DEPARTMENT OF ECOLOGY
State of Washington

Concise Explanatory Statement
Chapter 173-460 WAC
Controls for New Sources of Toxic Air Pollution

Summary of rulemaking and response to comments

November 2019

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Publication and Contact Information

This document is available on the Department of Ecology's website at:
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Concise Explanatory Statement

Chapter 173-460 WAC

Controls for New Sources of Toxic Air Pollution

Air Quality Program

Washington State Department of Ecology

Olympia, Washington

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Acronyms

APA	Administrative Procedure Act
ASIL	Acceptable Source Impact Level
CAS	Chemical Abstract Service
IRIS	Integrated Risk Information Systen
NOS	Not Otherwise Specified
PAH	Polycyclic Aromatic Hydrocarbon
RCW	Revised Code of Washington
SQER	Small Quantity Emission Rate
TAP	Toxic Air Pollutant
t-BACT	Best Available Control Technology for Toxics
URF	Unit Risk Factor
WAC	Washington Administrative Code

Introduction

The purpose of a Concise Explanatory Statement is to:

- Meet the Administrative Procedure Act (APA) requirements for agencies to prepare a Concise Explanatory Statement (RCW 34.05.325).
- Provide reasons for adopting the rule.
- Describe any differences between the proposed rule and the adopted rule.
- Provide Ecology's response to public comments.
- This Concise Explanatory Statement provides information on The Washington State Department of Ecology's (Ecology) rule adoption for:

Title:	Controls for New Sources of Toxic Air Pollutants
WAC Chapter(s):	173-460
Adopted date:	November 22, 2019
Effective date:	December 23, 2019

To see more information related to this rulemaking or other Ecology rulemakings please visit our website: https://ecology.wa.gov/About-us/How-we-operate/Laws-rules-rulemaking.

Reasons for Adopting the Rule

The purpose of this rule revision is to update the list of toxic air pollutants (TAPs) and their emission thresholds to reflect the most current scientific findings regarding TAPs and health effects.

This rulemaking makes the following changes:

- Updates the list of toxic air pollutants.
- Recalculates:
    - De minimis emission values: De minimis emission values determine whether a facility must use toxics best available control technology and undergo First Tier Review. Projects emitting less than de minimis levels of TAPs are not subject to any pre-construction permit review.
    - Small quantity emission rates (SQER): SQER values determine the degree of emissions modeling required when seeking a permit.
    - Acceptable source impact levels (ASIL): ASILs are concentrations of TAPs in ambient air at or below which a project's impacts may be permitted without the need to submit a site-specific health impact assessment. These levels are set to protect human health and safety. New or modified facilities must meet these levels using initially planned or additional emissions control measures.
- Specifies the number of significant digits of emissions rates (i.e., de minimis and SQERs) and concentrations (i.e., ASILs).
- Updates language in the rule to use the acronym "TAP" instead of toxic air pollutant.

The reasons for the rule amendments are to:

- Align the rule with current scientific information about chemicals, including adjusting for the impacts of early life exposure to a chemical. We are adding some chemicals or modified values based on previous errors in the rule language itself.
- Remove ammonium sulfate as a toxic air pollutant based on our toxicity review in response to a rulemaking petition on this chemical from the Far West Agribusiness Association.
- Improve clarity.
- Remove redundancy.

The "Decision Making Documentation: Updating Chapter 173-460 WAC (revised)" provides the decisions and reasons supporting the rule adoption on the following topics:

- Update the list (add or subtract chemicals): retained 387 toxic air pollutants, removed 8 toxic air pollutants, and added 51 toxic air pollutants.
- Chemicals considered but not added to the toxic air pollutants list: seven (acetone, fuel oil. no 2, kerosene and 4 kerosene-based jet fuels).

- Evaluation of ammonium sulfate: removed.
- Recalculation of ASILs: updated.
- Evaluation of excluding criteria pollutants as TAPs: retained as TAPs.
- Evaluation of the use of early life adjustment factors: included so adjusted appropriate ASILs.
- Review of the existing ASIL for diethyl and dimethyl mercury: revised.
- Evaluation of ASILs for groups of chemicals (toxicity equivalency): no adjustments
- Revision of the small quantity emission rate modeling parameters: updated modeling parameters.
- Recalculation of the small quantity emission rates: recalculated using AERSCREEN model and new modeling parameters.
- Recalculation of de minimis emission values: updated using existing methodology (SQER/20).
- Update the rule to support the rule changes: aligned rule to require two significant digits for emission rates and concentrations.

Differences Between the Proposed Rule and Adopted Rule

RCW 34.05.325(6)(a)(ii) requires Ecology to describe the differences between the text of the proposed rule as published in the Washington State Register and the text of the rule as adopted, other than editing changes, stating the reasons for the differences.

There are some differences between the proposed rule filed on June 4, 2019 and the adopted rule filed on November 22, 2019. Ecology made these changes for all or some of the following reasons:

- In response to comments we received.
- To ensure clarity and consistency.
- To meet the intent of the authorizing statute.

The following content describes the changes and Ecology's reasons for making them.

WAC 173-460-150: Changes throughout table

Common names and order of toxic air pollutants

We edited the common names and order of chemicals to make it easier to find them in the table. The new system groups chemical families near each other instead of throughout the table.

Scientific notation

We simplified the table by providing all values in the scientific notation format. Displaying ASILs, SQERs, and de minimis emission values in the table in two formats – decimal and scientific notation – was confusing.

WAC 173-460-150: Pollutant specific changes

Asbestos

The amendments add six types of asbestos to the list of toxic air pollutants: Actinolite, Amosite, Anthophylite, Chrysotile, Crocidolite, and Tremolite. The ASILs, SQERs, and de minimis emissions levels are identical to those of the general listing for "Asbestos (fibers/cubic centimeter)." This change reduces confusion about the coverage of the existing asbestos group listing.

Actinolite asbestos: CAS[1] 12172-67-7

Amosite asbestos: CAS 12172-73-5

[1] The Chemical Abstracts Service Registry Number (CAS) is a unique identifier for each chemical.

Anthophylite asbestos: CAS 17068-78-9

Chrysotile asbestos: CAS 12001-29-5

Crocidolite asbestos: CAS 12001-28-4

Tremolite asbestos: CAS 14567-73-8

Cobalt

We added “and compounds, NOS” to clarify that we consider all forms of cobalt compounds equally toxic based on the mass of cobalt in a cobalt compound.

Dimethyl mercury

We retained the original listing of “dimethyl mercury” because we mistakenly changed the name to "methyl mercury (dimethyl mercury)" when we proposed the rule.

Ethyl carbamate

We added urethane as a common name for this chemical because it has the same CAS number.

Fluorides

We corrected the misspelling of fluoride in the table in WAC 173-460-150.

Libby amphibole asbestos

We corrected the misspelling of amphibole and added “and amphibole, NOS” to be include other varieties of amphiboles to protect public health. This was due to EPA's toxicological review of Libby amphibole asbestos that highlights concerns about of a variety of amphiboles.

Nickel carbonate hydroxide

We corrected the CAS number to 12607-70-4.

Nickel oxide

We added nickel monoxide and nickel(II) oxide as common names for nickel oxide because they all have the same CAS number.

Nickel oxide black

We added CAS 1314-06-3 for this pollutant because the rule did not include one. We added nickel sesquioxide and nickel(III) oxide as common names for nickel oxide black because they all have the same CAS number.

Sulfur trioxide

We corrected the CAS number to 7446-11-9.

List of Commenters and Response to Comments

We accepted comments between June 4 and July 23, 2019. We summarized and edited some of the comments in this section for clarity. You can see the original content of the comments we received at: http://ac.ecology.commentinput.com/?id=t7W9R. These comments remain available online for two years after the rule adoption date.

We grouped comments and topics together and organized them by topic. Under each topic heading, you can see all the comments we received for that topic, followed by our single response to all the comments on that topic.

Topic List

- Age dependent adjustment factor (ADAF)
- Confusing names (cresols & xylenes)
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- Expand the scope of the rule
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- Review least burdensome analysis
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- Specific toxic air pollutants
    - Asbestos
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    - Trichloropropane
- Table formatting

Individual Commenter Index

We did not get any oral testimony at the public hearing. Commenters can find their comments and the response by scrolling to the topic next to their name.

Commenter name	Affiliation	Topic of comment	Comment number
Hoffmann, Jesse		Expand the scope of the rule	I-2-1, I-2-2, I-2-3
Johnson, Giffe	NCASI	Age dependent adjustment factor	O-1-1
Johnson, Giffe	NCASI	Mercury averaging period	O-1-2
Johnson, Giffe	NCASI	Mercury, elemental	O-1-3
Kadlec, Matt		Dimethyl mercury	I-1-1
Mairose, Paul	Southwest Clean Air Agency	Asbestos	A-2-4
Mairose, Paul	Southwest Clean Air Agency	Cobalt	A-2-14
Mairose, Paul	Southwest Clean Air Agency	Confusing names (cresols and xylene)	A-2-5, A-2-12
Mairose, Paul	Southwest Clean Air Agency	Expand data sources	A-2-1
Mairose, Paul	Southwest Clean Air Agency	Fluorides	A-2-7
Mairose, Paul	Southwest Clean Air Agency	Include hazardous air pollutants	A-2-3
Mairose, Paul	Southwest Clean Air Agency	Libby amphibole asbestos	A-2-6
Mairose, Paul	Southwest Clean Air Agency	Mercury, elemental	A-2-8
Mairose, Paul	Southwest Clean Air Agency	Nickel black oxide	A-2-11
Mairose, Paul	Southwest Clean Air Agency	Nickel carbonate hydroxide	A-2-10
Mairose, Paul	Southwest Clean Air Agency	Remove criteria air pollutants	A-2-2
Mairose, Paul	Southwest Clean Air Agency	Remove banned / restricted pollutants	A-2-13
Mairose, Paul	Southwest Clean Air Agency	Spelling mistakes	A-2-15, A-2-16
Mairose, Paul	Southwest Clean Air Agency	Table formatting	A-2-9
McCabe, Christian	Northwest Pulp and Paper Association	Age dependent adjustment factor	O-2-1

Commenter name	Affiliation	Topic of comment	Comment number
McCabe, Christian	Northwest Pulp and Paper Association	General comment	O-2-5
McCabe, Christian	Northwest Pulp and Paper Association	Mercury averaging period	O-2-3
McCabe, Christian	Northwest Pulp and Paper Association	Review least burdensome analysis	O-2-4
McCabe, Christian	Northwest Pulp and Paper Association	Trichloropropane	O-2-2
Moody, Robert	Olympic Region Clean Air Agency	Spelling mistakes	A-1-1

Comments on Age dependent adjustment factor

Commenter: NCASI, Giffe Johnson - Comment O-1-1

1.0 There is a lack of evidence that the proposed use of an Age Dependent Adjustment Factor (ADAF) will provide health benefits to susceptible populations.

EPA provided guidance for Age Dependent Adjustment Factors (ADAFs) for cancer slope factors to adjust carcinogenic potency during early life stages for substances considered to be 'linear' carcinogens in the document *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*, on which Ecology bases proposed changes to some ASILs. The agency's purpose in proposing these changes is ostensibly to increase protection against cancer from exposure to carcinogens at earlier life stages. However, these life stage-based adjustments are (1) associated with substantial uncertainty; (2) being applied to standards that already contain multiple conservative assumptions; and therefore (3) unlikely to confer any additional public health benefit if implemented in their proposed form. The impact of these proposed changes is that many ASIL values may be substantially reduced, potentially impacting dischargers and government agencies that manage discharges, without clear evidence that a public health benefit will result. The scientific basis of Washington's ASIL values would be strengthened if the agency were to reevaluate and revise its implementation of ADAFs and life stage susceptibility assumptions to be consistent with the current state of scientific evidence regarding early exposure to carcinogens, as well as the substantial limitations found in the EPA guidance document.

1.1 ADAF adjustment

In the proposed ASIL values for several linear, mutagenic carcinogens, including chromium VI and multiple polycyclic aromatic hydrocarbons (PAHs), Ecology proposes to multiply the cancer slope factor (CSF) by a factor of 10 for ages birth to 2 years, and to multiply the CSF by a factor of 3 for ages 2 to less than 16 years. These adjustments are weighted by the time spent in the age range of interest. The justification for increasing the CSF during earlier life stages is the hypothesis that certain types of modes of action for carcinogens have greater impact if they occur at an earlier life stage. For example, it is suggested that mutagenic modes of carcinogenesis may have a greater impact with early life stage exposure because a mutated parent cell may produce a greater number of daughter cells that inherit the mutation due to the rapid proliferation of cells that takes place at an earlier life stage. EPA acknowledges, however, that the scientific underpinnings of ADAFs are not well characterized, and recommends them at least partially on the basis of policy rather than science (underlined for emphasis):

> The Agency has also carefully considered both the advantages and disadvantages to extending the default potency adjustment factors to carcinogenic chemicals for which the mode of action remains unknown. It is the Agency's long-standing science policy position that use of the linear low-dose extrapolation approach (without further adjustment) provides adequate public health conservatism in the absence of chemical-specific data indicating differential early-life susceptibility. At the present time, therefore, EPA is recommending

> these age-dependent adjustment factors only for carcinogens acting through a mutagenic mode of action based on a combination of analysis of available data and the above-mentioned science policy position. (USEPA 2005, p 35)

Not all carcinogens with a mutagenic mode of action have been demonstrated to confer an exceptional early life stage risk and the degree of impact is poorly characterized. In addition, EPA notes that the linear extrapolation method provides adequate public health conservatism, unadjusted for ADAFs, because of the extremely low risk levels addressed by this approach. Without specific data that early life stage exposure for a substance (at environmentally relevant levels) is having an impact on cancer risk, ADAF application is not likely to confer any public health benefit.

1.2 Impact of ADAFs

By weighting the slope factor for ages 0 to <2 yr by a factor of 10 and weighting the slope factor for ages 2 to <16 yr by a factor of 3, resultant ASILs decrease by approximately 40% compared to the unweighted adult algorithm. Again, this reduction in the standard would apply to all 'linear' carcinogens, characterized by a mutagenic mode of action, and result in lowering the ASIL for at least eight substances.

While the authors of the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens put forth some plausible hypotheses to suggest that early life stage exposure may increase risk of developing cancer, the data to support them are limited. This is noted in the EPA document:

> The relative rarity in the incidence of childhood cancers and a lack of animal testing guidelines with perinatal exposure impede a full assessment of children's cancer risks from exposure to chemicals in the environment. Unequivocal evidence of childhood cancer in humans occurring from chemical exposures is limited. (USEPA 2005, p 2)

Not only is the underlying data to support or quantify an increased risk of cancer associated with early life stage exposure limited, but at the exposure levels being regulated by the ASIL they are wholly absent. No studies provide direct evidence of any risk at such exposure levels, much less those that characterize differences between early life stage exposure risk and lifetime average exposure risk. It is at these exposure levels that the convention of linear extrapolation requires the disclaimer that the true value of the risk is unknown and may be as low as zero. The intent of the linear extrapolation method is to use an upper bound estimate of dose response (where actual data may exist from animal studies) drawn down to an extremely low acceptable risk (such as 1 in 1,000,000 where no actual data exist) such that the risk from exposure is undetectable, or possibly zero. Assuming that the mechanisms that produce susceptibility at much higher exposures in animals for early life stage cancer risk also exist at exposures orders of magnitude lower is a policy decision, not a science-based decision, as data at these low exposure levels do not exist to support such a decision. Applying additional adjustments to the cancer slope factor at these exposure levels has not been demonstrated to result in any public health benefit.

Again, the idea that early life stage exposure confers additional risk for the development of cancer remains a hypothesis. In the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens the authors offer two plausible mechanisms for any observations of increased risk from early life stage exposure (underlined for emphasis):

> While the induction of cancer by ionizing radiation and the induction of cancer by chemical mutagens are not identical processes, both involve direct damage to DNA as critical causal steps in the process. In both cases, the impacts of early exposure can be greater than the impacts of later exposures, <u>probably due to some combination of early-life stage susceptibility and the longer periods for observation of effects</u>. (USEPA 2005, p 24)

As noted in the EPA document, most animal studies to evaluate lifetime cancer risk begin after the animals reach sexual maturity, reducing total lifetime exposure to a suspected carcinogen by that amount of time. The authors of the EPA document offer this limited exposure time (i.e., less than a full lifetime due to lack of early stage exposure) as a potential source for an increase in cancer risk from early stage exposure. However, it is important to note that in the traditional risk assessment process for carcinogens, exposures are assumed to be persistent over a 70-year lifetime. This means that even though some exposure period is lost during typical lifetime testing in animals, that exposure is built back into the risk assessment model. Any further adjustment of the model because of this potential mechanism is redundant and not likely to confer additional public health benefit.

In addition, the traditional linear extrapolation method for conducting risk assessment for carcinogens uses an upper bound estimate of the potency of the carcinogen (e.g., the cancer slope factor). This upper bound estimate is purposefully conservative in order to ensure protection for susceptible populations. The result is that risk is always overestimated rather than underestimated with this method, and the degree of overestimation increases as the exposure level decreases. Because of the existing conservatism in the linear extrapolation method used to develop cancer slope factors, modest increases in assumed potency from ADAFs (at higher exposure levels in animal studies) are not likely to confer additional public health benefit at exposures related to the policy-dictated risk management levels of 1 in 100,000 and 1 in 1,000,000, which occur at orders of magnitude lower exposures.

It is also important to consider these proposed changes within the broader context of the conservative assumptions that already exist throughout the ASIL development process. Collectively, using multiple conservative assumptions results in an ASIL that may be far more protective than necessary to meet the risk management goal used to derive it. This phenomenon of greater conservatism embodied by the whole rather than the conservatism of each individual part is referred to as “compounded conservatism.” In the ASIL derivation process, compounded conservatism plays a role both in determination of individual factors of the derivation equations (i.e., in toxicity factors and explicit and implicit exposure elements) and in the equations’ use of multiple factors, most based on upper bound limits and/or conservative assumptions. Given both the inherent conservatism in the linear extrapolation model for evaluating the risk of carcinogens and the other conservative assumptions used in the ASIL process at large, it is unlikely that the use of ADAFs will confer any additional benefit to public health in the ASIL values.

USEPA. 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Washington DC Risk Assessment Forum. United States Environmental Protection Agency.
http://epa.gov/cancerguidelines/guidelinescarcinogensupplement.htm.

Commenter: Northwest Pulp and Paper Association, Christian McCabe - Comment O-2-1

Ecology prepared a white paper on age dependent adjustment factor (ADAF) in deriving ASILs and presented its content to the stakeholder group on February 21st. The National Council for Air and Stream Improvement (NCASI) prepared and submitted a comment letter dated March 20th addressing the ADAF topic and other matters. While Ecology has posted that letter on the rule-making docket, there is no indication the agency considered the NCASI submittal. This initial NWPPA comment is a request that Ecology respond to the NCASI critique of the agency decision to incorporate early-life adjust factors for the 31 mutagenic TAPs.

Those detailed comments will not be reiterated here, but can be characterized as follows:

- There is no science-based evidence of actual and additional benefit to public health associated with application of these ADAF's. The Environmental Protection Agency says as much. Adding the ADAF into the ASIL derivation imparts more conservatism into what is already acknowledged as a fully health protective protocol.
- The effect of the ADAF's will be to reduce the ASILs and de minimis values, and this means additional new source review projects will be captured into the WAC 173-460 permitting processes. In turn, this means more cost and time for permittees and jurisdictional agencies, without corresponding benefit to the regulatory objective of achieving a health protection target.

Response to Age dependent adjustment factor

In the 2005 Guidelines for Carcinogen Risk Assessment, EPA recognized that "childhood may be a susceptible period" in that "exposures during childhood generally are not equivalent to exposures at other times and may be treated differently from exposures occurring later in life …. In addition, adjustment of unit risk estimates may be warranted when used to estimate risks from childhood exposure …."[2] The Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens[3] describes age dependent adjustment factors as a way of addressing uncertainty related to an absence of toxicity data from exposures that occur during early-life. EPA recommends using these factors because risk estimates based on exposures occurring at various life stages may not consider the potential for higher cancer risks from early-life exposures. EPA developed

[2] https://www.epa.gov/risk/guidelines-carcinogen-risk-assessment page 1-18.
[3] https://www.epa.gov/risk/supplemental-guidance-assessing-susceptibility-early-life-exposure-carcinogens

procedures for adjusting cancer potency estimates only for those carcinogens that act through a mutagenic mode of action.

One of the goals of this rule is to prevent new sources of air pollution from emitting toxic air pollutants at a rate that may pose an unacceptable risk to individuals and communities.

We set the acceptable source impact level (ASIL) at an increased cancer risk rate of 1 in one million based on continuous lifetime exposure beginning at birth to 70 years. While we understand that the assumptions and the methods for quantifying inhalation unit risk factors (e.g., linear low-dose extrapolation upper-bound estimate) generally provide public health protection, it is important to consider children's susceptibility to exposure to carcinogens. In this manner, we follow EPAs guidelines to use age dependent factors to account for children's susceptibility from exposure to pollutants that act through a mutagenic mode of action.

We relied on EPA guidelines for determining which chemicals are considered to act through a mutagenic mode of action (Integrated Risk Information System (IRIS), Regional Screening Levels (RSLs) – User's Guide, and Supplemental Guidance for Assessing Susceptibility from Early-life Exposure to Carcinogens). We adjusted the ASIL value for 30 TAPs based on EPA's early-life adjustment factor: [4]

- 1.66 to account for increased susceptibility among infants and children exposed to mutagenic chemicals.
- 1.22 for trichloroethylene because the mutagenic mode of action applies to kidney tumors, but not for other cancers included in the derivation of the unit risk factor.

In addition, it should be noted that several polycyclic aromatic hydrocarbon (PAH) compounds for which we applied the age dependent adjustment factor were not listed in the Decision Document. These PAHs are included on the toxic air pollutant list based on inhalation unit risk values reported by California Office of Environmental Health Hazard Assessment. Because these chemicals are assumed to cause toxicity in a similar manner as benzo(a)pyrene for which EPA determined acts through a mutagenic mode of action, we also applied the 1.66 adjustment factor in deriving ASILs for the 18 chemicals in Table 1 below.

Table 1: Additional PAH adjusted by age dependent adjustment factors

Common Name	CAS #
1. 2-Acetylaminofluorene	53-96-3
2. 2-Aminoanthraquinone	117-79-3
3. Benzo[j]fluoranthene	205-82-3
4. Dibenz[a,h]acridine	226-36-8

[4] "Decision-Making Documentation," May 2019, pages 9-10. https://ecology.wa.gov/Asset-Collections/Doc-Assets/Rulemaking/AQ/WAC173-460_-18-07/Decision-making-document-(WAC-173-460)-05-19. The ASIL for trichloropropane was not adjusted by an early-life adjustment factor because there is no unit risk value for quantifying increased cancer risk from inhalation exposure to this chemical. See response to Comment O-2-2.

Common Name	CAS #
5. Dibenz[a,j]acridine	224-42-0
6. