Memo

To: Cleaner Air Oregon Regulatory Reform Advisory Committee
From: DEQ and OHA
Date: October 5, 2016, 2016
Subject: Pollutant Scope and Setting Concentration Levels

Request for Advisory Committee Members

The Oregon Department of Environmental Quality (DEQ) and the Oregon Health Authority (OHA) have identified six discussion topics for the advisory committee meetings. The following document describes one discussion topic, with four related program elements. DEQ and OHA are seeking Advisory Committee input on the following questions:

1) What should DEQ and OHA be considering in relation to pollutant scope and setting concentration levels when choosing an approach for Cleaner Air Oregon?
2) Are there additional elements, other than the ones listed, that DEQ and OHA should consider?
3) Are there other air toxics permitting programs that provide unique examples not described in this discussion paper?

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Introduction

The Cleaner Air Oregon rulemaking is a partnership between OHA and DEQ 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 and will allow DEQ and OHA to carry out their respective missions of cleaner air while protecting and promoting health in 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.

After receiving input on the different aspects of a risk-based air toxics permitting program from the Technical Workgroup, the Regional Forums, and the Advisory Committee, DEQ and OHA will draft proposed rules. All interested parties will have a chance to comment on the proposed rules during the public notice period in 2017.

DEQ and OHA have evaluated air toxics permitting programs in Louisville, Kentucky; New Jersey; New York; Rhode Island; South Coast Air Quality Management District, California; and Washington. These programs were recommended as being innovative, representing a range of diverse approaches to air toxics permitting programs. In addition, Washington's program was included because it is often compared to DEQ's. Key elements of these air toxics programs were summarized and discussed at Technical Workgroup meetings in June and July 2016. Documentation of Technical Workgroup discussions and background information for Oregon, along with elements to consider are presented below.

DEQ and OHA will be asking for Advisory Committee input for each discussion topic and if there are any additional topics that should be considered.

A glossary of terms can be found at this link: http://www.oregon.gov/deq/RulesandRegulations/Advisory/8Glossary.pdf

The Technical Workgroup provided an evaluation of other state's approaches to human health risk-based air toxics programs for industrial facilities and answered technical questions in support of rulemaking, as requested by DEQ and OHA. The workgroup was tasked with providing focused and specific input to help DEQ prepare policy issues for discussion at Regional Forums and Advisory Committee meetings in the fall of 2016. The workgroup was not a decision-making body. The Technical Workgroup included individuals with expertise in toxicology, modeling, pollution prevention, and representatives of other state air toxics programs.

The Regional Forums occurred in the months of September and October in all regions of the state to provide an opportunity for informal community input.

The Advisory Committee includes a variety of representatives from community level organizations, advocacy groups to city/county government representatives to small businesses and large businesses.

Purpose

This discussion paper addresses the key elements of pollutant scope and setting concentration levels: What air toxics should be included in the program? What are the most important air toxics to address in Oregon's industrial air toxics permitting program, and why? What information is used to set the health risk-based concentration levels? How is this updated as new information becomes available? What timeframe should be considered when setting a health-risk based concentration?

For detailed information on the six air toxics permitting programs that DEQ and OHA researched, please see the Appendix below.

Program Element 4: What air toxics should be included in the program?

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 air toxics. In general, programs included the federally listed Hazardous Air Pollutants. Programs regulating air toxics beyond the federal Hazardous Air Pollutants 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 air toxics 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.

Oregon Information

The following information is included to help inform decisions on what air toxics to include within the scope of the Cleaner Air Oregon rulemaking. In Oregon's existing air toxics program that focuses mainly on understanding and reducing air toxics emissions from the most significant mobile, area and point sources in communities, there are ambient benchmark concentrations or clean air goals for 52 air toxics.

