Memo

To: Technical Workgroup
From: DEQ and OHA
Date: June 14, 2016
Subject: Pollutant Scope and Setting Concentration Levels (UPDATED)

Introduction

The Cleaner Air Oregon rulemaking is a partnership between Oregon Health Authority and Oregon Department of Environmental Quality to develop a new regulatory system for managing air toxics emissions from industrial sources. The new rules will be based on the potential risk to human health so DEQ can carry out its mission of cleaner air and a healthier Oregon. In developing this new regulatory approach, the two agencies will begin looking at individual sources of industrial emissions across the state in relation to public health benchmarks.

DEQ and OHA have evaluated other state air toxics permitting programs and narrowed the field to six programs for further assessment: Louisville, Kentucky; New Jersey, New York, Rhode Island, South Coast Air Quality Management District (California), and Washington. Key elements of these air toxics programs will be summarized and presented to the Technical Workgroup and the resulting policy issues will be discussed at Policy Forums around the state and with the Advisory Committee. After receiving input on the different aspects of a risk-based air toxics permitting program from the Technical Workgroup, the Policy Forums, and the Advisory Committee, DEQ/OHA will draft proposed rules and all interested parties will have a chance to comment on the proposed rules during the public notice period in 2017.

DEQ and OHA will be updating this issue paper throughout the rulemaking process based on input from the Technical Workgroup, Policy Forums around the state and the Advisory Committee.

A glossary of terms can be found at this link:
http://www.deq.state.or.us/nwr/docs/metalsem/8Glossary.pdf

Purpose

This issue paper addresses the key elements of pollutant scope and setting concentration levels: What pollutants are included in other states' air toxics programs? How are concentration levels set?

Scope of Pollutants

What pollutants are included in other air toxics programs? What was the basis for including or excluding pollutants?

The scope of regulated air toxics for the six programs investigated varied depending on the program goals and structure, as well as state or local prioritization of particular pollutants. In general programs included the federally listed hazardous air pollutants. Programs regulating pollutants beyond the federal HAPs relied on other commonly used sources of air toxics listing such as the California Office of Environmental Health Hazard Assessment, the Agency for Toxic Substances and Disease Registry, and other agencies that set protective levels for public health. The degree of flexibility in adding new pollutants varies. Information on the Michigan air toxics program was added on the suggestion of a member of the

Technical Workgroup as having an interesting, alternative approach. Michigan's open-ended definition says "toxic air contaminants" are regulated until delisted which shifts the burden to industry and requires new and modified facilities to demonstrate acceptable impacts.

Program	Program Description
Louisville, Kentucky	Louisville uses a tiered approach to chemicals and how requirements are applied, requiring major and synthetic minor sources to assess risk and hazard for chemicals, locally monitored and modeled, as potential public health problems (Categories 1 and 2). New and modified major and synthetic minor sources must assess risk and hazard for the locally identified pollutants, as well as those on EPA's urban air toxics list and the federal Clean Air Act Hazardous Air Pollutant list of 187 chemicals. • Category 1 Toxic Air Contaminants were chosen because these were the chemicals that were monitored in the West Louisville Air Toxics Study at a concentration representative of a risk greater than one in one million or a Hazard Quotient greater than 1.0. There are 18 Category 1 Toxic Air Contaminants. • Category 2 Toxic Air Contaminants were chosen because of their role in the high level of risk determined for Jefferson County by EPA Region 4. The risk derived from the Risk-Screening Environmental Indicators model was based on reported actual emissions of those Toxic Air Contaminants. There are 19 Category 2 Toxic Air Contaminants. • Category 3 Toxic Air Contaminants are chemicals identified by the EPA as urban air toxics because these hazardous air pollutants "... present the greatest threat to public health in the largest number of urban areas ..." [Clean Air Act Section 112(k)(3)(B)(i)], and are not included in Categories 1 and 2. There are 17 Category 3 Toxic Air Contaminants. • Category 4 Toxic Air Contaminants are chemicals identified under Section 112(b) of the Clean Air Act as Hazardous Air Pollutants because these chemicals "present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive dysfunction, or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise ..." [Clean Air Act Section 112(b)(2)]. These Toxic Air Contaminants exclude chemicals in Categories 1, 2, and 3. There are 136 Category 4 Toxic Air Contaminants. Under Regulation 5.21, the Title V and Federally Enforceable District Origin Operating Permit (potential to emit at major source levels but have enforceable limits to stay below) companies are required to demonstrate environmental acceptability for Category 1 and 2 Toxic Air Contaminants from existing processes and process equipment and for Category 1, 2, 3, and 4 Toxic Air Contaminants for new and modified processes and process equipment. Louisville also has a general duty clause which they have never applied. It allows them to address any industrial emissions regardless of applicability criteria. It requires facilities to "provide the utmost care and consideration to prevent the potential harmful effects of the emissions resulting from the process or process equipment," and prohibits emissions "in a quantity or duration as to be harmful to the health and welfare of humans, animals, and

