Oregon Department of Environmental Quality
Toxic Air Contaminant Review and Update Rulemaking 2025

4: Proposed TRVs where DEQ is the Authoritative Source

Contents

1. Proposed TRVs for the Authoritative Source "Oregon DEQ in Consultation with ATSAC"

The purpose of this document is to describe the 184 Toxicity Reference Values (TRVs) for which DEQ is the authoritative source during the 2025 Toxic Air Contaminant (TAC) Review and Update Rulemaking and provide information on how these TRVs were derived.[1]

Oregon Administrative Rules, adopted by the Environmental Quality Commission, specify sources of toxicity information considered to be authoritative in terms of their scientific rigor and comprehensive methods for producing TRVs (OAR 340-247-0030). There are four authoritative sources in rule: the U.S. Environmental Protection Agency (EPA), U.S. Agency for Toxic Substances and Disease Registry (ATSDR), California's EPA (CalEPA), and Oregon DEQ in consultation with the Air Toxics Science Advisory Committee (ATSAC).

As one of the authoritative sources in rule, DEQ in consultation with ATSAC can develop TRVs, adapt TRVs from other authoritative sources, and consider TRVs developed by organizations other than those listed in rule. In this rulemaking, all TRVs where "DEQ in consultation with ATSAC" is the proposed authoritative source come from or are modified from:

- California Environmental Protection Agency's (CalEPA's) Office of Health Hazard Assessment (OEHHA)

[1] Appendix A contains a complete list of acronyms used in this document.

- EPA's Integrated Risk Information System (IRIS)
- EPA's Provisional Peer Reviewed Toxicity Value (PPRTV) program
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Texas Commission on Environmental Quality (TCEQ)*
- Minnesota Department of Health (Minnesota DOH)*
- Michigan Department of Environment, Great Lakes, and Energy (EGLE)*
- New Jersey Department of Environmental Protection (NJDEP)*

*These sources are not authoritative sources in DEQ rules.

DEQ uses the term TRV when referring to any similarly derived health-based toxicity value developed by other agencies. A toxic air contaminant could have up to three different TRVs:

- **Chronic cancer TRV** - Air concentration corresponding to a one in one million excess cancer risk, calculated by dividing one in one million (0.000001) by the inhalation unit risk when that air is breathed continuously over a lifetime.
- **Chronic noncancer TRV** - Air concentration below which noncancer health effects are not expected over a year or more of constantly breathing that air.
- **Acute noncancer TRV** - Air concentration below which noncancer health effects are not expected over 24 hours or less from breathing that air.

Throughout the remainder of this document the agency from which DEQ derived or adopted a TRV will be simply referred to as the "source agency." This is because not all of the agencies DEQ proposes to adopt TRVs from are listed as "authoritative sources" in rule. In such cases, "DEQ in consultation with ATSAC" is serving as the authoritative source.

One hundred eighty-four (184) of DEQ's proposed TRVs list "DEQ in consultation with ATSAC" as the authoritative source. These 184 TRVs are spread across 122 toxic air contaminants (TACs). This document contains derivation information for each of these TRVs. The TRVs are grouped by the methods used to derive them and then alphabetically within those groupings – the following is a broad summary of the proposed TRVs:

- 65 (35%) TRV proposals are for 24-hour acute exposure noncancer TRVs:
    - 17 acute TRV proposals are from making a time adjustment from a 1-hour acute exposure OEHHA or TCEQ TRV to a DEQ 24-hour acute exposure TRV
    - 23 acute TRV proposals are from making exposure time adjustments to convert a subchronic PPRTV or ATSDR intermediate minimal risk level (MRL) into a DEQ 24-hour acute exposure TRV
    - 9 are from a variety of other types of modifications
    - 16 acute TRV proposals are adopted directly from a non-standard (not an authoritative source in DEQ rule) source without modification
- 55 (30%) TRV proposals are for chronic exposure noncancer TRVs
    - 4 chronic TRV proposals are from adjusting uncertainty factors from TRVs developed by other sources
    - 35 chronic TRVs are from various other types of modifications, many belonging to a class of TACs like brominated dioxins and furans
    - 16 chronic TRV proposal are adopted directly from another source without modification

- The remaining 64 (35%) proposed TRVs where DEQ is listed as the authoritative source are cancer TRVs. All but one of these are members of one of two classes of TACs, polycyclic aromatic hydrocarbons (PAHs), brominated dioxins and furans, or dioxin-like polybrominated biphenyls (PBBs).

DEQ is seeking feedback from ATSAC members on all these potential TRVs. DEQ will carefully consider ATSAC's feedback in this rulemaking.

DEQ used different methods and approaches to develop proposed TRVs where DEQ is the authoritative source. Methods depended on the category of TRV (acute, chronic, cancer) and the type and source of information DEQ used to develop the TRV. Each section in this document represents a different approach or method used to develop the TRV and lists the TACs/TRVs developed using that method or approach.

2. Acute TRVs Derived from Other Sources by Modifying the Exposure Time

DEQ developed many acute TRVs from other sources by adjusting the experimental exposure times in underlying toxicological studies to better fit DEQ's definition of acute exposure, which is 24 hours. These exposure time adjustments rely on a principle in toxicology usually referred to as Haber's Law (see section 2.1). In some cases, DEQ was adjusting a TRV to be protective of a longer exposure (i.e., 24 hour exposure) from a TRV that was originally developed to be protective of a shorter exposure. For example, DEQ modified several OEHHA or TCEQ 1-hour TRVs to fit DEQ's 24-hour assumed exposure time for acute TRVs (see section 2.2). DEQ also modified some subchronic exposure (less than a year of exposure) TRVs from ATSDR and PPRTV to better fit a DEQ 24-hour acute TRV (see section 2.3).

2.1 Haber's Law and ten Berge Adjustment

All DEQ's authoritative sources use a principle called Haber's Law when developing TRVs (OEHHA 2008). Haber's Law states that the severity of health effect caused by inhalation of a toxic chemical is influenced equally by the concentration inhaled and the amount of time spent inhaling it.

There are cases when Haber's Law may not apply. Empirical evidence for a specific chemical may show that an effect is only concentration-dependent, and that increased exposure time does not influence the outcome. Eye or mucous membrane irritation triggered solely by the activation of the trigeminal nerve is one example where the effect is exclusively concentration dependent and is not dependent on the exposure time (OEHHA 2008).