- Current benchmark air toxics were chosen because the National Air Toxics Assessment, and DEQ monitoring and emission inventory data indicated that these air toxics are present in Oregon's air in quantities that could pose threat of harm to human health.
- Oregon's 52 ambient benchmark concentrations, originally adopted in regulation in 2006, have been updated several times by DEQ's standing Air Toxics Science Advisory Committee.
- Oregon ambient benchmark concentrations are based on excess lifetime cancer risk of 1 in 1 million and a non-cancer hazard quotient of one.
- With the exception of hydrogen sulfide and diesel particulate matter, the current list of Oregon ambient benchmark concentrations is included within the EPA list of 187 hazardous air pollutants.

Oregon performs a triennial air toxics emission inventory using best available data and submits it to EPA for use in the National Air Toxics Assessment (NATA). Unlike the criteria pollutant emission inventory, Oregon's triennial air toxics emission inventory is not federally mandated, and the focus is on larger permitted facility emissions to the extent DEQ has available information.

Currently DEQ does not require that permitted facilities report regularly or comprehensively about their air toxics emissions beyond source-specific regulatory requirements, so there are gaps in the Oregon point source air toxics emission inventory.

In line with EPA air toxics monitoring guidance, DEQ operates six different types of samplers to capture air toxics for analysis of long-term trends in Portland and La Grande. DEQ has performed 1-2 year community air toxics assessment monitoring in Medford, Salem,

The Clean Air Act (CAA) addresses two major categories of pollutants for which standards are set differently: criteria pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide) and Hazardous Air Pollutants (HAPs). The principal difference between the two arises from the specification in the CAA that the presence of criteria pollutants "in the ambient air results from numerous or diverse mobile or stationary sources." No such requirement is stated for HAPs. Thus, presumably, criteria pollutants are more ubiquitous, pose a risk to a larger fraction of the general population, and have more widespread impacts on ecosystems and natural resources than HAPs. Criteria pollutants and HAPs are managed through fundamentally different regulatory frameworks. Criteria pollutants are regulated primarily through the setting of ambient-air-concentration and time standards, known as the National Ambient Air Quality Standards, and taking action to attain these standards. HAPs are regulated through the promulgation of standards that limit the release or emissions of such compounds (as opposed to their ambient concentrations), followed in the cases of major stationary sources and area sources by assessment of residual risk. The responsibility for setting the standards for both types of pollutants is assigned to the EPA administrator.

Criteria pollutants are addressed under DEQ's current air quality permitting program. DEQ surveys levels of criteria pollutants through ambient monitoring and works with any community that has potential violation of the NAAQS.

Klamath Falls, Hillsboro and Portland. The Lane Regional Air Protection Agency periodically conducts air toxics monitoring in Lane County. These monitors use equipment and materials specific to collect aldehydes, volatile organic compounds, semi-volatile organic compounds, metals, and black carbon which is a surrogate for diesel particulate. The DEQ lab generally analyzes for 107 air toxics, but subject to detection level limitations and cost limitations, could potentially perform analysis for a total range of about 150 chemicals.

Summary of Technical Workgroup Input

- At a minimum, any approach to regulating air toxics should include the federally regulated Hazardous Air Pollutant list of 187 air toxics. These are air toxics designated as potential threats to human health by the 1990 Clean Air Act amendments. This list could be used as a first cut to designate more or fewer air toxics for prioritization.
- When assembling a list of air toxics to regulate in addition to the federally regulated Hazardous Air Pollutants, DEQ can consider:
    - Air toxics with potential public health concerns that are not Hazardous Air Pollutants such as diesel particulate matter, hydrogen sulfide, and others, as needed;
    - Air toxics with existing risk-based screening levels that are also listed as air toxics by other state air programs;
    - Air toxics for which there is currently little formal health effects data, but are likely to cause health impacts, and in the future related new studies may quantify human health risk for such air toxics;
    - Refining other state lists based upon what is known about air toxics emitted in Oregon;
    - Prioritizing air toxics that are detectable through monitoring.
- There are some air toxics that are more important than others because of toxicity, concentrations and the number of people exposed. Look at data for air toxics in Oregon to identify the number of people affected by a risk level and categorize national and regional air toxic drivers and contributors to help devise a list.
- A more inclusive yet prioritized list of regulated air toxics would improve public health protection and inclusion of air toxics not currently tracked, while allowing DEQ and regulated facilities to focus on, reduce and avoid using chemicals likely to cause the most human health risk. Several states studied use a longer list to help determine which chemicals were important to regulate because they wanted to include emerging air toxics for which scientific information is being developed in regard to levels of concern.
- An inclusive list of regulated air toxics with more specificity for priority chemicals would provide more certainty to industry than an approach in which DEQ began with a shorter list and periodically added chemicals. It would be difficult for facilities if DEQ kept adding substances because they need to design controls or pollution prevention measures to cover as many of the toxic air pollutants as possible. Do not phase the program in by adding chemicals to the list of regulated air toxics
- It could be problematic to include air toxics that don't have risk-based concentrations because there would be no human health basis of comparison to monitored or modeled values, making communication about air toxics difficult. Until agencies like EPA, California Office of Environmental Health Hazard Assessment, and the Agency for Toxic Substances and Disease Registry have caught up with research, chemicals without risk based concentrations could be added to an air toxic list, but be treated differently than those with established human health effect values.