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	plants."
New Jersey	New Jersey's stationary source air toxics program uses the Environmental Protection Agency's list of 187 Hazardous Air Pollutants.
New York	NY regulates "air contaminants" "(d) Air contaminant or air pollutant. A chemical, dust, compound, fume, gas, mist, odor, smoke, vapor, pollen or any combination thereof." New York currently includes 1091 pollutants in its air toxics program. Short-term Guideline Concentrations are chosen to protect the general population from adverse acute one-hour exposures. Annual Guideline Concentrations are chosen to protect against adverse chronic exposure and are based upon the most conservative carcinogenic or non-carcinogenic annual exposure limit. For a list of guideline concentrations see http://www.dec.ny.gov/docs/air_pdf/agcsgc14.pdf. Most of the time New York derives Short-term Guideline Concentrations and Annual Guideline Concentrations values by adopting the most scientifically valid preliminary values from the United States Environmental Protection Agency or the New York State Department of Health. If there are no exposure limits derived by New York, USEPA or New York State Department of Health, the Annual Guideline Concentrations/Short-term Guideline Concentrations values will be derived from Threshold Limit Values, Threshold Limit Value Ceiling Limits, or Short-Term Exposure Limits published by the American Conference of Governmental Industrial Hygienists. When no exposure limits or American Conference of Governmental Industrial Hygienist values are available, New York will often derive Annual Guideline Concentration/Short-term Guideline Concentration values based on an analogy to a compound with similar toxicological properties. Lastly, when no exposure limits or American Conference of Governmental Industrial Hygienist values are available and no analogies can be made, New York will assign a conservative de minimus limit as the Annual Guideline Concentrations. New York also has a list of 62 High Toxicity Air Contaminants (mass emissions in pound/year that are used for screening). To see how New York developed this list, please see Appendix C. http://www.dec.ny.gov/chemical/30681.html If the process operation emits any High Toxicity Air Contaminant below the mass emission limits established in Table 2, then they are in compliance with Part 212. If they emit more than the High Toxicity Air Contaminant mass emission limit, then they have to perform a toxic impact statement to ensure that the High Toxicity Air Contaminant maximum impact is less than Annual Guideline Concentrations, Short-term Guideline Concentrations, and persistent and bio-accumulative triggers.
Rhode Island	Rhode Island includes a list of about 258 air toxics subject to regulation based on meeting one or more of the following criteria: • The Environmental Protection Agency has classified the substance as a Hazardous Air Pollutant; • An inhalation Reference Concentration and/or an inhalation cancer potency factor for

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	the substance is currently listed on EPA's Integrated Risk Information System database; • The California Office of Environmental Health Hazard Assessment or California Air Resources Board has derived a chronic and/or acute inhalation Reference Exposure Level for the substance (for non-cancer effects); • EPA has classified the substance as an A, B1, B2, or B2-C carcinogen, the National Toxicology Program has classified the substance as a K or R carcinogen, and/or the International Agency for Research on Cancer has classified the substance as a 1, 2A or 2B carcinogen and California and/or EPA has derived an inhalation cancer potency factor for the substance; or • The substance is emitted in Rhode Island by one or more stationary sources and an inhalation and/or oral health benchmark is available for the substance on EPA's Integrated Risk Information System database (Reference Concentration, Reference Dose, or cancer potency factor), from the Agency for Toxic Substances and Disease Registry, (oral or inhalation Minimal Risk Level), and/or from California (inhalation Reference Exposure Level or cancer potency factor).
South Coast Air Quality Management District (CA)	California regulates toxic air contaminants, or airborne substances with potential to cause adverse health effects in humans. Toxic Air Contaminants are identified by state and federal agencies based on a review of available scientific evidence. Federal agencies also use the term Hazardous Air Pollutant. In the state of California, Toxic Air Contaminants are identified through a two-step process that was established in 1983 under the Toxic Air Contaminant Identification and Control Act, Assembly Bill 1807, Tanner. This two-step process of risk identification and risk management was designed to protect residents from the health effects of toxic substances in the air. • South Coast uses a list of 23 higher risk pollutants for yearly fee assessment purposes. • They have a list with toxics criteria for 150-200 pollutants that they use for permitting • They also have a list of 450 chemicals covered by Hot Spots reporting; reporting is required every 4 years. • They include the 187 federally listed HAPs plus tobacco smoke, diesel particulate, and asbestos. http://www.arb.ca.gov/toxics/id/taclist.htm
Washington	Washington has a list of 398 pollutants with levels that correspond to three tiers in regulations: • De minimis levels; • Acceptable Source Impact Levels; and • Small Quantity Emission Rates. These pollutants were identified if they had an inhalation unit risk value or inhalation reference value from one of three sources: EPA Integrated Risk Information System (Reference Concentrations and Unit Risk Values), CA Office of Environmental Health Hazard Assessment (Reference Exposure Levels and Unit Risk Values) and Agency for Toxic Substances and Disease Registry (Minimum Risk Levels).
Michigan	Michigan does not maintain a list of all toxic air contaminants. The rules define toxic air contaminant as any air contaminant for which there is no national ambient air quality