Another situation where DEQ did not apply Haber's Law was when the health effect was developmental in nature. Developmental effects are caused when an exposure to a chemical occurs during a critical developmental window either *in utero* or during childhood. That exposure can lead to changes in developmental trajectory and long-lasting health effects that persist long after the exposure to the chemical has stopped. In these cases, the timing of exposure during development, rather than the duration of exposure, is the critical factor for determining negative health effects. (OEHHA 2008).

In other cases, both concentration and time are important but one is more important than the other. OEHHA and others use an adjustment to Haber's Law, called the ten Berge adjustment (Ten Berge, Zwart, and Appelman

1986), to account for cases when the harmful effect is dependent on both concentration and time, but one is more influential than the other.

Here are some basic equations representing Haber's Law with the ten Berge adjustment that DEQ used in deriving or modifying some of the proposed TRVs in this document.

Equation 1. Haber's Law with ten Berge Adjustment.

$$C_1^n \times T_1 = C_2^n \times T_2$$

Where:

C_1 = Concentration 1: This is the concentration used in the toxicological studies
T_1 = Exposure time 1: This is the daily duration of exposure in the toxicological studies
C_2 = Concentration 2: This is the concentration agencies like OEHHA or DEQ use to calculate their TRVs
T_2 = Exposure time 2: This is the exposure time for which agencies like OEHHA or DEQ want their TRVs to be protective
Exponent "n" = an exponent reflecting the influence of concentration on the health effect relative to the influence of exposure time.

C_2 is the concentration DEQ needs to solve for to generate a revised TRV. When the equation is resolved to solve for C_2, it transforms to:

Equation 2. Equation 1 resolved to solve for C_2.

$$C_2 = \sqrt[n]{C_1^n \times \frac{T_1}{T_2}}$$

When DEQ applied Haber's Law with ten Berge adjustment to adjust another source's TRVs, DEQ used values for exponent "n" provided or specified by the source agency the original TRV came from. When the source agency applied a default value for exponent "n," DEQ applied an exponent "n" of 1 when extrapolating from a shorter exposure time to a longer one and an exponent "n" of 3 when extrapolating from a longer exposure duration to a shorter one. This is consistent with OEHHA's Risk Assessment Guidelines (OEHHA 2008).**Error! Bookmark not defined.** These are the health-protective assumptions/defaults when making exposure time adjustments in the absence of empirical values for exponent "n."

An exponent "n" of 1 means that concentration and time are equally weighted in terms of their influence on health effects. When exponent "n" equals 1, equation 2 above reduces to:

Equation 3. Equation 2 reduced when "n" equals 1.

$$C_2 = C_1 \times \frac{T_1}{T_2}$$

2.2 Exposure Time Adjustments from 1-Hour Acute TRVs to 24-Hour Acute TRVs

Eighteen of the acute TRVs that DEQ proposes to use are adapted from OEHHA's or TCEQ's 1-hour reference exposure levels (RELs) or Reference Exposure Values (ReVs). DEQ's acute TRVs are intended to protect health over a 24-hour period, while OEHHA and some TCEQ acute TRVs are intended to only protect health over 1-hour of exposure. Table 1 summarizes the modifications made to each TRV in this category.

Generally, DEQ modified the point of departure (POD) from the critical study selected by the source agency to use in deriving their 1-hour TRV. DEQ made these modifications using Haber's Law with or without ten Berge adjustment (Equation 2 or 3). DEQ then applied any dosimetric adjustment factors (DAF) applied by the source agency, and divided it by uncertainty factors (UFs). DEQ used the same total uncertainty factors as the source agency unless otherwise noted. Specific DAFs and UFs applied in each case are documented in Table 1 below and in *ATSAC Workbook 2: TRV Derivation*. In some cases, the POD was expressed in parts per million (ppm). DEQ applied a conversion factor from ppm to micrograms per cubic meter (µg/m^3) in those cases. The unit conversion factors integrate the molecular weight of the specific TAC and assume standard temperature and pressure (25 degrees Celsius and 1 atmosphere). This unit conversion is for uniformity across TRVs for all TACs listed in DEQ rule. Equation 4 below is an example of the full adjustment for TRVs in this category if all components were necessary.

Equation 4. Acute TRV adjustment from 1-hour acute TRV to 24-hour acute TRV.

$$Proposed\ TRV\ \left(\frac{\mu g}{m^3}\right) = \frac{\sqrt[n]{POD^n \times \frac{T_1}{T_2}} \times DAF}{Total\ Uncertainty\ Factor} \times ppm\ to\ \frac{mg}{m^3}\ conversion\ \times \frac{mg}{m^3}\ to\ \frac{\mu g}{m^3}\ conversion$$

Where:

POD = Point of departure – This is the air concentration from the critical study that the source agency used to calculate their 1-hour acute TRV. Examples of PODs include no observable adverse effect levels (NOAELs), lowest observable adverse effect levels (LOAELs), and benchmark concentrations (BMCLs). In cases where the source agency had already expanded an exposure shorter than 1 hour to 1 hour, DEQ used the 1-hour REL or ReV as the POD and made T_1 equal to 1.

Exponent "n" = Reflects influence of concentration on toxicity relative to the influence of time. When n = 1, concentration and time have equal influence. DEQ applied an exponent "n" of 1 unless the source agency had applied an empirically derived exponent "n" specific to a TAC.

T_1 = The daily duration that experimental animals, human subjects, or occupationally exposed workers breathed the air in the critical study selected by the source agency.

T_2 = The amount of time DEQ intends to protect with their acute TRV. For DEQ that is 24 hours of exposure.

DAF = Dosimetric adjustment factor – This is the factor used by the source agency to convert an air concentration from animals to humans using specific toxicokinetic differences between the test species and humans. In each case DEQ used the same DAF as the source agency. DAF is an umbrella term that can represent more specific terms like regional deposition dose relationship (RDDR) or regional gas dose ratio (RGDR).

Not all components of equation 4 were necessary for all TRVs. For example, if the concentration of the TAC used in the critical study used by a source agency was expressed in mg/m^3, then no conversion from ppm to mg/m^3 was necessary. If the source agency did not apply a DAF, then DEQ did not include one in the adjustment. If the source agency did not apply a ten Berge adjustment to Haber's Law for the exposure time adjustment, then DEQ did not include one.

Table 1. Acute TRVs that DEQ Modified by Adjusting Exposure Times from Shorter to Longer.