Summary of considerations for pollutant scope

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup and from experience in the air program. We consider this a starting point for the Advisory Committee discussion and input.

- The scope of air toxics regulated generally corresponds to concerns in each state or region.
- The science of air toxics is still emerging, so there will be different capabilities and levels of knowledge for various chemicals. For example, technical or analytical obstacles may prevent monitoring or source testing of some air toxics. However, if there is an emission factor for an industrial process, air toxics can be estimated even if they can't be monitored. If chemicals have no associated measurement technology and no available emission factors, DEQ may not want to list them or if they are listed, treat them differently from air toxics with available data.
- 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.
- A long, very inclusive list or air toxics could:
    - Ensure comprehensive public health protection;
    - Increase the number of industries that would need to comply;
    - Increase the cost of compliance for industry;
    - Increase the cost of list development and maintenance for DEQ, as well as the cost of issuing and administering more permits.
- Prioritizing groups of higher- and lower-risk chemicals and associated requirements, such as reporting, can help focus work and add efficiency.
- Michigan uses a broad general definition of air toxics and provides many exemptions and guidance to facilities that bear the burden of estimating air toxics risk from an open ended set of chemicals. This approach involves additional uncertainty and still requires the administering agency to maintain various exemptions, as well as a guidance list of risk-based concentrations for commonly emitted chemicals.
- Oregon's Administrative Procedures Act mandates that any agency requirements affecting peoples' interests be included in regulations as opposed to policy documents. Since the list of regulated air toxics and their associated thresholds or levels would affect public and industrial interests, they must be adopted and updated in regulation.
- DEQ has a comprehensive agency-wide Toxics Reduction Strategy, aimed at preventing air toxics from entering the environment. In this strategy, DEQ has listed 51 chemicals or groups of chemicals posing the most threat to human health and the environment through all pathways – water, land and air. Many of DEQ's chemicals with air toxics ambient benchmark concentrations are also on the Oregon toxic chemical focus list.
- DEQ has the authority to regulate any air toxic from industrial sources.

Potential elements for pollutant scope

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements	
A.	Use 52 Oregon Ambient Benchmark air toxics http://www.deq.state.or.us/aq/toxics/benchmark.htm
B.	Use 187 Federally listed Hazardous Air Pollutants (Includes 50 Oregon Ambient Benchmark air toxics, but not diesel particulate matter or hydrogen sulfide) https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications
C.	Include Oregon's toxic chemical focus list http://www.deq.state.or.us/toxics/docs/focuslist.pdf
D.	Use a list composed of 187 federally listed Hazardous Air Pollutants plus other air toxics shown to be a concern in OR, WA or CA
E.	Use NY's very inclusive air toxics list http://www.dec.ny.gov/docs/air_pdf/dar1.pdf
F.	Michigan model: broad and inclusive definition. No list. Guidance documents help facilities assess the risk associated with potential air toxics emissions, and the burden is on the facility to assess the risk. There are many exemptions for low toxicity, criteria pollutants, if the facility has a NESHAP residual risk standard in place.
G.	South Coast model: use different lists of chemicals for different program functions. Establish classes of toxics – high, medium and low toxicity, with different requirements for the high versus low. For example, low toxicity compounds might require reporting only.
H.	Propose that the Environmental Quality Commission delegate adding, removing or changing the threshold or levels of an air toxic to the DEQ Director
I.	Placeholder for elements developed by advisory committee members