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	standard and which is or may become harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration. Michigan does maintain a list of initial threshold screening levels for 134 pollutants and risk screening levels (initial and secondary) for 1143 pollutants. Forty-one substances including lead are specifically exempt from the definition of toxic air contaminant, including such things as criteria pollutants, inert gases, nuisance particulates, and substances that have relatively low toxicity. There are two basic requirements of the rules. First, each new and modified emissions unit or process must apply the best available control technology for toxics (T-BACT). After the application of T-BACT, the emissions of the toxic air contaminant cannot result in a maximum ambient concentration that exceeds the applicable health based screening level. Facilities determine concentration levels using one of three methods: allowable emissions, a matrix approach or a modeling approach. This link provides a description of the different methods: http://www.michigan.gov/documents/TACS_Demonstrating_Compliance_with_Rule_225_117508_7.pdf There are several exemptions or off ramps from the health based screening level requirement. These include the following: • Emissions of toxic air contaminants that are less than 10 pounds per month and 0.14 pound per hour, provided that the toxic air contaminant is not a carcinogen or on a list of a high concern compounds. The high concern toxic air contaminants include 38 chemical substances or classes of compounds specifically listed in Table 20 of the rules. • Processes that are regulated by a National Emission Standard for Hazardous Air Pollutants (NESHAP) promulgated before November 1990 (for example standards for radon, beryllium, mercury, vinyl chloride.) • Emissions of hazardous air pollutants regulated by NESHAPs that have undergone residual risk analysis. • Rule 226(d) exempts emissions of toxic air contaminants from the health based screening level requirement if it can be demonstrated that the emissions will not cause or contribute to a violation of the provisions of Rule 901. Rule 901 prohibits emissions of air contaminants that alone or in reaction with other air contaminants, cause injurious effects to human health or safety, animal life, plant life or significant economic value or property. The demonstration under Rule 226(d) must be made on a case-by-case basis and include consideration of all relevant scientific information. Michigan regulations, see page 46 et seq http://w3.lara.state.mi.us/orr/Files/AdminCode/1494_2014-154EQ_AdminCode.pdf

The following information was gathered at the June 29, 2016 Technical Workgroup meeting:

Pros and Cons of short or long pollutant lists:

HAPS

- At a minimum you have to cover the Hazardous Air Pollutant federally regulated list. As this list changes over time, updates to state rules will be required. The data can be used as a first cut to designate more or less toxics pollutants for prioritization.

Additions to any list we use

- Include pollutants that are not HAPs such as diesel particulate matter because of public health concerns.
- Include pollutants that you know are toxics but are not on the HAP list, such as pollutants on the Washington or California lists.
- Include pollutants that you don't have health data for but you know cause health impacts (H_2S is a good example). Quantifying risk in the future based on new studies may be possible.
- Look at existing lists from other states and refine further based on what you know about air toxic pollutants emitted in Oregon.
- Include pollutants that are detectable through monitoring although data is limited by the number of locations as well as the number of pollutants you can test for but still useful as a prioritization tool.

Use a very inclusive list

- Use a longer list to help determine what is important to regulate. SCAQMD did so because they didn't know what pollutants would be emitted at levels of concern. If the pollutant is novel or emerging, it might be hard to determine what a "level of concern" is.
- Use a longer list but prioritize that list. As businesses are looking towards the future in manufacturing, it would be good to know what could be regulated in the future.
- Look at pollutants that already have existing risk based screening levels (New York's approach)
- Establish a list of pollutants that could be important to regulate in the future when science and health risk catch up.

Don't use an inclusive list

- Don't include those pollutants that don't have risk based concentrations because there would be no basis of comparison. If you detect or model some concentration of an air toxic, you really need some kind of comparison value to provide context for what the numbers mean to the public. It can be really challenging to communicate about contaminants for which we have no comparison value.

Priority OR pollutants

- There are some pollutants that are more important than others because of toxicity, concentrations and the number of people exposed. Look at this data for pollutants in Oregon to see the number of people affected by a risk level and categorize national and regional pollutant drivers and contributors to devise list.

What are the advantages and/or limitations to the program's scope of pollutants?

***Note:** this is each state's/local's evaluation of their own program.*

The scope of air toxics regulated generally correspond to concerns in each state or region. Prioritizing groups of higher risk chemicals can help focus work and add efficiency. Some regulators stressed the importance of maintaining the authority and flexibility to add or revise chemicals of concern as new scientific and toxicological information becomes available. An alternate approach is to assemble a long, very inclusive list, although this could increase resources for compliance and list maintenance.