Name	CAS RN	Used equation 4 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV ($\mu g/m^3$)
Acrylic acid	79-10-7	**Source of original value:** 1999 OEHHA 1-hour acute REL **Variables** • POD = NOAEL = 80 ppm • T_1 = 6 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 100 • Unit conversion = 2.95 mg/m^3 per 1 ppm	590
Benzyl chloride	100-44-7	**Source of original value:** OEHHA 1-hour acute REL **Variables** • POD = LOAEL = 20 ppm • T_1 = 2 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 600 • Unit conversion = 5.18 mg/m^3 per 1 ppm	14
Bromo-methane	74-83-9	**Source of original value:** 1999 OEHHA 1-hour acute REL **Variables** • POD = LOAEL = 35 ppm • T_1 = 2 hours • T_2 = 24 hours • Exponent "n" = 1.33 (empirically derived specifically for this chemical in studies cited by OEHHA) • DAF = NA • UF = 60 • Unit conversion = 3.89 mg/m^3 per 1 ppm	350

Name	CAS RN	Used equation 4 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV ($\mu g/m^3$)
Carbonyl sulfide	463-58-1	**Source of original value:** 2023 OEHHA 1-hour acute REL **Variables** • POD = NOAEL = 740 mg/m^3 • T_1 = 6 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 2,000 • Unit conversion = NA	93
Cyanide, Hydrogen	74-90-8	**Source of original value:** 1999 OEHHA 1-hour REL **Variables** • POD = OEHHA 1-hour REL = 340 $\mu g/m^3$ • T_1 = 1 hour • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = NA – started from finished OEHHA REL • Unit conversion = NA – starting value already in $\mu g/m^3$	14
Diethanolamine	111-42-2	**Source of original value:** 2018 TCEQ acute 1-hour ReV **Variables** • POD = NOAEL = 100 mg/m^3 • T_1 = 6 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = 0.1730 • UF = 180 • Unit conversion = NA	24
Heptane	142-82-5	**Source of original value:** 2016 TCEQ acute 1-hour ReV **Variables** • POD = BMCL = 2945 ppm • T_1 = 0.5 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 180 • Unit conversion = $\frac{100.2\frac{g}{mole}}{24.45\ L/mole}$	1,400

Name	CAS RN	Used equation 4 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV ($\mu g/m^3$)
Hexamethylene-1,6-diisocyanate	822-06-0	**Source of original value:** 2019 OEHHA 1-hour acute REL **Variables** • POD = NOAEL = 0.034 mg/m^3 • T_1 = 5 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 200 • Unit conversion = NA	0.035
Hydrochloric acid	7647-01-0	**Source of original value:** OEHHA 1-hour REL **Variables** • POD = OEHHA 1-hour REL = 2,100 $\mu g/m^3$ • T_1 = 1 hour • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = NA – started from finished OEHHA REL • Unit conversion = NA – starting value already in $\mu g/m^3$	88
Methylene diphenyl diisocyanate	101-68-8	**Source of original value:** 2016 OEHHA 1-hour REL **Variables** • POD = LOAEL = 0.7 mg/m^3 • T_1 = 6 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = RGDR = 1.71 • UF = 600 • Unit conversion = NA	0.50
Phenol	108-95-2	**Source of original value:** 1999 OEHHA 1-hour REL **Variables** • POD = LOAEL = 5.2 ppm • T_1 = 8 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 10 • Unit conversion = 3.85 mg/m^3 per 1 ppm	670

Name	CAS RN	Used equation 4 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV (µg/m^3)
Phosgene	75-44-5	**Source of original value:** 1999 OEHHA 1-hour REL **Variables** • POD = OEHHA 1-hour REL = 4 µg/m^3 • T_1 = 1 hour • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = NA – started from finished OEHHA REL • Unit conversion = NA – starting value already in µg/m^3	0.17
Propylene oxide	75-56-9	**Source of original value:** 1999 OEHHA 1-hour acute REL OEHHA's Appendix G lists two values for exponent "n" in the ten Berge-adjusted Haber's Law equation. Both indicate that the acute effects of propylene oxide are slightly more influenced by concentration than by exposure time, although both still play a role. DEQ chose the lower of the two listed values for exponent "n" (1.5), which is the more health-protective approach when adjusting a shorter exposure time to a longer one. **Variables** • POD = LOAEL = 387 ppm • T_1 = 4 hours • T_2 = 24 hours • Exponent "n" = 1.5 • DAF = NA • UF = 600 • Unit conversion = 2.38 mg/m^3 per 1 ppm	460
Selenide, Hydrogen	7783-07-5	**Source of original value:** 1999 OEHHA 1-hour REL **Variables** • POD = OEHHA 1-hour REL = 5 µg/m^3 • T_1 = 1 hour • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = NA – started from finished OEHHA REL • Unit conversion = NA – starting value already in µg/m^3	0.21

Name	CAS RN	Used equation 4 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV ($\mu g/m^3$)
Triethylamine	121-44-8	**Source of original value:** 1999 OEHHA 1-hour acute REL **Variables** • POD = NOAEL = 10 mg/m^3 • T_1 = 8 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 10 • Unit conversion = NA	330
Trimethylbenzenes	25551-13-7	**Source of original value:** 2023 OEHHA 1-hour acute REL **Variables** • POD = BMCL1SD = 709 mg/m^3 • T_1 = 8 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 600 • Unit conversion = NA	390
Vinylidene chloride	75-35-4	**Source of original value:** 2007 TCEQ 1-hour acute ReV **Variables** • POD = NOAEL = 10 ppm • T_1 = 6 hours • T_2 = 24 hours • Exponent "n" = 1 • DAF = NA • UF = 100 • Unit conversion = 3.96 mg/m^3 per 1 ppm	99

2.3 Exposure Time Adjustments from Subchronic TRVs to 24-Hour Acute TRVs

For some TACs, DEQ proposes to use acute TRVs derived from subchronic TRVs. In all cases in this subsection, the source of the subchronic TRVs is either ATSDR or PPRTV. ATSDR's subchronic TRVs are called intermediate minimal risk levels (MRLs), and PPRTV's subchronic TRVs are called Subchronic reference exposure concentrations (RfCs).

For TACs in this subsection, the exposure time adjustment is always from longer exposures in the critical studies used by the source agencies down to a 24-hour acute TRV. In each case, the source agency had added a days

per week adjustment to derive their value from studies in which exposure was intermittent over some period of time. DEQ's modification for these values was to remove the days per week adjustment, since DEQ acute TRVs apply to a single, 24-hour exposure. DEQ used equation 5 to make these adjustments to all TACs in Table 2 below using inputs in the table:

Equation 5. Subchronic to 24-hour acute adjustment

$$Proposed\ acute\ TRV = \frac{Subchronic\ TRV}{\frac{days}{week}}$$

Table 2. Acute TRVs that DEQ Modified by Adjusting Exposure Times form Longer to Shorter

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
Bis(2-chloroethyl) ether	111-44-4	**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration:** 130 days **Variables:** • Subchronic TRV = ATSDR intermediate MRL= 120 µg/m^3 • Day/week = 5/7	170
Bis(chloromethyl) ether	542-88-1	**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration:** 6 months **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 1.4 µg/m^3 • Day/week = 5/7	2
Chlordane	57-74-9	**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration:** 90 days **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 0.2 µg/m^3 • Day/week = 5/7	0.28

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
Chlorine Dioxide	10049-04-4	**Source of original value:** 2004 ATSDR intermediate MRL **Exposure duration:** 2 months **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 2.8 µg/m^3 • Day/week = 5/7	3.9
Chromium III water *soluble* compounds	16065-83-1	**Source of original value:** 2012 ATSDR's intermediate MRL **Exposure duration:** 13 weeks **Variables:** • Subchronic TRV = ATSDR's intermediate MRL = 0.1 µg/m^3 • Day/week = 5/7	0.14
Chromium III water *insoluble* compounds	16065-83-1	**Source of original value:** 2012 ATSDR's intermediate MRL **Exposure duration:** 13 weeks **Variables:** • Subchronic TRV = ATSDR's intermediate MRL =5 µg/m^3 • Day/week = 5/7	7
Chromic(VI) acid, including chromic acid aerosol mist and chromium trioxide	7738-94-5	**Source of original value:** 2012 ATSDR intermediate MRL **Exposure duration:** Median 2.5 years **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 0.005 µg/m^3 • Day/week = 5/7	0.007

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
Diazinon	333-41-5	**Source of original value:** 2008 ATSDR intermediate MRL **Exposure duration:** 3 weeks **Variables:** • Subchronic TRV = ATSDR intermediate MRL =10 µg/m^3 • Day/week = 5/7	14
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration:** 14 weeks **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 1.9 µg/m^3 • Day/week = 5/7	2.7
1,3-Dichloropropene	542-75-6	**Source of original value:** 2008 ATSDR intermediate MRL **Exposure duration**: 6 months **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 36 µg/m^3 • Day/week = 5/7	50
Diethylene glycol monobutyl ether	112-34-5	**Source of original value:** 2009 PPRTV subchronic REL **Exposure duration:** 5 weeks **Variables:** • Subchronic TRV = 2009 PPRTV subchronic REL= 1 µg/m^3 • Day/week = 5/7	1.4

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
Diethylene glycol Monoethyl ether	111-90-0	**Source of original value:** 2009 PPRTV subchronic REL **Exposure duration:** 28 days **Variables:** • Subchronic TRV = 2009 PPRTV subchronic REL= 3 µg/m^3 • Day/week = 5/7	4.2
1,1-Dimethylhydrazine	57-14-7	**Source of original value:** 1996 ATSDR intermediate MRL **Exposure duration:** 6 months **Variables:** • Subchronic TRV = ATSDR intermediate MRL =0.49 µg/m^3 • Day/week = 5/7	0.69
Ethylene glycol monomethyl ether acetate	110-49-6	**Source of original value:** 2011 PPRTV **Exposure duration:** 13 weeks **Variables:** • Subchronic TRV = 2011 PPRTV subchronic RfC = 11.3 µg/m^3 • Day/week = 5/7	16
1-Methylnaphthalene	90-12-0	**Source of original value:** 2024 ATSDR intermediate MRL **Exposure duration**: 13 weeks **Variables:** • Subchronic TRV = ATSDR intermediate MRL =0.5 µg/m^3 • Day/week = 5/7	0.7

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
2-Methylnaphthalene	91-57-6	**Source of original value:** 2024 ATSDR intermediate MRL **Exposure duration:** 4 weeks **Variables:** • Subchronic TRV = ATSDR intermediate MRL = 2 µg/m^3 • Day/week = 5/7	2.8
2-Nitropropane	79-46-9	**Source of original value:** 2019 PPRTV subchronic RfC **Exposure duration**: 1-3 months **Variables:** • Subchronic TRV = 2019 PPRTV subchronic RfC = 66.67 µg/m^3 • Day/week = 5/7	93
Parathion	56-38-2	**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration:** 6 weeks **Variables:** • Subchronic TRV = 2017 ATSDR intermediate MRL = 20 µg/m^3 • Day/week = 5/7	28
Polybrominated diphenyl ethers		**Source of original value:** 2017 ATSDR intermediate MRL **Exposure duration**: 13 weeks **Variables:** • Subchronic TRV = 2017 ATSDR intermediate MRL =5.8889 µg/m^3 • Day/week = 5/7	8.2

Name	CAS RN	Used equation 5 for all calculations in this table using the inputs listed	DEQ Proposed Acute TRV Value (µg/m^3)
Propylene glycol	57-55-6	**Source of original value:** 1997 ATSDR intermediate MRL **Exposure duration**: 13 weeks **Variables:** • Subchronic TRV = 1997 ATSDR intermediate MRL =28 µg/m^3 • Day/week = 5/7	39
Tribufos	78-48-8	**Source of original value:** 2020 ATSDR's intermediate MRL **Exposure duration:** 13 weeks **Variables:** • Subchronic TRV = 2020 ATSDR's intermediate MRL = 40 µg/m^3 • Day/week = 5/7	56
Uranium – Insoluble compounds	7440-61-1	**Source of original value:** 2013 ATSDR intermediate MRL **Exposure duration:** 5 weeks **Variables:** • Subchronic TRV = 2013 ATSDR intermediate MRL = 2 µg/m^3 • Day/week = 6/7	2.3
Uranium – soluble compounds	7440-61-1	**Source of original value:** 2013 ATSDR intermediate MRL **Exposure duration:** 5 weeks **Variables:** • Subchronic TRV = 2013 ATSDR intermediate MRL = 0.1 µg/m^3 • Day/week = 6/7	0.12

3. TRVs that DEQ Derived by Using a Better Studied Surrogate

DEQ derived TACs in this session by applying the TRV for a better studied chemical to these lesser studied TACs. DEQ relied on guidance and findings applied by other expert agencies when deciding which better studied chemical to use as a surrogate. These instances were relatively rare, and because each circumstance was somewhat unique, DEQ describes the specifics for each case in Table 3.

Table 2. TRVs that DEQ Derived by Applying Toxicity Information from a Better Studied Chemical as a Surrogate

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**		
Crotonaldehyde	4170-30-3	Chronic	None of DEQ's authoritative sources have inhalation toxicity values for crotonaldehyde. TCEQ has both chronic and acute toxicity values for crotonaldehyde. TCEQ's 24-hour ReV for crotonaldehyde is based on a toxicological study done using crotonaldehyde itself as the test substance and is listed in Table 7. Although, TCEQ could not find subchronic or chronic studies using crotonaldehyde suitable to develop a chronic ReV, they did identify acrolein as a suitable index chemical. TCEQ developed and applied a relative potency factor between acrolein and crotonaldehyde such that their chronic ReV for crotonaldehyde is their chronic ReV for acrolein multiplied by the relative potency factor. See chapter 4 section 4.1 of TCEQ's Developmental Support Document for Crotonaldehyde for TCEQ's justification and methods for derivation of a median relative potency factor to apply. DEQ agrees with TCEQ's relative potency factor rationale and development (applying the median *in vivo* chronic relative potency factor of 3 relative to the chronic toxicity of acrolein); however, DEQ proposes to apply the relative potency factor to DEQ's proposed chronic TRV for acrolein (0.35 µg/m^3) rather than to TCEQ's chronic ReV for acrolein (8.1 µg/m^3). DEQ's proposed chronic noncancer TRV for acrolein comes from one of DEQ's authoritative sources (OEHHA). Therefore, derivation of DEQ's proposed chronic TRV for crotonhaldehyde is:	Chronic TRV: 1.1 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**		
			$$Proposed\ chronic\ TRV\ for\ crotonaldehyde = OEHHA\ chronic\ REL\ for\ acrolein \times TCEQ\ median\ in\ vivo\ relative\ potency\ factor\ for\ crotonaldehyde = 0.35\ \frac{\mu g}{m^3} \times 3 = 1.05\ \frac{\mu g}{m^3} \approx \mathbf{1.1}\ \frac{\boldsymbol{\mu g}}{\boldsymbol{m^3}}$$	
Polybrominated biphenyls (PBBs), evaporated and PBBs, aerosols and particulates		Cancer	DEQ proposes to apply cancer TRVs for unspecified mixtures of polychlorinated biphenyls (PCBs), (evaporated or aerosols and particulates) to their brominated analogues. This approach is justified by the similarity in chemical structure and properties and is recommended in a peer-reviewed publication (Van den Berg et al. 2013). ATSAC has previously communicated approval of this proposed approach in a series of email communications (https://www.oregon.gov/deq/aq/Documents/ATSACResponsestoTEFs.pdf).	Cancer TRV for evaporated mixures: 0.0091 µg/m^3 Cancer TRV for aerosol and particulate mixtures: 0.0018 µg/m^3
Polybrominated dibenzo-p-dioxins (PBDDs) & dibenzofurans (PBDFs) TEQ & Dioxin-like polybrominated biphenyls (PBBs)		Cancer and Chronic noncancer	DEQ proposes to apply TEFs for chlorinated dioxins, furans, and polychlorinated biphenyls (PCBs) to their brominated analogues and to include risk from brominated dioxins, furans, and dioxin-like polybrominated biphenyls (PBBs) in the risk for the dioxin/furan class. This approach is recommended in a peer-reviewed publication (Van den Berg et al. 2013), and ATSAC has previously communicated approval of this proposed approach in a series of email communications (https://www.oregon.gov/deq/aq/Documents/ATSACResponsestoTEFs.pdf).	See ATSAC Workbook 1: Proposed TRVs

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**		
N-Propylbenzene	103-65-1	Cancer, Chronic, and Acute	Appendix A of the February 2, 2009 PPRTV document for n-propylbenzene applies the EPA chronic RfC for ethyl benzene from the 1991 IRIS assessment to this compound, stating that ethyl benzene is a reasonable surrogate for n-propylbenzene. OEHHA and ATSDR came out with more recent toxicity values for ethyl benzene since the 2009 PPRTV document for n-propylbenzene. If PPRTV stated that ethyl benzene is a good surrogate for n-propylbenzene, it stands to reason that the updated tox values for ethyl benzene should be applied to n-propylbenzene as well. Therefore, DEQ proposes to use all TRVs proposed for ethyl benzene to n-propylbenzene.	Cancer: 0.4 µg/m^3 Chronic: 260 µg/m^3 Acute: 22,000 µg/m^3
Perfluorooctane sulfonamide	754-91-6	Chronic and acute	DEQ proposes to apply the TRV for perfluorooctanoic acid (335-67-1) to this TAC. This decision is justified by TCEQ as they also used their PFOA toxicity information as a surrogate for this TAC. [Document 9: ERG Summary of Inhalation Toxicity Values Annotated by DEQ]	Chronic TRV: 0.0001 µg/m^3 Acute TRV: 0.063 µg/m^3

4. TRVs where DEQ Proposes to Modify Uncertainty Factors

This section describes cases where DEQ modified a TRV from another source by adjusting the uncertainty factors applied in their derivation. In each of the cases in this section, DEQ agreed with the originating source agency in all other aspects of the derivation. In several of the cases, the purpose of the DEQ-proposed additional uncertainty factor was to adjust a subchronic TRV to a chronic TRV.

Table 3. TRVs where DEQ Proposes to Modify Uncertainty Factors Applied by Originating Source Agency.

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations for each TAC shown below where applicable**	
Acetone	67-64-1	Chronic	DEQ adapted this proposed chronic TRV from TCEQ 2015. DEQ proposes to increase TCEQ's LOAEL to NOAEL UF from 2 to the more standard 3 used by all DEQ's authoritative sources (TCEQ 2015), raising the total UF from 20 to 30. The proposed TRV is therefore calculated: $Proposed\ chronic\ TRV = \frac{LOAEL_{adj}}{UF} \times ppm\ to \frac{mg}{m^3}\ adjustment$ $= \frac{133.9\ ppm}{30} \times \frac{2.38 \frac{mg}{m^3}}{1\ ppm} = 10.623 \frac{mg}{m^3} = 10623 \frac{\mu g}{m^3} \approx \mathbf{11{,}000\ \mu g/m^3}$	Chronic TRV: 11,000 µg/m^3
Chromium III water *insoluble* compounds	16065-83-1	Chronic	DEQ derived a chronic TRV from ATSDRs intermediate MRL (2012) for insoluble trivalent chromium compounds. DEQ proposes to adopt all aspects of the intermediate MRL derivation from the same critical study with the addition of an uncertainty factor of 3 (total UF of 300) to extrapolate the results of this 13-week animal study to an annual, chronic TRV. OEHHA applied the same approach in deriving their chronic ReV for water soluble trivalent chromium from the same critical study that ATSDR used (Derelanko 1999). Note that the Derelanko study included exposures to both insoluble and soluble trivalent chromium compounds to compare the relative inhalation toxicity of the two. OEHHA only used the water soluble portion of this study, while ATSDR used both.	Chronic TRV: 1.4 µg/m^3
Dichlorodifluoromethane	75-71-8	Chronic	DEQ proposes to adapt Minnesota's subchronic risk assessment advice (RAA) value 2016, which was based on a 4 week exposure in humans, to a chronic duration TRV by applying an additional uncertainty factor of 10. This is done by dividing Minnesota's subchronic RAA by 10: $Proposed\ chronic\ TRV = \frac{Minnesota\ RAA}{10} = \frac{11{,}790\ \mu g/m^3}{10} = 1{,}179\ \frac{\mu g}{m^3}$ $\approx \mathbf{1{,}200\ \mu g/m^3}$	Chronic TRV: 1,200 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations for each TAC shown below where applicable**	
Ethylene dibromide	106-93-4	Acute	DEQ's proposed acute TRV is a modification to the 2017 TCEQ acute ReV. TCEQ has a policy for acute exposure TRVs that the maximum total UF cannot exceed 300. Here, TCEQ had calculated a total UF of 3000, but only used a total UF of 300 due to state policy. DEQ and OHA proposed to adopt the 2017 TCEQ acute TRV with the total UF of 3000 instead of 300. Therefore, to calculate the proposed acute TRV, DEQ and OHA followed this equation: $$\text{proposed acute TRV} = \frac{\text{TCEQ 24 – hour ReV}}{\text{additional factor of 10}} = \frac{510\ \frac{\mu g}{m^3}}{10} = \mathbf{51}\ \frac{\mu \mathbf{g}}{\mathbf{m^3}}$$	Acute TRV: 51 µg/m^3
n-Hexane	110-54-3	Acute	DEQ's proposed acute TRV is a modification to the 2017 TCEQ 24-hour acute ReV. DEQ and OHA modified the TCEQ ReV by changing the "minimal LOAEL" UF from the 2 that TCEQ applied to 3 to be more consistent with other DEQ authoritative source agency policies (TCEQ 2015). This changed the total uncertainty factor from the TCEQ 180 to 300. To calculate the proposed acute TRV, DEQ and OHA followed this equation (all from TCEQ except for the modified UF): $$\text{proposed acute TRV} = \frac{\text{LOAEL}}{\text{UF}} = \frac{1000\ \text{ppm}}{300} = 3.33\ \text{ppm} = 11.749\ \frac{\text{mg}}{m^3} = 11{,}749\ \frac{\mu g}{m^3}$$ $$\approx \mathbf{12{,}000}\ \mu \mathbf{g}\ /\boldsymbol{m^3}$$ OHA staff used this website to convert ppm to mg/m^3 using the molecular weight for n-hexane (86.178 g/mol).	Acute TRV: 12,000 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting Information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations for each TAC shown below where applicable**	
Tribufos	78-48-8	Chronic	Proposed chronic TRV is derived by applying an additional uncertainty factor of 3 to ATSDR's intermediate MRL (2020), which was based on a 13-week study in rats, to adjust from subchronic to chronic exposure. The proposed chronic TRV is derived: $DEQ\ Chronic\ TRV = \frac{ATSDR\ intermediate\ MRL}{UF_S} = \frac{40\ \mu g/m^3}{3} = 13.33\frac{\mu g}{m^3}$ $\approx \mathbf{13}\ \boldsymbol{\mu g/m^3}$	Chronic TRV: 13 µg/m^3

5. Other Types of Adjustments

DEQ modified the TRVs in this section in ways that do not fit in the categories described elsewhere. In some cases, DEQ did not make an adjustment per se but proposes to apply a TRV in a way that is different than the originating source agency does. Each adjustment in this section is so unique, that DEQ listed the specific details for each in Table 5.

Table 4. TRVs where DEQ made other types of adjustments.

