 μg m^{-3} as Oregon's interim ambient benchmark for xylenes.
21	***Acrylonitrile***
	This air toxic is considered a B1 carcinogen.[8] Both the USEPA IRIS potency value and the OEHHA value were derived from the same rat study, although with different uncertainty factors. The Committee questioned, but did not strongly object to, the derivation of USEPA's adjustment for lifetime. Following their established practices,[5] it was the consensus of the Committee to accept the proposed value of 0.015 μg m^{-3} as Oregon's interim ambient benchmark for acrylonitrile.
22	***Ammonia***
	This is a non-carcinogenic air toxic that was selected for a benchmark primarily because of its high emission rates in the State.[17] Following their established practice,[9] it was the consensus of the Committee to accept the higher OEHHA value (200 μg m^{-3}) as Oregon's interim ambient benchmark for ammonia.
23	***Beryllium***
	Very little of this air toxic appears to be emitted in Oregon.[17] USEPA has identified it as a B1 carcinogen.[8] Worker inhalation studies provide strong evidence for a cancer endpoint and there is good confidence in the potency value. Both OEHHA and USEPA IRIS based their analyses on the same studies and agree on the value. After a brief discussion, it was the consensus of the Committee to accept the IRIS value of 4.2×10^{-4} μg m^{-3} as Oregon's interim ambient benchmark for beryllium.
24	***Carbon Disulfide***
	This air toxic appears to be a non-carcinogen. It was pointed out that the IRIS value on the summary sheet is incorrect and should be changed to 700 μg m^{-3}. Because of confounding factors present in studies involving humans, the potency of this air toxic in humans is presently unclear. However, animal studies appear to be reliable. Following their established practices,[9] it was the consensus of the Committee to use the higher OEHHA value of 800 μg m^{-3} as Oregon's interim ambient benchmark for carbon disulfide.

[18] Early Life Stage guidance (USEPA/630/R-03/003F, March 2005).

[19] Lowest-observed-adverse-effect-level. The Committee expressed a preference for values derived from a LOAEL, as these are more likely to equate to point where actual effects may occur. Because of methodological issues, the same cannot be said for values derived from a NOAEL. Part of the rational for the Committee's preference of a higher value[9] is tied to this LOAEL concept.

25	***Chlorine***
	Discussion of this air toxic touched on several issues. There was general surprise among Committee members that so few toxicological studies had been done on such a common chemical. Only a non-cancer OEHHA value was available and this was based on animal studies. A question was raised about adjusting short-term human exposure studies, but it was agreed that this would be inappropriate for determining chronic effects (and difficult to substantiate and defend). It was noted that Washington state had adopted an ASIL[20] of 5 $\mu g\ m^{-3}$ for chlorine. Following these discussions it was the consensus of the Committee to accept the OEHHA value (0.2 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for chlorine. However, the Committee wanted to "flag" this value for reconsideration during rule making, and possibly for early future review.
26	***Chloroform***
	Chloroform is considered a B2 carcinogen[8] that is fairly persistent in the environment. The USEPA IRIS value is derived from oral exposure in an animal study dating back to 1976. USEPA's preference appears to be to use the non-cancer potency in risk assessments. On the other hand, the OEHHA value is derived from a newer study that suggests a cancer endpoint only through oral exposure. The Committee once again expressed surprise that no solid study of inhalation exposure was available for a commonly used chemical. Due to a lack of confidence in the cancer potency value, it was the consensus of the Committee to accept the IRIS non-cancer RfC, 98 $\mu g\ m^{-3}$, for Oregon's interim ambient benchmark concentration for chloroform.
27	***Cobalt Compounds***
	No USEPA IRIS or OEEHA values were available for this air toxic. It was the consensus of the Committee to accept the ATSDR value (0.1 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for cobalt.[5]
28	***Dibutylphthalate***
	As no inhalation toxicity information is available for this air toxic, DEQ had proposed a value based on an oral-to-inhalation dose conversion. The Committee felt that there was insufficient information on inhalation exposure to justify setting an ambient air benchmark concentration on this basis.[16] The Committee decided to move this air toxic back to an inactive status (Priority Tier 4) due to this lack of adequate toxicological information.
29	***1,4-Dichlorobenzene***
	The USEPA IRIS RfC and the corresponding non-carcinogen value from OEHHA are the same. However, only OEHHA has a cancer potency value. Studies of potential cancer effects give mixed results, and then only for oral exposures. OAQPS used the OEHHA cancer potency value in the 1996 NATA[21] and is also using it in developing standards for industrial sources. It was the consensus of the Committee to tentatively agree to the proposed value of 0.091 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for 1,4-dichlorobenzene. Washington State has an ASIL of 1.5 $\mu g\ m^{-3}$ developed by consecutively dividing the OSHA[22] TLV[23] of 450 $mg\ m^{-3}$ by safety factors of 300 and 1000.
30	***1,3-Dichloropropene***
	The only non-cancer and cancer potency values for this air toxic are those from USEPA IRIS. There are good animal inhalation studies to support the cancer potency and the Committee had only a brief discussion before reaching consensus on accepting the IRIS value of 0.25 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for 1,3-dichloropropene.

[20] Air Source Impact Level
[21] National-scale Air Toxics Assessment.
[22] Occupational Health and Safety Administration.
[23] Threshold Limit Value.