Program	Program Description
Louisville, Kentucky	• Prioritized pollutants are known to be problems • General duty clause allows regulating new chemicals if needed
New Jersey	• Using the federal Hazardous Air Pollutant list provides certainty, stability and alignment with the federal program. • New Jersey does not appear to have the ability to add air toxics beyond the federal list to tailor its approach to unique industries or new chemicals of concern. • *DEQ and OHA are seeking technical workgroup input on the advantages and limitations of the program's scope of pollutants*
New York	• Broad authority and open ended definition of air pollutants allows New York to stay current on chemicals in use that are determined to be hazardous • List is a guidance or policy document that staff update periodically in consultation with Health and notice to stakeholders. This is more flexible than revising regulations. • Extensive list avoids repeated revisions • More maintenance to keep a long list updated • New York has added a set of chemicals specific to their state that have separate documentation not available on Integrated Risk Information System or from California's Office of Environmental Health Hazard Assessment. • Sources use their Material Safety Data Sheets to determine what chemicals to screen for and thus are not overwhelmed by the huge list.
Rhode Island	• Rhode Island's list uses the best available information from federal agencies and California. The biggest strengths are that it takes advantage of available high quality toxicity data, making it justifiable. They have the ability to add chemicals that are not regulated elsewhere, as they have recently done for n-propylbromide. This adds flexibility when a chemical is of concern in the state related to their unique industry mix. • It can be controversial to add a state initiated chemical, requiring a great deal of justification. • Neighbors Massachusetts and Connecticut have smaller regulated air toxics

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	lists, so Rhode Island may be considered more burdensome by comparison.
South Coast Air Quality Management District (CA)	• South Coast defaults to the Office of Environmental Health Hazard Assessment for toxicity criteria. Office of Environmental Health Hazard Assessment also tracks and provides toxicity assessments and listings for new chemicals of concern. • Lists are tailored to different purposes. • In assessments, South Coast uses pollutants most applicable to the District, the longer list includes exotic chemicals not commonly in use.
Washington	By choosing to include pollutants that are based on toxicity values available from EPA IRIS, California Office of Environmental Health Hazard Assessment, and Agency for Toxic Substances and Disease Registry, Washington has included pollutants that have been evaluated using a formal process. Toxicity values derived by these agencies have undergone comprehensive evaluation and systematic review. Unlike occupational exposure levels, these values were derived with the intent of being relevant to exposures experienced by the general public. The resulting values were often derived after consensus among multiple reviewers, and in some cases, input from a broad range of stakeholders and the public. The decision to use existing toxicity values from reputable sources was made to limit the amount of time Ecology staff would need to spend to derive and defend the use of alternative toxicity values. The limitations of this approach include: • A narrower list has the potential to miss pollutants that have not yet been through a formal review process, but still may pose a threat to public health. • As toxicity values are updated, or new toxicity values are added by EPA, Agency for Toxic Substances and Disease Registry, or California Office of Environmental Health Hazard Assessment, Ecology cannot update their list of toxic air pollutants until the rule is re-opened under a formal process (i.e., the list is not quickly adaptive to new science)
Michigan	Michigan initiated its inclusive, open-ended approach to which air toxics are regulated based on advice of stakeholders in the late 1980s. Facilities with new or modified emissions are required to assess all reasonably anticipated air toxics emissions using available data like emission factors or stack testing. In general, regulated industry in Michigan dislikes the burden of the inclusive approach to regulated pollutants. A recent stakeholder process resulted in a proposal to compile a list of more than 700 chemicals instead. This proposal went out for public comment and was dropped because of overwhelming opposition from public and environmental stakeholders. (Michigan will provide link to proposal and stakeholder discussions.) Michigan's open-ended toxics definition uses multiple exemptions and off

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	ramps to narrow applicability and increase ease of use.

What concentration averaging time periods do other states/locals use? Annual? 24 hour?

All six programs have some form of health-based screening values other than those limited to chronic exposure to air toxics and to the related annual averaging of air toxics data. These shorter-term screening values are related to averaging times appropriate to the term being assessed: for example, a concentration of a toxic air contaminant monitored and averaged over an 8-hour time span is compared to short-term screening values relevant to 8 hours of exposure. It is important to note that short-term health effects are often completely different from health effects that occur due to a longer, or lifetime, exposure to a chemical; that is why different types of screening values related to varying time periods of exposure are valuable.

Program	Program Description
Louisville, Kentucky	Allows assessment of calculated ambient maximum concentrations for a toxic air contaminant utilizing emissions durations related to annual (chronic); 24-hour; 8-hour; and 1-hour time periods. Calculated ambient maximum concentrations are then compared to risk-based screening levels called Benchmark Ambient Concentrations. Can also use other lengths of durations if it can be demonstrated that such use is appropriate. Cancer Benchmark Ambient Concentrations are calculated for chronic exposure per an annual average time period. Non-cancer Benchmark Ambient Concentrations can be calculated for annual (chronic) exposure durations; for 8-hour exposure durations (appears to be used when only an Occupational Exposure Level, rather than a recognized toxicity value, is available for a chemical); for 4-hour durations; and for 1-hour durations.
New Jersey	Maximum annual exposure time is used for carcinogens to determine incremental cancer risks and for non-carcinogens to determine chronic non-cancer effects. For short-term non-cancer effects, an averaging time of 24 hours is used, which can be broken down into 1-hour, and 8-hour exposure periods when needed. This is dependent on the availability of appropriate non-cancer reference concentrations (RfC's) and what exposure time each RfC is related to.
New York	1-hour Short-term Guideline Concentrations for non-cancer short-term effects and Annual Guideline Concentrations for cancer and non-cancer are compared to modeled 1-hour and annual concentrations of toxic air pollutants being emitted from a stationary source. This comparison determines the degree of air pollution control. Short-term Guideline Concentrations and Annual Guideline Concentrations are updated every three years and were developed to protect the environment and public health.

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Rhode Island	1-hour (acute), 24-hour (intermediate), and annual (chronic) Ambient Air Levels.
South Coast Air Quality Management District (CA)	For non-cancer: 1-hour (acute), 8-hour, and chronic. For cancer: 30 years for maximally exposed individual, 70 years for population.
Washington	Acceptable Source Impact Levels, which are screening levels, are available for three averaging periods: 1 year, 24 hours, and 1 hour. Acceptable Source Impact Levels based on a one-year averaging time are used for carcinogens and for a few non-cancer chemicals; for cancer, these Acceptable Source Impact Levels are protective to one in one million cancer risk. Acceptable Source Impact Levels based on a 24-hour averaging time are actually protective of chronic non-cancer effects.
Michigan	New or modified facilities must demonstrate compliance with health based screening levels calculated based on emission rates including annual, monthly, 24 hour, 8 hour, and 1 hour averaging times.

The following information was gathered at the June 29, 2016 Technical Workgroup meeting:

Pros and Cons of different concentration averaging times:

- There are several short term criteria but inventories are based on annual average emissions and don't capture any peaks and lows. For residual risk, you can estimate short term emissions based on annual emissions but it may not be accurate.
- SCAQMD uses an 8-hour period for short term chronic, repeated exposure, which is a new standard. For detailed permitting calculations or when doing a health risk assessment for an existing facility, the facility must submit throughput, hours of operation and emissions data along with substantiation of maximum emission rates.
- Washington made the mistake of assuming they would only use one averaging time when they were revising list of toxic air pollutants. To address acute concerns, they used 24-hour levels based on chronic exposures which triggered a costly and possibly unwarranted review.
- Have a table with more than one averaging time for a chemical as appropriate.
- Get a relevant emissions profile from the industry so the program can be implemented effectively.
- There are chronic and acute hazards but chronic data is more accurate. Acute toxicity data often comes from and is applied to occupational exposures. DEQ and OHA should weigh the strength of short-term toxicity data, realizing acute data is not helpful with air toxics whose health effects are more subtle than acute irritation.
- If you make a conscious decision not to go with the short term concentration approach, it affects permitting and also responding to incidents. Without short term risk based concentrations, risk communication is difficult.

- Emissions, exposure, and meteorology must all align for short term risk to occur and the probability is pretty slim. If you have a short term issue, you'll see it in complaints and feedback from public.

Setting Concentration Levels

How are the pollutant risk-based concentrations calculated? What information does the program rely on to set a risk-based concentration?

Very few programs have the resources to set their own human health risk-based concentrations. California is the exception, setting all of their own human health risk-based concentrations. New York and New Jersey derived their own human health risk-based concentrations for a few air toxics, but for the bulk of the air toxics they rely on other jurisdictions. Other programs evaluated rely almost entirely on risk-based air concentrations derived by other state or federal agencies.

The most common sources that states rely upon are the U.S. Environmental Protection Agency, the federal Agency for Toxic Substances and Disease Registry, and California EPA. Some states also applied consistent modification strategies to adjust risk-based concentrations from one jurisdiction to fit a purpose for which they were not originally designed. For example, New York applied adjustment factors to risk-based concentrations designed by the American Conference of Governmental Industrial Hygienists to protect worker populations. New York's adjustment factors were applied for the purpose of making the ACGIH values more applicable to the general population. Another example is Washington's use of chronic non-cancer risk-based concentrations for comparison to 24-hour modeled concentrations. This is a very health-protective approach.