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations and/or narrative for each TAC shown below where applicable**	
Benzo[a]pyrene	50-32-8	Acute	DEQ proposes to apply EPA's chronic RfC as an acute TRV as well. This is because the health effects are developmental and the experimental exposure was only 9 days without information on the minimum exposure time necessary to cause the observed effects.	Acute TRV: 0.002 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations and/or narrative for each TAC shown below where applicable**	
Boron trichloride	10294-34-5	Acute and Chronic	Both acute and chronic noncancer proposed TRVs for boron trichloride apply the principle described in the 2012 PPRTV document for boron trichloride. It is that the toxicity of boron trichloride is the same as that of hydrogen chloride because each molecule of boron trichloride hydrolyzes to 3 molecules of hydrogen chloride. DEQ proposed to adopt OEHHA's toxicity values for hydrogen chloride for both acute and chronic noncancer TRVs. Therefore, to calculate proposed acute and chronic TRVs for boron trichloride, DEQ multiplied the OEHHA-based proposed TRVs for hydrogen chloride by the ratio of the molecular weight for boron trichloride by 3 times the molecular weight of hydrogen chloride. That ratio works out to be 1.07. So, the proposed TRVs for boron trichloride are equal to the proposed TRVs for hydrogen chloride multiplied by 1.07. Calculations here: **Acute TRV** $$Proposed\ acute\ TRV\ for\ boron\ trichloride = Proposed\ acute\ TRV\ for\ HCL \times \left(\frac{Molcular\ weight\ boron\ trichloride}{3 \times Molecular\ weight\ HCL}\right)$$ $$2247\frac{\mu g}{m^3} = 2100\frac{\mu g}{m^3} \times \left(\frac{117.17\ \frac{g\ BCL_3}{mol}}{3 \times 36.46\ \frac{g\ HCL}{mol}}\right) = 2100\frac{\mu g}{m^3} \times 1.07 \approx \mathbf{2200}\frac{\boldsymbol{\mu g}}{\boldsymbol{m^3}}$$ **Chronic TRV** $$Proposed\ chronic\ TRV\ for\ boron\ trichloride = Proposed\ chronic\ TRV\ for\ HCL \times \left(\frac{Molcular\ weight\ boron\ trichloride}{3 \times Molecular\ weight\ HCL}\right)$$ $$9.63\frac{\mu g}{m^3} = 9\frac{\mu g}{m^3} \times \left(\frac{117.17\ \frac{g\ BCL_3}{mol}}{3 \times 36.46\ \frac{g\ HCL}{mol}}\right) = 9\frac{\mu g}{m^3} \times 1.07 \approx \mathbf{9.6}\ \boldsymbol{\mu g/m^3}$$	Acute TRV: 2200 µg/m^3 Chronic TRV: 9.6 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations and/or narrative for each TAC shown below where applicable**	
Hydrazine	302-01-2	Acute	DEQ derived this proposed acute TRV by modifying ATSDR's intermediate MRL (1996). The intermediate MRL came from a mouse study in which animals were exposed continuously for 6 months. ATSDR did not make any modifications to the POD for intermittent exposure since the experimental exposure was continuous. DEQ applied equation 4 from this document assuming an exponent "n" of 3 as a default in the absence of empirical data for an alternative value. This is the health protective default when moving from a longer experimental exposure to a shorter assumed exposure time and is the policy used by both OEHHA and TCEQ. All other inputs to equation 4 came directly from ATSDR's derivation of their intermediate MRL. **Variables** • POD = LOAEL = 0.2 ppm • T_1 = 4,380 hours (6 months continuous exposure) • T_2 = 24 hours • Exponent "n" = 3 (default when moving from longer to shorter exposure) • DAF = 5.788 • UF = 300 • Unit conversion = 1.31 mg/m^3 per 1 ppm	Acute TRV: 29 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations and/or narrative for each TAC shown below where applicable**	
Perfluorononanoic acid (PFNA)	375-95-1	Acute	DEQ derived the proposed acute TRV by modifying a chronic RfC developed by TCEQ and published 2/24/2023 [Document 9: ERG Summary of Inhalation Toxiciy Values Annotated by DEQ]. The TCEQ value is based on an inhalation study in which animals were exposed for 4 hours. TCEQ applied a subacute to chronic uncertainty factor and applies the TRV to chronic exposure. They also did not make a time adjustment from 4 hours to 24 hours. DEQ proposes to adjust the TCEQ chronic RfC to acute by multiplying the RfC by 10 (thus removing the 10-fold subacute to chronic UF that TCEQ applied) and multiply by 4/24 hours/day (0.16667) to adjust the 4 hour exposure to a 24 hour averaging time. The full equation is presented here: $$Proposed\ acute\ TRV = TCEQ\ chronic\ RfC \times subacute\ to\ chronic\ UF \times \frac{4}{24} hours\ day = 0.028\ \mu g/m^3 \times 10 \times 0.16667 = \mathbf{0.047}\ \boldsymbol{\mu g/m^3}$$	Acute TRV: 0.047 µg/m^3

Toxic Air Contaminant Basic Information			DEQ Narrative Supporting information	DEQ Proposed TRV Value
Name	**CAS RN**	**TRV Exposure Category**	**Specific equations and/or narrative for each TAC shown below where applicable**	
Polycyclic aromatic hydrocarbons (PAHs)		Cancer	DEQ and OHA propose to use the benzo[a]pyrene IUR developed by EPA IRIS in 2017 as the index member of the class. Proposed cancer TRVs for all other members of the PAH family are calculated by multiplying the IUR for benzo[a]pyrene by a relative potency factor (RPF) derived for the specific PAH in question from the source indicated in the TRV tool and in the table below. DEQ selected RPFs from the Minnesota Department of Health because they had RPFs for the widest range of PAHs and compiled their RPFs from other sources that DEQ considers authoritative (i.e. EPA, OEHHA, etc.). To get the final TRV, DEQ divided the target risk of 1 in 1 million by the modified IUR as shown here: $$Cancer\ TRV\ for\ PAHn = \frac{0.000001}{IUR\ for\ benzo(a)pyrene \times RPFn}$$ Specific proposed RPFs for individual PAH species are listed in Table 6 below.	ATSAC Workbook 1: Proposed TRVs
sec-butyl alcohol	78-92-2	Acute	This proposed acute TRV is the subchronic PPRTV RfC published in 2009. It is the same value as the proposed chronic TRV. Agency staff propose this as a reasonable acute TRV since it is based on a subchronic developmental study (gestation days 1-19 in rats) with no uncertainty factors to adjust for chronic averaging times.	Acute TRV: 30,000 $\mu g/m^3$

Table 5. Carcinogenic polycyclic aromatic hydrocarbon Relative Potency Factors and their sources (chronic, cancer)

PAH	CAS RN	RPF (unitless)	Source of RPF	DEQ Notes
Anthanthrene	191-26-4	0.4	Minnesota Department of Health 2016	
Benz[a]anthracene	56-55-3	0.2	Minnesota Department of Health 2016	
Benzo[b]fluoranthene	205-99-2	0.8	Minnesota Department of Health 2016	
Benzo[c]fluorene	205-12-9	20	Minnesota Department of Health 2016	
Benzo[g,h,i]perylene	191-24-2	0.009	Minnesota Department of Health 2016	
Benzo[j]fluoranthene	205-82-3	0.3	Minnesota Department of Health 2016	
Benzo[k]fluoranthene	207-08-9	0.03	Minnesota Department of Health 2016	
Chrysene	218-01-9	0.1	Minnesota Department of Health 2016	
Cyclopenta[c,d]pyrene	27208-37-3	0.4	Minnesota Department of Health 2016	
Dibenz[a,h]acridine	226-36-8	0.1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value

PAH	CAS RN	RPF (unitless)	Source of RPF	DEQ Notes
Dibenz[a,j]acridine	224-42-0	0.1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo(a)pyrene rather than the newer 2017 IRIS IUR value
7H-Dibenzo[c,g]carbazole	194-59-2	1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo(a)pyrene rather than the newer 2017 IRIS IUR value
Dibenz[a,h]anthracene	53-70-3	10	Minnesota Department of Health 2016	
Dibenzo[a,e]pyrene	192-65-4	0.4	Minnesota Department of Health 2016	
Dibenzo[a,h]pyrene	189-64-0	0.9	Minnesota Department of Health 2016	
Dibenzo[a,i]pyrene	189-55-9	0.6	Minnesota Department of Health 2016	
Dibenzo[a,l]pyrene	191-30-0	30	Minnesota Department of Health 2016	