31	***Diesel Particulate Matter (DPM)***

General

This air toxic was the most discussed of all those considered. The discussion began by noting that Diesel Particulate Matter (DPM) was an unusual air toxic in that it referred to a source as well as an air toxic. Although other pollutants previously discussed by the Committee could have been associated with a specific source, this was not done. In addition, the particulate matter in diesel exhaust is only one component, albeit the one most often mentioned, of a complex and varying mixture of gases and particles that make-up this air emission. It was also noted that this mixture changes with the operation of the source, as well as in the ambient air after it has been released. Thus in toxicological studies, the investigator is able to know that the air toxic is coming from a particular process, but when collected from the ambient air, the source of the air toxic, or pollutants, is not known unambiguously. There are differing or overlapping definitions of what constitutes DPM, diesel exhaust, diesel emissions, etc. Recently reported research provides evidence that the RfC for DPM of 5 $\mu g\ m^{-3}$ (used by USEPA OAQPS) is not low enough to be protective of many non-cancer health effects. It was asked what would be the effect of ATSAC not making a benchmark concentration recommendation for DPM. The leader of DEQ's diesel team said that while the federal new engine program would continue, a diminished estimate of DPM's health impact would be de-motivating, possibly lessening the impetus for the state to focus on DPM reductions from the existing fleet.

Monitoring

The issue of monitoring was raised, since measurements will be needed for evaluation of ambient air concentrations relative to the ambient benchmark. There was concern whether DEQ was able, both technically and financially, to perform such measurements and about whether ambient measurements would allow the air toxic to be ascribed to a specific source, or source type. In response, it was stated that DEQ had a modest budget available for air toxics monitoring, which could include sampling for DPM. DEQ currently collects semi-volatile organic compounds, analyzing for polynuclear aromatic hydrocarbons (PAH). In addition, USEPA has a $PM_{2.5}$ national network, with several monitoring locations in Oregon. The samples are routinely analyzed for a suite of components, including ions, metals, and carbon fractions. Using these analyses, DEQ could use techniques such as Chemical Mass Balance (CMB) or Principal Component Analysis (PCA) to determine the contribution of diesel emissions sources to the fine particles collected. It was then mentioned that PCA, using PAH, was difficult primarily because the relative compositions of the PAH from sources were constantly changing. It was also noted that, over time, volatile components in diesel exhaust convert into particulates. In addition, it was noted that as engine and fuel standards change so will particle size, PAH composition, and sulfur compounds in the exhaust.

A DEQ staff member was asked if he had found out anything new about measurement of the components of DPM. He replied that the department had considerable data on the composition of fine particulate, $PM_{2.5}$, and that the measurements of other diesel exhaust components were also being made. He reiterated, however, that much of the work attempting to quantify ambient concentrations of DPM relied on analysis of the PM constituents followed by use of statistical methods to determine source contributions. It was mentioned that several comparisons of source contributions had been done using the positive matrix factorization method and the chemical mass balance method but that they gave different results for the diesel contribution. Because one would find similar PM constituents from any internal combustion source using similar fuels, it would be difficult to link the toxicology literature to what is monitored in ambient air because different constituents are being measured.

Proxies for DPM

Committee members were asked if they thought the focus should be on Particulate Matter (PM) or a suite of specific components of diesel exhaust. Some members preferred to focus on PM.

	A member of DEQ's emissions inventory staff was asked what air toxic emissions factors were used in compiling the emissions inventory for diesel. He replied that it was $PM_{2.5}$.[24] Most of it was from exhaust but some came from evaporation of fuel during storage and transport. It was pointed out that the chronic bronchitis and other toxicity studies were based on exposure to the mixture of pollutants in diesel exhaust and that sometimes this mixture was aged. PM is often used as a proxy measure in these studies. It was also pointed out that almost all emissions are a mixture and that everything we breathe is a mixture and that there was no good way to do toxicity studies on mixtures. Decomposing this mixture into components is consistent with the way the Committee has previously approached establishing ambient benchmark concentrations. A Committee member asked if it was possible to identify the most toxicologically significant components. A concern was then raised about the synergistic effects (i.e., the ability of fine particles in DPM to deliver other substances (e.g., PAHs) deep into the lungs) that made DPM unique. It was then suggested the Committee consider VOC, PAH, and PM_{fine} as proxies for DPM. Maine and Rhode Island use PAH, while OEHHA and New Jersey use DPM. It was asked if there was evidence to suggest whether it was the PAH or the PM that was primarily responsible for the toxicity. It was noted that IARC[25] had found DPM to be a "probable" carcinogen while gasoline exhaust PM was considered only "likely". There is scientific consensus that diesel's small-sized carbon particles act to effectively deliver organics and metals deep into the respiratory region of the lung. This physical property and depositional tendency makes DPM unique. Studies had shown that elemental carbon alone, even as nanoparticles, was not a carcinogen. The point was made that the small particle size coupled with the PAH composition was what made this air toxic unique, noting that several researchers suggested that it was the number of particles, rather than the mass, that was likely to be the cause of the negative health outcomes. As there is no precedent at the federal level of an ultrafine ($PM_{0.1}$) particle standard, it would be a difficult route for DEQ to undertake this by itself. If it was generally agreed that DPM is a carcinogen, then the Committee should include that factor in its determination of an ambient benchmark. It was suggested that diesel exhaust might be approached as a mixture using some method of combining the effects of the individual components. It was again noted that those components vary at the point of release and then change over time. The air quality community, however, appears to be comfortable, at present, with having almost all DPM exposure estimates come from modeling, rather than monitoring. This suggests that DEQ could use modeled DPM as a surrogate for diesel exhaust until acceptable monitoring methods are established. <u>Four Options</u> It was proposed that, as a point of departure the Committee consider four possible approaches to a benchmark for DPM: (1) Adopt a benchmark based on the OEHHA cancer URE,[26] as USEPA IRIS no longer provides a URE for diesel exhaust but USEPA OAQPS has adopted the OEHHA value, (2) As was done in New Jersey, recognize DPM as a potential carcinogen but modify the non-cancer RfC by a "cancer safety factor" to arrive at a benchmark for DPM - New Jersey selected 10 as its safety factor but other values are certainly a possibility, (3) Ignore DPM as a potential carcinogen, and set a benchmark based directly on the RfC, without modification, or (4) Ignore DPM and utilize benchmarks developed for the major constituent chemicals in diesel exhaust (e.g., particulates, VOCs,[27] semi-VOCs, etc.). The Committee was queried as to which of the four approaches (listed above) had their support.