Program	Program Description
Louisville, Kentucky	The Louisville program relies on the expertise of other agencies to estimate risk, including the U.S. EPA, the National Toxicology Program, the International Agency for Research on Cancer, the Agency for Toxic Substances and Disease Registry, and the California and Michigan air regulatory agencies and air dispersion modeling, including AERMOD and other EPA-approved models. For chemicals that have not been well studied and do not have quantitative toxicity information available (no cancer-related URE values or non-cancer-related RfC values are available), the Louisville program has declared default toxicity values for chemicals without toxicity information. The default values they use are • URE default value = 0.0004 ug/m3. • RfC default value = 0.04 ug/m3.
New Jersey	New Jersey uses a combination of values from other jurisdictions including EPA (Integrated Risk Information System, Health Effects Assessment Summary Tables, Acute Exposure Guideline Levels /10), Agency for Toxic Substances and Disease Registry (chronic and acute Minimum Risk Levels), and CalEPA (Reference Exposure Levels, and hot spot risk assessment guidance documents), and a few values derived by New Jersey Department of Environmental Protection. They have in place policies to modify certain

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	concentrations such as dividing Acute Exposure Guideline Levels by a factor of 10 for use as short-term risk-based concentrations. Total polycyclic aromatic hydrocarbons can be evaluated as benzo(a)pyrene; and total dioxins and furans can be evaluated as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. They also have a list of nickel compounds that qualify as "soluble nickel salts."
New York	Chemicals are broadly classed as "high," "moderate," or "low" toxicity based on a set of criteria. These classifications influence how occupational standards (when selected) are adjusted for the general public. Concentrations are set based on the following hierarchy with preference for the most scientifically valid methods of derivation: • New York Department of Environmental Conservation • New York Department of Health • Environmental Protection Agency – Integrated Risk Information System If no value is available from those three sources, New York will turn to the American Conference of Governmental Industrial Hygienists values such as Threshold Limit Values and Short-Term Exposure Limits with adjustments made to account for differences between healthy workers and the general population as well as exposure time adjustments from 8-hour work week to 24 hours per day, 7 days per week. For example, an 8-hour time weighted average would be divided by 4.2 to adjust from a 40-hour work week to 24 hours per day, 7 days per week exposure and would also divided by a factor of 10-100 (depending on toxicity of the chemical) to adjust from healthy adult workers to sensitive populations. For short term risk-based concentrations, New York does not make the time adjustment, but they still divide by 10 to account for sensitivity differences between healthy adult workers and the general population. When no values are available from New York state agencies, the EPA or American Conference of Governmental Industrial Hygienists, New York may apply the risk-based concentration for a similar chemical as a surrogate. When none of the above resources are available for a given contaminant, New York will apply a conservative *de minimis* concentration. When a contaminant is known not to be a "High Toxicity" chemical it is assigned a de minimis value of 0.1 µg/m3. If it is known to be a "Low Toxicity" chemical, it is assigned a de minimis value of 1.0 µg/m3. For high toxicity contaminants, a de minimis limit of 2×10^{-5} µg/m^3 is set which is the value above which 95% of New York-selected risk-based toxicity values for carcinogens falls.
Rhode Island	Generally Rhode Island uses or adapts existing risk concentrations. The hierarchy and procedures differ based on averaging time (1 hour, 24 hour, and annual): <u>1 hour risk-based concentrations</u> The hierarchy is:

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	1. The more stringent of Agency for Toxic Substances and Disease Registry's acute inhalation Minimum Risk Level or California EPA's acute inhalation Reference Exposure Level 2. If neither of above are available, then Agency for Toxic Substances and Disease Registry acute oral Minimum Risk Levels were converted to µg/m^3 assuming 70 kilograms (155 pounds) body weight and 20 cubic meters of air per day (150 bathtubs). <u>24 hour risk-based concentrations</u> The hierarchy is: 1. EPA Reference Concentration if: a. Agency for Toxic Substances and Disease Registry has established an intermediate inhalation Minimum Risk Level that is more stringent than the Reference Concentration or b. the Reference Concentration is based on a developmental health effect, or c. Agency for Toxic Substances and Disease Registry has a chronic Minimum Risk Level or CalEPA has a chronic Reference Exposure Level that is lower than the Reference Concentration or d. Neither Agency for Toxic Substances and Disease Registry nor CalEPA have derived chronic inhalation values. 2. If no EPA Reference Concentration, then Agency for Toxic Substances and Disease Registry intermediate inhalation Minimum Risk Level 3. If neither of the above available then more stringent of EPA oral Reference Dose or Agency for Toxic Substances and Disease Registry intermediate oral Minimum Risk Level converted to µg/m3 assuming 70 kilograms body weight and 20 cubic meters of air per day. <u>Annual risk-based concentrations</u> If toxicity values for both cancer and non-cancer effects were available, they used the more stringent of the two. For contaminants with more certain cancer ratings (e.g., EPA class A or B or International Agency for Research on Cancer class 1 or 2a), The hierarchy is: 1. Calculated using EPA Integrated Risk Information System inhalation unit risk estimate 2. Calculated using CalEPA inhalation unit risk estimate 3. Calculated using EPA Integrated Risk Information System oral cancer slope factor adjusted from oral to inhalation route 4. Calculated from CalEPA No Significant Risk Levels assuming that all intake is via inhalation and 20 cubic meters of air per day 5. EPA Reference Concentration divided by 100 6. Agency for Toxic Substances and Disease Registry chronic inhalation Minimum Risk Level or CalEPA chronic inhalation Reference Exposure Level divided by 100 (more stringent of the two if both available) 7. Agency for Toxic Substances and Disease Registry intermediate