Program Element 5: Method for setting health risk-based concentrations (RBCs)

Very few programs have the resources to set their own human health risk based ambient air concentrations. California is the exception, setting all of their own human health RBCs. New York and New Jersey derived their own human health RBCs 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 RBCs 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 RBCs from one jurisdiction to fit a purpose for which they were not originally designed. For example, New York applied adjustment factors to RBCs designed by the American Conference of Governmental Industrial Hygienists, which protect worker populations, for the purpose of making them more applicable to the general population. Another example is Washington's use of chronic non-cancer RBCs for comparison to 24-hour modeled concentrations. This is a very health-protective approach because short term exposures require higher concentrations of air toxics to cause harm than long term exposures.

Oregon information

In the current Oregon air toxics program, ambient benchmark concentrations or RBCs have been identified for the 52 air toxics of most concern in Oregon, based on data from EPA's Integrated Risk Information System (IRIS), California Office of Environmental Health Hazard Assessment, or the Agency for Toxic Substances and Disease Registry. These ambient benchmark concentrations are used as guidelines and are not directly enforceable standards. However, the ambient benchmarks are used to identify problem areas based on collected air data and to focus staff resources on the most pressing air toxics issues.

These ambient benchmark concentrations are set by the Air Toxics Science Advisory Committee, a volunteer committee convened and hosted by DEQ. The Air Toxics Science Advisory Committee meets to review air toxics RBCs set by other jurisdictions and the science that supports them and recommends one of these values to DEQ to use as its benchmark. A typical review of the existing 52 benchmarks takes about 18 months. Diesel particulate matter is the only example of a benchmark value that the Air Toxics Science Advisory Committee is developing based on its own review of primary toxicological and epidemiological literature rather than selecting from among RBCs developed by other jurisdictions.

Summary of Technical Workgroup input

- Toxicity values should be based on the best science available from a well-respected authoritative body. The International Agency for Research on Cancer, which is part of the World Health Organization, is the premier organization for listing carcinogens, because they are not subject to the political pressure that can overrule science. They use California Office of Environmental Health Hazard Assessment and Department of Toxic Substances Control as one of their authoritative bodies. The Technical Workgroup recommended looking at the California lists, including the Safer Consumer Product regulations.
- RBCs from different agencies vary. The website International Toxicity Estimates for Risk compares different databases and saves time. With the advancement in science, the RBCs from EPA may remain the same, along with the uncertainty factors but the scientific methods may have changed. Make sure you use advanced methods to derive the current RBCs. The Southwest Clean Air Agency in Vancouver, WA also has an online tool that is a work in progress for comparing the data from several agencies and states: http://www.swcleanair.org/PollutantRptSel.asp (compare multiple air toxics) and http://www.swcleanair.org/PollutantSearch.asp (view data on a single air toxic).
- For the hierarchy used at EPA, the federal Science Advisory Committee recommended consideration of the latest science. EPA has RBCs for about 140 chemicals. To add chemicals to the Hazardous Air Pollutant list is very difficult. If chemicals are added, what will then be required of existing sources?
- Using a hierarchy of other jurisdictions that develop toxicity threshold values does not always provide the best information. Look at a hybrid approach because not all air toxics will fit into the typical boxes for setting RBCs. Some federal Hazardous Air Pollutants are in groups (e.g., arsenic compounds), and are not discrete chemicals. Should all of these compounds be treated exactly the same? If you start with 187 federal Hazardous Air Pollutants, that may cover 90% of chemicals, but something different will be needed for other 10%, which will typically necessitate a hybrid approach. Don't be tied to one method and lose sight of other methods that can be used.
- A decision making process will be necessary in cases of disagreement among the primary toxicological and epidemiological literature, like whether something causes cancer or not. Even if a hierarchy is used, deciding on an appropriate RBC among many will still be necessary.
- If there are no toxicity criteria for a particular air toxic, then you cannot identify an RBC for a particular air toxic and you will not be able to determine if the emissions of that air toxic are safe.

This problem is more common for short-term values. The public may ask about a compound that wasn't evaluated, and response would be because there was no toxicity data with which to evaluate it. Use the best information available at the time.

- Use a surrogate analysis approach if you don't have data for a chemical. Surrogate analysis requires a very good understanding of the chemistry, biology and toxicology knowledge in order to perform this type of analysis correctly. DEQ and OHA could select a likely surrogate for chemicals without benchmarks where the chemistry is similar to other chemicals which do have benchmark information using methods such as QSAR (http://www.qsartoolbox.org) or read-across approach and surrogate analysis. Quantitative Structure-Activity Relationship is based on a modeling approach, whereas surrogate analysis is based on a combined modeling and manual approach.
- Timeliness should be highlighted as an issue when developing a list of air toxics and RBCs. Recent research is changing things. Some of EPA's IRIS numbers are outdated and may be replaced by newer information or more current science. Consider European Union information because they are more active at looking at air toxics.
- Don't limit yourself to peer-reviewed literature. Most toxics studies are conducted by industry and trade groups, which typically have an agenda. Make sure the study is done by reputable researchers under good laboratory practices. Industrial chemical studies are not always published, making it hard to provide this kind of information to the public.
- Flexibility is important in setting RBCs. If RBCs are included in rules, updates would require the long rulemaking process. Making changes to RBCs outside of rulemaking would be more timely.
- Lead is one air toxic that has well-recognized non-cancer effects. Theoretically, one molecule of lead can have a non-cancer effect. There are no safe exposure levels for lead so you can't do the cumulative assessment with lead that you can do with other air toxics. There are hazard indices for all other air toxics, but for lead, they look at the national ambient air quality standards. There was a good health study done for lead with the national ambient air quality standards development.

Summary of considerations for method for setting health risk-based concentrations

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup and from experience in the air program. We consider this a starting point for the Advisory Committee discussion and input.

- Across federal, state, and international agencies there is a continuum of methods to derive RBCs. These methods range from very rigid and low-resource intensive methods to very flexible and high-resource intensive methods. Very few states or federal agencies adhere strictly to only one of the methods listed below. Rather, most jurisdictions employ some combination of the elements listed below in a hybrid approach. However, for discussion purposes, the continuum that exists can be generally described (from most flexible/resource intensive to least flexible/resource intensive) as:
    - Comprehensive review of primary toxicological and epidemiological studies in peer-reviewed literature and/or private sector studies using Good Laboratory Practices and *de novo* development of RBC from the synthesized findings of that review (this is the processed used by federal agencies and a very few other states);
    - Selection of RBCs from among those developed by authoritative bodies, such as federal agencies or other states, on an established/approved list. Apply some level of discretion and review of the basic scientific underpinnings of RBCs developed by authoritative bodies, in order to decide which of the established RBCs to select for use in Oregon (this element is the

most similar to the current Air Toxics Science Advisory Committee process used in Oregon to develop Ambient Benchmark Concentrations);

  - Rigid hierarchy or algorithm for selecting or adapting RBCs developed by authoritative bodies on an established/approved list;
  - Wholesale adoption of RBCs developed by a selected authoritative body.

- If a hybrid approach is selected where various methods are used to develop RBCs for different air toxics (e.g., comprehensive review for some, rigid hierarchy for others), clear criteria and transparent communication about how and why each method was used is needed.
- Some authoritative bodies are backlogged on reviewing their own RBCs, making some RBCs outdated and not reflective of the most recent science. In addition, those authoritative bodies may not be able to respond quickly to a newly recognized air toxic in Oregon that does not have established RBCs.
- To meet the deadlines established in the Cleaner Air Oregon rulemaking, the timeframe for setting risk based concentrations in this rulemaking is short.
- Some authoritative bodies only develop RBCs for use in occupational settings, which may have limited applicability to the general population that DEQ and OHA are charged to protect.
- If a resource intensive method is selected, the number of air toxics for which Oregon could develop RBCs is limited. If a rigid hierarchy or algorithm method is selected, there may be many air toxics for which no authoritative body has developed an RBC for Oregon to select.
- DEQ has the authority to regulate any air toxic from industrial sources.
- DEQ must go through rulemaking to establish risk based concentrations in rules.

Potential elements for method for setting health risk-based concentrations

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Comprehensive review and evaluation of primary research by agency
B. Use of established list of authoritative bodies from among which to select RBCs with discretion as to which of the RBCs is based on the best science (52 from Air Toxics Science Advisory Committee, EPA Integrated Risk Information System, Office of Environmental Health Hazard Assessment, Agency for Toxic Substances and Disease Registry)
C. Use of rigid hierarchy or algorithm to select from among risk based concentrations developed by an established list of authoritative bodies
D. Use of other program's values
E. Establish hybrid approach that can use combination of methods listed above depending on situation for individual air toxics
F. Incorporate cross-media impact potential into the risk based air concentration goal itself*
G. Account for cumulative risk from multiple air toxics by setting very low acceptable risk level for individual air toxics to leave estimated buffer for cumulative effect.*

Potential Elements
H. Review and update the list of air toxics every 5 years
I. Placeholder for elements developed by advisory committee members

*Please see the discussion paper on Cumulative Risk and Background for discussion of cross-media exposure and cumulative risk.

Program Element 6: Default toxicity values

Depending on the size of the list of air toxics that DEQ will regulate under the proposed rules, there may be cases where there is insufficient toxicity information from any credible source to develop an RBC specific to a certain air toxic pollutant. DEQ and OHA could have a contingency plan in these cases, such as setting and using a default toxicity value or RBC.

Some state programs include the use of default toxicity values in their rules. Most states that use default toxicity values, use defaults only as a last resort. For example, a state might be attempting to develop or select an RBC for a specific air toxic using one or all of the approaches listed in Program Element 5 above, yet will find that there is insufficient information available from any approved source to establish an RBC specific to that toxic air pollutant.

To address this issue, one option is to choose a single, default, conservative RBC for cancer effects and for non-cancer effects. This established default would be applied to air toxics for which there is insufficient information from any established source to develop an RBC specific to the toxic air pollutant in question.

Read across is a "non-testing" approach to fill data gaps by finding information on an endpoint of a target substance by using information from the same endpoint of another reference substance. The target and reference substances would have to be grouped first based on their structural/metabolic/toxicological properties.

Without default RBCs, chemicals without conventional RBCs tend to be discussed only in a qualitative way. Thus, the potential cancer and/or non-cancer risks for these chemicals are not quantified and end up not being included in the overall estimate of risk. The possible downside of using default RBCs is the unknown amount of uncertainty related to how accurately the risk estimates for certain chemicals represent actual risk.

Oregon information

The current Oregon air program does not incorporate the use of default toxicity factors.

Summary of Technical Workgroup input

- Default RBCs could be very useful in regulating air toxics for which little information is available, but they should only be used as a last resort if no other method is possible to develop a chemical specific RBC. If you use Michigan's approach, steps need to be defined before triggering the use of a default value. If a default toxicity factor or RBC is used, you need a trigger to say whether a chemical is toxic. Using default toxicity values is the precautionary principle in action.
- Using the read-across method for structurally similar air toxics (surrogates) or extrapolating an RBC from ingestion toxicity information are both preferable to using default RBCs. However, if no

suitable surrogate can be found and no ingestion toxicity information is available, a default RBC may be needed.

- If a facility is going to emit an unknown chemical, put the burden on industry to determine a risk level for that chemical. Industry should have some idea of where it fits on a hierarchy instead of using default RBCs.
- Technical Workgroup members favored programs that have more than one default RBC that could be applied depending on whether there is basic information about whether a toxic air pollutant has "high", "medium", or "low" toxicity or whether or not an air toxic is likely to be carcinogenic (i.e., have one default RBC for carcinogens and another for non-carcinogens).

Summary of considerations for default toxicity values

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup and from experience in the air program. We consider this a starting point for Advisory Committee discussion and input.

- All members of the Technical Workgroup and state agency staff agree that default RBCs or toxicity values, if used at all, should only be applied as a last resort when no other method of derivation is possible because of lack of information specific to a given toxic air pollutant or reasonable surrogate.
- Default RBCs would make it possible to regulate a larger list of air toxics.
- Default RBCs carry the risk of over- or underestimating the actual risk posed by the air toxic in question. This is why the use of default RBCs is only recommended in cases of last resort where no chemical-specific toxicity information is available.
- Not having a default RBC would make it impossible to quantitatively regulate air toxics for which there is insufficient scientific, toxicological information to develop a chemical-specific RBC.
- DEQ has the authority to set default RBCs.

Potential elements for default toxicity values

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Do not use default toxicity values
B. Use a tiered system of default RBCs based on any available information about whether an air toxic has generally high, medium, or low toxicity. There could be a default RBC for each toxicity category.
C. Develop and use different default RBCs for air toxics that may cause cancer and those that do not.
D. Develop a single default RBC that is very conservative to use for any toxic air pollutant for which there is inadequate information to develop a chemical specific RBC.
E. Placeholder for elements developed by advisory committee members

Program Element 7: Risk based concentration averaging times

Averaging time refers to the amount of time a person is assumed to be exposed to a specific air toxic. Health risks related to air toxics increase with increasing concentrations of toxics in air a person breathes and the length of time and/or frequency with which they breathe it. Generally, a higher air concentration is required to cause health effects if the averaging time is shorter. Different RBCs can be developed for the same chemical depending on the assumed averaging time. Typically, states and federal agencies develop a set of "chronic" RBCs that are designed to protect the health of people who are exposed chronically for a long time (typically years or up to a lifetime). Fewer federal agencies and states also develop a set of "acute" RBCs that are designed to protect people who are exposed for a short time period, such as 24 hours. Generally, an acute RBC would be a higher air concentration than a chronic RBC because it is assumed that the person will only be breathing air at that concentration for a short amount of time. Also, health effects that result from breathing a higher concentration of a chemical over a short time are often different than the health effects that occur from breathing a lower air concentration over a lifetime. For example, the same chemical may cause lung irritation and a burning sensation in the eyes if breathed at high concentrations over a short time and also increase the risk of getting cancer if breathed at much lower concentrations over a lifetime. This is why it is sometimes valuable to have acute RBCs as well as chronic RBCs.

All six state programs studied have chronic RBCs and some form of acute RBCs, although the assumed averaging time for acute RBCs varies from 1 hour to 24 hours.

Oregon information

The current Oregon air program considers only lifetime, or chronic, averaging times when developing RBCs. However there have been recent efforts to develop acute RBCs for a limited number of air toxics where monitoring is ongoing near known sources of air toxics emissions. The chronic RBCs (called ambient benchmark concentrations in Oregon) are compared to averaged annual concentrations of air toxics measured or modeled in air.

Summary of Technical Workgroup input

- It makes sense to have multiple averaging times when there is appropriate toxicological data available, and there are multiple sources of information to develop acute RBCs for shorter averaging times. Having both acute and chronic RBCs has worked well in other states.
- Generally, information to support the calculation of acute RBCs is less available and of lesser quality than information to support the calculation of chronic RBCs. Often, the information for acute RBCs is based on occupational scenarios with limited applicability to the general public because people are exposed to air toxics longer than an 8-hour work day.
- It can be difficult to get emissions information that supports good modeling for short averaging times. Typically, some assumptions have to be made and applied to annual emissions inventories in order to estimate acute concentrations for comparison to acute RBCs.
- Acute RBCs are especially important for interpretation of short-term monitoring results and responding to acute incidents but instances where the acute risk is driving permitting and/or enforcement actions are likely to be rare based on the experience of other states.
- Acute and chronic RBCs may have different spatial uses. For example, for a one-hour RBC you might model or monitor a sidewalk or street where someone might spend only an hour. Chronic

RBCs are only applicable to locations where people live or work (e.g., houses, places of employment, schools, etc.) for long periods.

Summary of considerations for concentration averaging times

This is preliminary information DEQ and OHA have gathered in discussions with the Technical Workgroup and from experience in the air program. We consider this a starting point for Advisory Committee discussion and input.

- Having both acute and chronic RBCs would be protective of health, especially for air toxics where the difference between concentrations that cause health effects after acute exposures are not much higher than concentrations that cause effects after chronic exposures. In such cases, the acute RBC may impose more regulatory restrictions on facilities than the chronic RBC would.
- Acute RBCs may be especially protective of health for air toxics that cause irreversible developmental problems in children following short term exposures in early life. For example, even brief exposures to elevated concentrations of lead can cause brain development impairment in young children. An RBC focused exclusively on chronic exposures may not adequately protect against such outcomes in the case of some air toxics.
- If chronic RBCs are set conservatively enough, then the risk from most acute exposures may be addressed by keeping annual average concentrations below that annual RBC. However, there may be important exceptions.
- Development of acute RBCs would effectively double the workload for agencies developing RBCs (i.e., an acute RBC would need to be developed as well as a chronic RBC for every regulated toxic air pollutant).
- Authoritative bodies develop acute RBCs for fewer air toxics than they do chronic RBCs. Also fewer authoritative bodies develop acute RBCs for any air toxics. This will make selection/development of acute RBCs more difficult than chronic RBCs for DEQ and OHA.
- Addition of acute RBCs should not add much difficulty of compliance for facilities. They may need to calculate emissions with shorter averaging times in addition to annual averages, but most modeling programs make this very simple. In fact, many modeling programs require calculation of shorter term emission rates in order to calculate annual averages.

Potential elements for concentration averaging times

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Chronic: Annual
B. Chronic: 8-hour (for nearby workers, schoolchildren, or other populations)
C. Acute: 1-hour
D. Acute: 24-hour
E. Intermediate: Two weeks up to a year
F. Placeholder for elements developed by advisory committee members

APPENDIX

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

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 1 in 1 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

Program	Program Description
	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 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 minimis 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

Program	Program Description
	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 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.

Program	Program Description
	• They include the 187 federally listed hazardous Air Pollutants plus tobacco smoke, diesel particulate, and asbestos. http://www.arb.ca.gov/toxics/id/taclist.htm
Washington	Washington Ecology has a list of 398 pollutants and pollutant groups (e.g. cadmium and compounds, lead and compounds) 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). The older version of the toxics regulation (WAC 173-460) implemented by SWCAA includes: • 147 Class A pollutants: pollutants and pollutants groups with a cancer risk of 1:1,000,000 • 527 Class B pollutants and pollutant groups with an EPA IRC or ACGIH TLV-TWA This regulation includes 24-hour and annual ASILs. For some pollutants (e.g. chromium VI), the emissions must be modeled; there is no SQER for any pollutant with an ASIL less than 0.001 $\mu g/m^3$).
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 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

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

The scope of air toxics regulated generally corresponds 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 needed 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.

Program	Program Description
	• 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.
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 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

Program	Program Description
	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's open-ended toxics definition uses multiple exemptions and off ramps to narrow applicability and increase ease of use.

3. How are the air toxic risk-based concentrations calculated? What information does the program rely on to set a risk-based concentration?

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

Program	Program Description
	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 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.

Program	Program Description
	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: 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.

Program	Program Description
	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 inhalation Minimum Risk Level divided by 100 8. EPA oral Reference Dose divided by 100 converted to $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ assuming 70 kilograms body weight and 20 cubic meters of air per day.

Program	Program Description
	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.
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 doc.msg	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 1 in 1 million (1:1,000,000), and the Secondary Risk

Program	Program Description
	Screening Level (SRSL), which is defined as an increased cancer risk of one in one hundred thousand (1:100,000). 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 µg/m³ for chemicals that don't have toxicity information available.