24 Particulate matter 2.5 microns in diameter.
25 International Agency for Research on Cancer.
26 Unit risk estimate.
27 Volatile organic compounds.

	Only (2) (safety factor approach) and (4) (major constituents approach) were supported. There was some support for (2), with a safety factor of 10 modification to the RfC (because 10 is most commonly used). Others preferred focusing on individual constituents, in that DPM could not be distinguished from other fine particulate with any certainty. PAH alone was not thought adequate to describe the toxicity of diesel emissions. It was acknowledged that DPM was not fully characterized chemically but perhaps creating a "measure" would help drive the science. The discussion came down to either believing that DPM was a unique (measurable) air toxic or a non-unique collection of toxic air pollutants. <u>A Fifth Option</u> The discussion turned to an agreement that there was clearly qualitative, if not good quantitative, evidence (primarily occupational epidemiology and laboratory toxicity studies with rats) that diesel exhaust is a likely carcinogen. On this basis, it was suggested that the Committee look at the range of cancer potency ranges that have been previously published, which were summarized as: (a) The World Health Organization range was well documented and it is about in the middle of the overall range of values, (b) The Pepelko study should have been considered by USEPA and OEHHA but was not, (c) The results in Dawson and Alexeef may have been influenced by Dawson's connection with the 1998 OEHHA study, and (d) Although older studies used older engines they may still have validity because of fleet longevity. While these ranges were based on generally the same toxicity studies, USEPA and OEHHA reached different interpretations. The concern that there be specificity about the subject of the benchmark concentration was repeated. A benchmark for DPM of either 0.1 or 0.06 $\mu g\ m^{-3}$ was then proposed, based on the information provided, professional judgment, and discussion among Committee members. One member thought either would be adequate, three preferred the 0.1 $\mu g\ m^{-3}$ value. At this point a concern was raised with the rule language requiring that the ambient benchmark concentration be set for a cancer risk of 10^{-6}. A benchmark just for DPM sets the risk level for this source category without considering the other pollutants also being emitted in the exhaust. The group agreed that the benchmark should relate only to DPM exhausted by diesel-fueled internal combustion engines. It was the consensus of the Committee to accept 0.1 $\mu g\ m^{-3}$ (the upper end of a credible range of estimates) as Oregon's interim ambient benchmark concentration for diesel particulate matter (DPM), where DPM is particulate matter exhausted by diesel-fueled internal combustion engines.
32	***Dioxins & Furans, Total (as 2,3,7,8-TCDD)***
	The discussion began by noting that less than 100 lbs of total dioxins were estimated in the emissions inventory,[17] although given the toxicity of these compounds, this is still significant. There are two dioxin monitoring locations, near Albany and Newport, which are part of the National Air Deposition Monitoring Network (NDAMN). The one in Albany was moved because it was located next to farming activities and frequently had anomalous values due to trace levels of dioxins in farm chemicals. Measured values in the range of 4 – 16 fg m^{-3} are similar to background measurements by OEHHA, but also close to the proposed ambient benchmark. It was then suggested that the octachloro- and hexachloro- congeners be combined with total dioxins and the entire group be given an ambient benchmark concentration based on its toxicity equivalency to the 2,3,7,8 tetrachlorodibenzo-p-dioxin congener. The Committee agreed to include the octachloro- and hexachloro- congeners with the rest of the dioxins and use toxicity equivalency factors (TEF). It was then suggested that the furans also be included and everyone agreed. It was recommended that WHO[14] TEFs from 1998 be used since they are the best documented and the most accepted. It was pointed out that we could have TEFs that change as the WHO changes their TEF values by setting the benchmark in rule but keeping the TEFs in guidance. Because the OEHHA value was based on a unit risk estimate that was related to toxicity to children, it was proposed to use the OEHHA value as the basis for our benchmark concentration.

	Because dioxins are a potential multi-pathway air toxic, the Committee also addressed the issue of whether a benchmark based on inhalation exposures would not a priori be inadequately protective for exposures by other pathways (e.g., ingestion, dermal exposure, etc.). Through the use of a large-scale fugacity model, the Committee was able to assure itself of an adequate margin of safety even with only an inhalation benchmarks.[28] It was the consensus of the Committee to accept the proposed value of 2.6×10^{-8} μg m^{-3} as Oregon's interim ambient benchmark for total chlorinated dioxins and furans.
33	***Polynuclear Aromatic Hydrocarbons (PAHs)***
	The discussion began by noting that the DEQ emissions inventory includes estimates for PAHs both as groups (e.g., USEPA 16-PAH, USEPA 7-PAH, and POM) and as individual compounds (e.g., benzo(a)pyrene). However, the toxicology of PAHs is for individual compounds, which makes it difficult to provide a reasonable benchmark for groups of PAHs. In addition, there is considerable overlap in how PAH groups and POM are defined. USEPA 7-PAH consists of those PAHs considered carcinogenic by USEPA, whereas the 16-PAH list includes PAHs not classifiable (by USEPA) as carcinogens (a weight of evidence designation of "D"[8]) and naphthalene (sometimes, however, naphthalene is not included). POM is a mixture of numerous PAHs; however, the toxicological properties of only sixteen of these have been reported in the literature. These factors suggested that it might be easier and more toxicologically defensible to proceed on the basis of individual PAHs. The Committee had been given a proposal from DEQ for addressing the 7-PAH and POM benchmarks on the basis of individual PAHs. In this proposal, USEPA's seven carcinogenic PAHs were added to the sixteen carcinogens in POM whose toxicology had been studied, to yield a list of twenty-four carcinogenic PAHs. After some discussion by the Committee, the eight noncarcinogenic PAHs were placed in a separate category. In practice, concentrations of these individual PAHs would be normalized to a benzo(a)pyrene concentration with Toxicity Equivalency Factors (TEF). TEFs permit the toxicity of various individual PAHs to be expressed ("normalized") in terms of benzo(a)pyrene toxicity, one of the best studied PAHs. This normalization is based on oral toxicity factors. Both USEPA and WHO use TEFs. The sum of normalized concentrations for both the carcinogenic and noncarcinogenic PAHs would be compared to the OEHHA benzo(a)pyrene concentration of 0.0009 μg m^{-3}. Naphthalene is both a representative volatile PAH and the single most emitted PAH in Oregon.[17] As such, it was considered separately and 0.03 μg m^{-3} (the OEHHA benchmark) was proposed for use as Oregon's benchmark. Three other PAH-related issues were also discussed: (1) if, when monitoring for PAHs, the more volatile PAHs should be considered separately from the less volatile in the group, (2) how PAHs

[28] The Committee was provided with information about a fugacity model used in Canada (ChemCAN) which can be used to estimate the distribution of a chemical into various environmental media after its release to the environment. It was noted that the model incorporates conservative assumptions so that the results were more likely to be an over-, rather than an under-, estimate of the actual values. The model was used to predict human multi-pathway exposures assuming an initial air concentration. Model estimated levels in air, water, soil, and fish tissue were made assuming the following inputs on an air toxic: (1) at emission levels predicted by the 1999 emission inventory, at the proposed ambient benchmark concentrations, and (3) at a measured "background" concentration. Results were compared to USEPA Region 9 Preliminary Remediation Goals (PRGs), which are human health risk-based values used by the federal Superfund program. Only dioxins in air and mercury in fish came within an order of magnitude of these PRGs; all other estimates were much lower. This suggests that use of the proposed ambient benchmarks being considered today would be unlikely to create problems via multi-pathway exposures as well. It was pointed out that ChemCAN does not give absolute values but only results that could be used to show the relative impact of various initial conditions. Since none of the model inputs came close to creating a breach of the PRG (with the two noted exceptions), it was felt this model gave an analysis that is sufficient to address multi-pathway concerns at this point in the program. It was generally agreed that should the ambient concentration of a multi-pathway air toxic approach the benchmark, then it would be appropriate to use a more refined model to better address the specifics of a given situation.

	classified as "D" carcinogens should be included, and (3) whether naphthalene should have its own benchmark. It was pointed out that sampling methods have a big impact on PAH measurements. The use of polyurethane foam (PUF) or XAD resins, either with or without a particulate pre-filter, will effect what is captured and ultimately measured. It was noted that naphthalene has significant break-through with the standard PUF method. It was then suggested the volatiles be split from the non-volatiles; however, this would require defining a volatility cut point. The Committee concluded that guidance will be needed on how to best measure these pollutants in the ambient air. It was then suggested that PAHs listed as "D" carcinogens be kept separate from those that are more clearly carcinogenic, primarily because there was no evidence concerning their carcinogenic potential. Because, however, some of these PAHs may have carcinogenic potential (per ATSDR) and are emitted in large quantities, they should not be ignored. It was suggested they be evaluated separately using the benzo(a)pyrene TEF approach and the Committee agreed to this. This is a conservative approach in that it holds "D" PAHs to the benchmark for carcinogens. It was suggested that naphthalene should be kept separate due to its volatility and the Committee supported that position. The Committee ultimately agreed to use the TEF approach for all PAHs with the exception of naphthalene. In addition, they recommended separating the carcinogenic 7-PAH and POM constituents from the "D" PAHs. It was the consensus of the Committee to accept the proposed value of 0.0009 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for twenty-four carcinogenic PAHs, as well as for the eight "D" PAHs. It was the consensus of the Committee to accept the proposed value of 0.03 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for naphthalene.
34	***Ethylene Oxide***
	Because no USEPA IRIS value was available, it was the consensus of the Committee to accept the OEHHA value (0.011 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for ethylene oxide.
35	***Hexachlorodibenzo-p-dioxins***
	These are one type of dioxin and are covered by the benchmark selected for total dioxins and furans (see #32).
36	***Hexane***
	Both USEPA IRIS and OEHHA values were available, with the OEHHA value being the larger of the two. Following its preference for the higher value (when other factors were similar)[9], it was the consensus of the Committee to accept the OEHHA value (7000.0 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for hexane.
37	***Hydrogen Chloride***
	It was the consensus of the Committee to accept the USEPA IRIS RfC value (20.0 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for hydrogen chloride.
38	***Hydrogen Cyanide***
	Both USEPA IRIS and OEHHA values were available, with the OEHHA value being the larger of the two. Following its preference for the higher value (when other factors were similar)[9], it was the consensus of the Committee to accept the OEHHA RfC value (9.0 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for hydrogen cyanide.
39	***Hydrogen Fluoride***
	Because no USEPA IRIS value was available, it was the consensus of the Committee to accept the OEHHA value (14 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for hydrogen fluoride.
40	***Mercury Compounds***

	It was asked if mercury had been studied in the Portland Air Toxics Assessment. It had not, since the 1996 NATA did not indicate any significant inhalation risk from mercury in Oregon. The form of the mercury is an important aspect of its toxicology. Non-cancer toxicity values were presented for divalent mercury, inorganic mercury, and methyl mercury. It was noted that methyl mercury is the predominant form in fish tissue, which is the primary point of human exposure and toxicity. Other forms of mercury make their way into aquatic systems where they are methylated, meaning that any mercury released to the atmosphere is important. Methyl mercury can be released from sources like settling ponds but most airborne mercury comes from combustion sources and is in elemental, oxide, or inorganic salt forms. A Committee member asked what form was measured by DEQ and a DEQ staff member replied that particulate matter was analyzed by ICP/MS to give total mercury. Mercury is not considered to be a carcinogen but is a potent neurotoxin; particularly with respect to developing fetuses. It was then pointed out that the USEPA IRIS and OEHHA potency values were derived from the same toxicology studies but that the two agencies used different uncertainty values to arrive at their published numbers. However, the toxicology has moderate uncertainty and the two values were within an order of magnitude. The group was comfortable with the IRIS concentration for elemental mercury but was not initially certain whether it should be applied to all mercury compounds. However, it was pointed out that all the inorganic mercury values were within the same order of magnitude. Because mercury is a potential multi-pathway air toxic, the Committee also addressed the issue of whether a benchmark based on inhalation exposures would not a priori be inadequately protective for exposures by other pathways (e.g., ingestion, dermal exposure, etc.). Through the use of a large-scale fugacity model, the Committee was able to assure itself of an adequate margin of safety even with only an inhalation benchmark.[28] It was the consensus of the Committee to accept the proposed value of 0.3 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for all forms of inorganic mercury. The Committee chose not to set a benchmark for methyl mercury in ambient air.
41	***Methyl Bromide***
	The USEPA IRIS value was supported by a OEHHA value for children of 4 $\mu g\ m^{-3}$. Following its established practices,[9] it was the consensus of the Committee to accept the IRIS value (5 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for methyl bromide. No consideration was given to this compound being an ozone depleting substance.
42	***Methyl Chloride***
	This air toxic (also known as chloromethane) has both USEPA IRIS and ATSDR chronic inhalation MRL (103.5 $\mu g\ m^{-3}$) values; the MRL is toxicologically equivalent to the IRIS RfC. There was some concern expressed about the large uncertainty factor in this IRIS value but no clear reason not to accept it. It was the consensus of the Committee to accept the IRIS value (90 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for methyl chloride.
43	***Methyl Chloroform***
	No USEPA IRIS value was available and there was no clear reason not to accept this OEHHA value. It was the consensus of the Committee to accept the OEHHA value of 1000 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for methyl chloroform.
44	***Methylene Chloride***
	It was the consensus of the Committee to accept a value (2.1 $\mu g\ m^{-3}$) based on the USEPA IRIS URE as Oregon's interim ambient benchmark for methylene chloride.
45	***Octachlorodibenzo-p-dioxins***
	These are one type of dioxin and are covered by the benchmark selected for total dioxins and furans (see #32).

46	***White Phosphorus, Phosphine, Phosphoric Acid***
	The proposed value was based on an oral-to-inhalation conversion for white or yellow phosphorus. Concerns were raised about using this value for all phosphorus-containing compounds. It was also noted that Washington state had an ASIL[20] for phosphorous metal and several phosphorous compounds. The majority of the discussion focused on whether the benchmark should only be for the elemental form and not include compounds containing phosphorus, such as phosphoric acid and phosphine. Most of the phosphorus identified in the DEQ emissions inventory comes from lime kilns at pulp mills where it would usually be in combined form. Health effects values for other phosphorus containing compounds were found to be substantially different. Values for phosphoric acid and phosphine are available in USEPA IRIS; a value for phosphoric acid is also available from OEHHA. Further review of the phosphine data revealed that both the USEPA IRIS and OEHHA values were based on the same study but that different uncertainty factors were used to arrive at the effect level. It was the consensus of the Committee to accept the OEHHA non-cancer value (0.07 $\mu g\ m^{-3}$) as Oregon's interim ambient benchmark for white phosphorus (elemental) only. Following its established practices,[9] it was the consensus of the Committee to select the IRIS value of 10 $\mu g\ m^{-3}$ and the slightly higher OEHHA value of 0.8 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmarks for phosphoric acid and phosphine, respectively.
47	***Polychlorinated Biphenyls (PCBs)***
	This air toxic is emitted in small quantities and it was not found to present a problem in Oregon based on the 1996 NATA. No monitoring data were presented and it was confirmed that PCBs have not been routinely measured in air, although the DEQ laboratory frequently analyzes for these compounds in water and soil. These compounds are potential carcinogens, as well as neurotoxins. The USEPA IRIS and OEHHA values are within an order of magnitude. It was pointed out that the IRIS value would be closer to the OEHHA value if the higher of the slopes for the persistence and bioaccumulation curves were used rather than the slope of the middle curve. It was clarified that the proposed benchmark resulted from using Toxicity Equivalence Factors (TEF) on this family of compounds. However, it was then noted that the risk assessment methodology assumes you are using speciated data which you won't have from monitoring. It was suggested that this benchmark be handled as a mixture of total PCBs. A value for total PCB was then proposed as this would be both conservative and easier to measure and assess. It was suggested that if a particular situation approached the benchmark a closer look and more refined analysis might be needed. It was asked if we could lump PCBs with dioxins but it was pointed out that only 13 PCBs are occasionally treated that way. The Committee decided not to lump the two groups together since they come from distinctly different sources and have different health impacts. A question was asked regarding the sources of these emissions since these compounds are no longer manufactured and are not easily volatilized. The emissions inventory[17] indicates that they are primarily emitted by backyard burning (i.e., people using burn barrels for household solid waste). Because PCBs are potential multi-pathway air toxics, the Committee also addressed the issue of whether an benchmark based on inhalation exposures would not a priori be inadequately protective for exposures by other pathways (e.g., ingestion, dermal exposure, etc.). Through the use of a large-scale fugacity model, the Committee was able to assure itself of an adequate margin of safety even with only an inhalation benchmark.[28] It was the consensus of the Committee to accept the IRIS value of 0.01 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for total polychlorinated biphenyls.
48	***Polycyclic Organic Matter (POM)***

	This is a group of numerous polycyclic aromatic hydrocarbons, and is covered by the benchmark selected for PAHs (see #33).
49	***Hydrogen Sulfide***
	This pollutant is described as a non-carcinogen with no special effect identified for sensitive sub-groups, such as children or asthmatics. The 1999 NATA did not indicate this was a pollutant of concern in Oregon. There is an RfC in U.S. EPA IRIS based on acute upper respiratory effects. The OEHHA RfC is five times higher but based on an older (1983) study than the 2000 study used by U.S. EPA. The newer study was well done and demonstrated irreversible nasal lesions resulting in loss of olfactory function. It was also noted that the study looked at effects on children and that the uncertainty factors had taken sensitive sub-groups into account. It was recommended the IRIS value and it was the consensus of the Committee to accept the proposed value of 2.0 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for hydrogen sulfide.
50	***Methanol***
	The Committee considered study results used by OEHHA in their determination of an RfC, since no IRIS value is available. There are many good studies available, although all are sub-chronic and few looked at inhalation. Both NOAEL and LOAEL have been determined and the uncertainty factors are small. It was pointed out that since no one has suggested methanol may be a carcinogen there have been no studies done with that toxicological endpoint in mind. Once again, it is surprising that such a common chemical in wide-spread use has not been studied for this effect. It was noted that a lot of work has been done on this chemical's oral toxicity and was surprised that the primary endpoint was teratogenic (birth defects), resulting in extra cervical ribs, rather than ocular (blindness). It was the consensus of the Committee to accept the proposed value of 4000 $\mu g\ m^{-3}$ as Oregon's interim ambient benchmark for methanol.
51	***1,1,2,2-Tetrachloroethane (TCA)***
	Because of conflicts and uncertainty in the available toxicological information for this air toxic, it was the consensus of the Committee to defer recommending an ambient benchmark value for 1,1,2,2-tetrachloroethane until additional information becomes available.
52	***Quinoline***
	The Committee decided to move this air toxic back to an inactive status (Priority Tier 4) due to this lack of adequate toxicological information and because it is not emitted in Oregon (in was formerly emitted by a facility in Washington State).
53	***Bis(2-ethylhexyl)phthalate (DEHP)***
	Because of conflicts and uncertainty in the available toxicological information for this air toxic, it was the consensus of the Committee to defer recommending an ambient benchmark value for bis(2-ethylhexyl)phthalate until additional information becomes available.