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	inhalation Minimum Risk Level divided by 100 8. EPA oral Reference Dose divided by 100 converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. 9. Chronic oral Agency for Toxic Substances and Disease Registry MRL divided by 100 converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. For contaminants with lower cancer ratings (e.g., EPA class C or IARC 2B), the hierarchy is: 1. Same as 1-4 above if available 2. EPA Reference Concentration divided by 10 3. Agency for Toxic Substances and Disease Registry chronic inhalation Minimum Risk Level or CalEPA chronic inhalation Reference Exposure Level divided by 10 (more stringent of the two if both available) 4. EPA oral Reference Dose divided by 10 converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. 5. Agency for Toxic Substances and Disease Registry chronic oral Minimum Risk Level divided by 10 converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. For non-cancer chronic health effects were selected by the following hierarchy of preference: 1. EPA Reference Concentration (unless it meets the criteria for a 24-hour value listed above) 2. More stringent of CalEPA chronic inhalation Reference Exposure Level or Agency for Toxic Substances and Disease Registry chronic inhalation Minimum Risk Level 3. Agency for Toxic Substances and Disease Registry chronic oral Minimum Risk Level divided by 10 to account for inter-route differences and converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. Where no EPA, Agency for Toxic Substances and Disease Registry, or CalEPA benchmarks were available, Rhode Island used: 1. EPA's Health Effects Assessment Summary Tables converted to µg/m^3 assuming 70 kilograms body weight and 20 cubic meters of air per day. 2. Short-term and Annual Guideline Concentrations from New York State DEC 3. Draft and final No Significant Risk Levels for carcinogens from CalEPA as published in "Proposition 65 Status Report" from February 2001. Beyond these criteria, Rhode Island made special consideration for the following contaminants (details available in their 2008 guidance document): cadmium, fluoride, hydrogen sulfide, 2,4- and 2,6-toluene diisocyanate, polycyclic organic matter, polychlorinated dibenzo dioxins, polychlorinated dibenzo furans, and dioxin-like polychlorinated biphenyls, and propylene glycol monomethyl ether.

Program	Program Description
South Coast Air Quality Management District (CA)	They use inhalation unit risk estimates and Reference Exposure Levels developed by CalEPA. CalEPA's Office of Environmental Health Hazard Assessment operates very similarly to EPA's Integrated Risk Information System program, and they derive their own toxicity threshold concentrations. Many other states use the concentrations derived by CalEPA, and are often part of the same hierarchy of toxicity concentration values as EPA's Integrated Risk Information System.
Washington  Setting an ASIL Document	For tier 1 assessment, the acceptable source impact levels (ASILs) are used. For carcinogenic compounds, Washington used inhalation unit risk estimates from either EPA Integrated Risk Information System or CalEPA, whichever was the most recent, to calculate risk-based concentrations for comparison to annualized average modeled ambient concentrations. For non-carcinogenic compounds, Washington selected the most-recent chronic inhalation value from EPA Integrated Risk Information System (Reference Concentration), CalEPA (Reference Exposure Level), or Agency for Toxic Substances and Disease Registry (Minimum Risk Level). In cases where no chronic value was available, Washington did select acute or intermediate Agency for Toxic Substances and Disease Registry Minimum Risk Levels or acute or subchronic CalEPA Reference Exposure Levels. Even though non-cancer risk-based concentrations are mostly based on chronic toxicity values, they apply them to averaging times of 24 hours or less.
Michigan	The health based screening level for non-carcinogenic effects of a toxic air contaminant is called the Initial Threshold Screening Level (ITSL). It is determined by a number of different methods, depending upon the available toxicological data. The rules specify a hierarchy of methods for determining the ITSL. There are two health based screening levels for carcinogenic effects. These include the Initial Risk Screening Level (IRSL), which is defined as an increased cancer risk of one in one million (10-6), and the Secondary Risk Screening Level (SRSL), which is defined as an increased cancer risk of one in one hundred thousand (10-5). The IRSL applies only to the new or modified emissions unit or process subject to the permit application. If the applicant cannot demonstrate that the emissions of the toxic air contaminant meet the IRSL, they may choose to demonstrate compliance with the SRSL, however in this case, they must include all existing emissions units of that toxic air contaminant emitted from the plant, not just the emissions unit being permitted. For chemicals that have not been well studied and do not have quantitative toxicity information available (no cancer-related URE values or non-cancer-related RfC values are available), Michigan DEQ uses a risk-protective value called the default Initial Threshold Screening Level (ITSL) value (referred to a default screening level) of 0.1 ug/m3 for chemicals that don't have toxicity information available.

The following information was gathered at the June 29, 2016 Technical Workgroup meeting:

Pros and Cons of setting a risk-based concentration (RBC):

- Use a surrogate analysis approach if you don't have data for a chemical, which is simple and doesn't require much work.
- If there is toxicity criteria, then risks from those pollutants are not discussed. So if you don't include risk-based concentrations, you won't be able to prevent them.
- Two aspects short term RBCs are useful – permitting aspects and responding to incidents.
- If you have a short term issue, you'll see it reflected in complaints and feedback from the public.

Pros and cons of using cancer risk as a basis of short term RBCs:

- There is too much uncertainty to take an annual cancer risk and turn it into a short term RBC. There is no biological basis. It's an easy way to get to a number but not an accurate one.
- SCAQMD's recently revised guidance now says a cancer risk study is required to look at as short a period as 6 months, potentially as short as 2 months, based on cancer risks for the third trimester. There are practical implications when looking at cancer risk, like from a construction project? How do you predict risk from construction activities?
- Deriving chronic risk values takes at least 90 days to do the chronic study, so using cancer values is not a good idea. Chronic non-cancer values may be valid for acute RBCs but it varies by contaminant.
- How much can DEQ and OHA use the values from other agencies? So many values are too old, up to 30 years. Do you want to just use these values or just use values from 10 years ago? What other criteria do you want to look at?

Do risk-based concentration levels address multiple exposure pathways for human health? If so, how and what are the advantages and disadvantages?

Most states do not adjust the risk-based concentrations themselves based on multi-media exposure pathways, but do incorporate these pathways when more in-depth facility-specific risk assessments are triggered. Two exceptions are New York and Rhode Island that actually apply differential adjustment factors to risk-based concentrations for contaminants that EPA classifies as persistent, bioaccumulative, and toxic.

Note: *this is each state's/local's evaluation of their own program.*

Program	Program Description
Louisville, Kentucky	The District may propose a Risk Reduction Plan if there is human exposure from routes other than direct inhalation per Regulation 5.21 section 6.2.3.
New Jersey	No, only the inhalation pathway.
New York	Yes. Risk from multiple pathways of exposure is one of the criteria used in designating a chemical as "high," "moderate," or "low" toxicity. That in turn can modify adjustments made to the American Conference of Governmental Industrial Hygienist-derived risk-based concentrations. Otherwise, cross-media considerations happen in other parts of the regulation and not via adjustments to the risk-based concentration levels.

Program	Program Description
Rhode Island	Yes. Risk-based concentrations for contaminants on EPA's list of Persistent, Bioaccumulative, or Toxic chemicals list, the values were derived as above and then divided by an additional factor of 10 to account for multiple pathway exposures. The main advantages to this approach are that it is simple to apply and provides some margin of safety. The disadvantages are that it is not a very nuanced or chemical-specific approach and is not based on empirical evidence.
South Coast Air Quality Management District (CA)	Not as part of the risk-based concentrations themselves, but adjustment factors are applied to the Tier 2 risk assessment process for air toxics with significant cross-media potential. These adjustments are not made for acute risk calculations. This allows for thorough coverage and protection from all exposure pathways related to a facility.
Washington	No, only the inhalation pathway.
Michigan	Rule 228 allows Michigan to require a lower emission rate than that specified by T-BACT or the health based screening level, on a case-by-case basis if it is determined that these requirements may not provide adequate protection of human health or the environment. In making this case-by-case determination, all relevant scientific information is considered, including such things as exposure from routes of exposure other than direct inhalation, synergistic or additive effects of toxic air contaminants, and effects on the environment.

TECHNICAL WORKGROUP QUESTION: What are the advantages and disadvantages of risk-based concentration levels that address multiple exposure pathways for human health?

The following are policy questions that should be addressed to ensure the program is adequately addressing pollutants of concern.

Do DEQ and OHA have the technical information assembled in this issue paper to inform these policy choices? Are there unique aspects of air toxics permitting programs not described in this paper that DEQ and OHA should consider? Is there technical information or considerations missing from this issue paper?

- What level of flexibility is necessary to add new pollutants of concern after the program is established?
- Should the program use a more inclusive list of air toxics to cover all possible existing and future emission scenarios or construct a list based on known source types and emissions in Oregon?
- What should the basis be for including or excluding pollutants?
- Should DEQ and OHA use annual, 24-hour, or other concentration averaging times?
- What information should DEQ and OHA rely on to set a risk-based concentration that is protective of human health?
- Should the risk-based concentrations address multiple exposure pathways for human health? If so, how?