PAH	CAS RN	RPF (unitless)	Source of RPF	DEQ Notes
7,12-Dimethylbenz[a]anthracene	57-97-6	64	Minnesota Department of Health 2016	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
Fluoranthene	206-44-0	0.08	Minnesota Department of Health 2016	
Indeno[1,2,3-cd]pyrene	193-39-5	0.07	Minnesota Department of Health 2016	
1,6-Dinitropyrene	42397-64-8	10	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
1,8-Dinitropyrene	42397-65-9	1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value

PAH	CAS RN	RPF (unitless)	Source of RPF	DEQ Notes
3-Methylcholanthrene	56-49-5	5.6	Minnesota Department of Health 2016	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
5-Nitroacenaphthene	602-87-9	0.02	Minnesota Department of Health 2016	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
5-Methylchrysene	3697-24-3	1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
6-Nitrochrysene	7496-02-8	10	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	

PAH	CAS RN	RPF (unitless)	Source of RPF	DEQ Notes
2-Nitrofluorene	607-57-8	0.01	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
1-Nitropyrene	5522-43-0	0.1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value
4-Nitropyrene	57835-92-4	0.1	Minnesota Department of Health 2016 And OEHHA (MDH adopted OEHHA's RPF)	TRV updated from 2018 value because old value used the same RPF but applied it to the outdated OEHHA IUR for benzo[a]pyrene rather than the newer 2017 IRIS IUR value

6. TRVs Proposed for Adoption from Non-Authoritative Sources without Modification

DEQ found some TRVs from sources other than the Authoritative Sources named in rule that DEQ considered of adequate derivation quality to adopt without modifications. These TRVs along with their sources are shown in Table 7.

Sources include TCEQ, Minnesota Department of Health (DOH), Michigan Department Environment, Great Lakes, and Energy (EGLE), New Jersey Department of Environmental Protection (DEP), and EPA's National Ambient Air Quality Standards (NAAQS). Blank cells in Table 7 indicate the missing TRV is from one of the Authoritative Sources in rule (ATSDR, CalEPA, or EPA) or is addressed in one of the tables above in this document.

Table 6. TRVs adopted from non-authoritative sources without modification.

Common Name	CAS RN	TRV Type	Cancer TRV (µg/m^3)	Chronic NC TRV (µg/m^3)	Acute TRV (µg/m^3)	TRV Source
tert-Butyl alcohol	75-65-0	Acute			15000	TCEQ
Carbon disulfide	75-15-0	Chronic NC		110		TCEQ
Crotonaldehyde	4170-30-3	Acute			29	TCEQ
Ethylene	74-85-1	Chronic NC/Acute		6100	570000	TCEQ
Isoprene, except from vegetative emission sources	78-79-5	Chronic NC/Acute		390	3900	TCEQ
Lead and compounds	7439-92-1	Chronic NC/Acute		0.15	0.15	EPA (NAAQS)
Manganese and compounds	7439-96-5	Acute			1.3	See DEQ 2024 Mn memo
Methyl amyl ketone (2-Heptanone)	110-43-0	Chronic NC/Acute		2800	15000	TCEQ
1-Methylnaphthalene	1321-94-4	Cancer	0.14			Michigan EGLE
6:2-Fluorotelomersulfonic acid (6:2 FTS)	27619-97-2	Chronic NC		1		Michigan EGLE
Perfluorobutane sulfonic acid (PFBS)	375-73-5	Acute			0.3	Minnesota DOH
Perfluorobutanoic acid (PFBA)	375-22-4	Chronic NC/Acute		3.5	10	Chronic from TCEQ; Acute from Minnesota DOH
Perfluorodecanoic acid (PFDA)	335-76-2	Chronic NC		0.053		TCEQ
Perfluorododecanoic acid (PFDoDa)	307-55-1	Chronic NC		0.042		TCEQ
Pefluorohexanesulfonic acid (PFHxS)	355-46-4	Acute			0.034	Minnesota DOH
Perfluorohexanoic acid (PFHxA	307-24-4	Chronic NC/Acute		0.5	1	Minnesota DOH

Common Name	CAS RN	TRV Type	Cancer TRV ($\mu g/m^3$)	Chronic NC TRV ($\mu g/m^3$)	Acute TRV ($\mu g/m^3$)	TRV Source
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Chronic NC/Acute		0.0004	0.011	Chronic from Michigan EGLE; Acute from Minnesota DOH
Hexafluoropropylene oxide dimer acid (HFPO-DA/Gen-X)	62037-80-3	Chronic NC		0.01		New Jersey DEP
Perfluorobutylethylene (PFBE)	19430-93-4	Chronic NC		2600		Michigan EGLE
Perfluorooctanoic acid (PFOA)	335-67-1	Chronic NC/Acute		0.0001	0.063	Chronic from Michigan EGLE/Acute from Minnesota DOH
Propionaldehyde	123-38-6	Acute			1,800	TCEQ
Silica, Amorphous and Other Non-Crystalline Forms (Respirable)	1058T	Chronic NC		6.6		TCEQ
Silica, Crystalline forms (respirable)	7631-86-9	Acute			24	TCEQ
4-Vinylcyclohexene	100-40-3	Chronic NC/Acute		330	5800	TCEQ

Appendix A. List of Acronyms

ATSDR	Federal Agency for Toxic Substances and Disease Registry
BMCL	Lower confidence limit of the benchmark concentration
CAS RN	Chemical Abstract Service Registry Number
DAF	Dosimetric adjustment factor
DEP	New Jersey Department of Environmental Protection
DEQ	Oregon Department of Environmental Quality
DOH	Minnesota Department of Health
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	Environmental Protection Agency
IRIS	EPA's Integrated Risk Information System
LOAEL	Lowest observable adverse effect level
MRLs	Minimal risk level
NAAQS	EPA's National Ambient Air Quality Standard
NOAEL	No observable adverse effect level
OEHHA	California Office of Environmental Health Hazard Assessment
POD	Point of departure
PPRTV	Provisional Peer Reviewed Toxicity Value
RDDR	Regional Deposition Dose Relationship
RGDR	Region Gas Dose Ratio
RELs	Reference exposure levels
REVs	Reference exposure values
RfC	Reference concentration
TAC	Toxic air contaminant
TCEQ	Texas Commission on Environmental Quality
TRV	Toxicity reference value
UF	Uncertainty factor
UF_D	Database uncertainty factor

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