ACRONYMS

ABC	Ambient Benchmark Concentration (Oregon)
ARB	Air Resources Board (California)
ATSDR	Agency for Toxic Substances and Disease Registry (CDC, DHHS)
C-ABC	Ambient Benchmark Concentration (Carcinogen)
CalEPA	California Environmental Protection Agency
CEHPA	Children's Environmental Health Protection Act (California)
CIIT	Chemical Industry Institute of Toxicology
DEQ	Oregon Department of Environmental Quality
EI	Emission inventory
HEAST	Health Effects Assessment Summary Table
IRIS	Integrated Risk Information System (USEPA)
MDL	Minimum detection limit
MRL	Minimal risk level
NAAQS	National Ambient Air Quality Standard
NATA 1996	1996 National Air Toxics Assessment (USEPA)
NATA 1999	1999 National Air Toxics Assessment (USEPA)
NC-ABC	Ambient Benchmark Concentration (Non-carcinogen)
n/m	Not measured by the NATA
OAQPS	Office of Air Quality Planning and Standards
OEHHA	Office of Environmental Health Hazard Assessment (CalEPA)
ORD	Office of Research and Development (USEPA)
PAH	Polycyclic Aromatic Hydrocarbon
PB-HAP	Persistent, bioaccumulative hazardous air pollutants
PRG	Preliminary Remediation Goal
RfC	Reference Concentration (inhalation)
RfD	Reference Dose (ingestion)
RfDi	Reference Dose (inhalation)
TAC	Toxic Air Contaminant (California)
TERA	Toxicology Excellence for Risk Assessment
URE	Unit Risk Estimate (inhalation exposure)
USEPA	United States Environmental Protection Agency

STACI SIMONICH, PH.D.

Dr. Simonich is currently an Assistant Professor at Oregon State University with a joint appointment in the Department of Environmental and Molecular Toxicology and Department of Chemistry. Dr. Simonich received her Ph.D. in Chemistry from Indiana University in 1995. Her graduate research focused on the global and regional atmospheric transport of persistent organic pollutants and their removal from the atmosphere by natural vegetation. This research resulted in publications in the journals Science, Nature, and Environmental Science and Technology. Following graduate school, Dr. Simonich worked for six years as a Senior Environmental and Atmospheric Chemist for the Procter & Gamble Company in Cincinnati, Ohio. Her research there focused on the environmental and atmospheric fate of high production volume fragrance materials that are used in consumer products, and resulted in publications in the journals Environmental Science and Technology and Environmental Toxicology and Chemistry. She joined Oregon State University in 2001.

Dr. Simonich's expertise is primarily in the area of air pollution monitoring and environmental science. Her 10-member research group at OSU is focused on studying the trans-Pacific and regional atmospheric transport and deposition of air toxics (primarily persistent organic pollutants) to high elevation ecosystems. Her laboratory's air monitoring research sites include Marys Peak in Oregon's Coast Range, the Olympic Peninsula of Washington, and a site on Mt. Bachelor. The air monitoring research sites are funded through a 5-year grant from the National Science Foundation. Dr. Simonich's laboratory is also studying the atmospheric deposition of air toxics to high elevation ecosystems located in eight Western U.S. National Parks.

Dr. Simonich is also experienced in the fields of toxicology and risk assessment because of her past employment at the Procter & Gamble Company in Consumer Product Safety and her appointment in OSU's Department of Environmental and Molecular Toxicology. Dr. Simonich is actively involved in the Society of Environmental Toxicology and Chemistry and has served on several committees, including the planning committee for the World Congress meeting in Portland, Oregon in 2004.

WILLIAM LAMBERT, PH.D.

Dr. Lambert is an associate professor in the Department of Public Health and Preventive Medicine at Oregon Health and Science University and a scientist at the Center for Research on Occupational and Environmental Toxicology (CROET). He holds a Ph.D. from the Department of Epidemiology and Environmental Analysis at the University of California, Irvine and a BA degree from the Department of Biology at the University of California, Los Angeles. His areas of expertise are air pollution epidemiology, biostatistics, and toxicology. He has served on a number of advisory/regulatory committees, including:

- 1991-1994, City of Albuquerque/Bernalillo County Air Quality Control Board (Member, Vice-Chair, and Chair)
- 1993-1996, American Thoracic Society, Environmental Health Committee, primary author of State-of-Science review on ambient air pollution health effects
- 1997-2000, American Cancer Society Southwest Division, Skin Cancer Core Team (Chair)
- 1990-2000, American Lung Association, New Mexico Chapter, Air Quality Committee (Member and Chair)
- 1998-2000, Childhood Lead Poisoning Taskforce (Member)
- 1999-2000, Children's Indoor Environment Improvement Project (Member)
- 1999-2000, New Mexico Turning Point Environmental Health Initiative (Member)
- 2003-Present, Citizen's Advisory Group for Viewmaster Plant (invited expert)

Dr. Lambert is supported by grants from the NIEHS (National Institute of Environmental Health Sciences), ATSDR/CDC (Agency for Toxic Substances and Disease Registry), NIOSH (National Institute for Occupational Safety, NCI (National Cancer Institute) and Northwest Portland Area Indian Health Board.

BRIAN PATTERSON, PH.D.

Dr. Patterson is currently employed as an environmental consultant with SECOR International Incorporated in Tualatin, Oregon. He holds a bachelor's degree in Chemistry and a doctorate degree in

Physical Chemistry. His areas of expertise include risk assessment, air dispersion modeling, air receptor modeling, environmental regulatory review, and air quality permitting.
Dr. Patterson is currently finishing a year-long air emission risk assessment for the Lawrence Berkeley National Laboratory which has focused on dispersion modeling and risk/hazard assessment. He worked with Oregon DEQ and public stakeholders to complete a similar study for the Swan Island area in Portland in 1997, and completed a graduate-level Risk Assessment and Toxicology course earlier this year.

CANDICE HATCH, P.E.

Ms. Hatch is an environmental engineer with more than 27 years of experience in air quality. Her work involves direction and performance of the technical analyses necessary for project evaluations. In addition, she has experience in task and project management for both industrial and governmental projects.

Ms. Hatch's air quality experience focuses on permitting of new and modified industrial facilities. She has prepared permit applications and obtained permits for facilities under Title V, prevention of significant deterioration (PSD), new source review, and state construction and operation permitting requirements. She has performed computer modeling, calculated emission inventories, and prepared air pollutant control equipment evaluations (i.e., BACT, RACT, and LAER) as required to satisfy these regulations. An understanding of regulations and the industry-agency negotiation process complements her technical skills. Examples of the variety of clients for whom she has performed air quality permitting services include steel mills, pulp and paper mills, wood products plants, aggregate mining and processing plants, asphalt refineries, petroleum terminals, silver mines, electronics manufacturers, magnetic tape manufacturers, biomass power plants, wood-treating plants, coal-fired power plants, and coal distribution facilities.

Ms. Hatch has prepared environmental impact statements (EIS) for a mix of projects. She has evaluated several transportation projects, a gold mine, an oil pipeline system, an oil refinery, a hazardous waste treatment storage facility, solid waste landfills, wastewater treatment facilities, power plants and other industrial developments under national and individual state EIS requirements. Ms. Hatch has also written the air quality evaluations of proposed rocket launch facilities in Florida and Kwajalein.
She holds a BS degree in Environmental Engineering from California Polytechnic State University and is a Registered Professional Engineer in Oregon and Ohio.

KENT NORVILLE, PH.D.

Dr. Norville is an Associate Atmospheric Scientist and project manager at Air Sciences Inc. in Portland, Oregon. He specializes in air quality dispersion modeling, data analysis, and model development. He has considerable experience with a wide variety of models for a number of different public and private sector modeling applications. Applications include regulatory permit modeling, risk assessments, and environmental impact statements; dust fall and deposition studies; accidental release dispersion modeling; visibility modeling; water vapor cloud assessments; odor assessments; transportation conformity and hot spots dispersion modeling; meteorological data processing and assessments; specialized modeling; and custom model development. He has provided modeling assistance to a number of industrial clients, including aluminum producers, wood product facilities, pulp and paper facilities, metal processors, cement plants, mining operations, food producers, electric power producers, composting facilities, and waste treatment facilities.

Dr. Norville is experienced with risk assessment methods and applications. He has worked on a variety of different risk and toxics projects, including EPA superfund sites, public municipalities, and private industries across the United States. He has conducted modeling analyses of many toxic compounds, including: BTEX compounds associated with refinery and fuel depots, lead and zinc impacts from contaminated road dust, particulate emissions from open-pit cement operations, PAH and HF emissions from smelters, vinyl chloride and TEC emissions from treatment plants, solvent emissions from semiconductor facilities, and dioxin and heavy metal emissions from hazardous waste incinerators. Much of the modeling work has been used to show compliance with Acceptable Source Impact Levels (e.g., Washington State), 1-in-a million cancer risks, chronic and acute hazard indexes (e.g., California's AB2588 program), and direct threshold levels used to access both public and on-site worker health. He holds a Ph.D. degree in geophysics from the University of Washington and a B.S. degree in physics from the California Polytechnic University, San Luis Obispo.

NATALIA KREITZER, P.E.

Ms. Kreitzer received a B.S. degree in chemical engineering from Oregon State University and has been employed as an air quality engineer, first as a consultant and more recently as an air quality regulator. Her relevant engineering experience includes knowledge of sources of toxic emissions to the air, emission control strategies and current and future EPA regulations affecting toxics air emissions.

For the past six years she has worked for the Southwest Clean Air Agency (SWCAA) in Vancouver, Washington and has been the air toxics coordinator at SWCAA since 2000. In addition, her duties include writing Air Discharge Permits for industrial facilities, inspecting industrial facilities and determining compliance with all applicable air regulations including Washington's toxic rule "Controls for New Sources of Toxic Air Pollutants." In 2002, she participated as a member of Washington's Mercury Chemical Action Plan Advisory Committee and assisted in the development of a plan to reduce mercury in the state of Washington.

DAVID STONE, Ph.D. (joined ATSAC in January 2006)

Dr. Stone is a public health toxicologist employed by the Oregon Department of Human Services (Health Services). He received his Ph.D. in Environmental & Molecular Toxicology from Oregon State University in 2002, a M.S. in Applied Environmental Sciences from the University of North Texas in 1996, and a B.S. in Zoology from the University of Texas in 1993.

His areas of expertise include risk assessment and toxicology. Dr. Stone has authored several public health assessments and consultations for contaminated sites throughout Oregon. He has served on the Oregon Environmental Council Tiny Footsteps advisory committee, the U.S. EPA Harmful Algal Bloom-Cyanobacteria expert panel, and the Oregon Chemical Preparedness and Emergency Response Planning workgroup. He is a member of the Society of Environmental Toxicology and Chemistry, the Society for Risk Analysis, and the Oregon Collaborative on Health and the Environment. Recent grant sources include the Agency for Toxic Substances and Disease Registry (ATSDR) and City of Portland for work in the Portland Harbor Superfund Site and an Environmental Public Health Tracking grant for biomonitoring of mercury levels in fish from Jackson County.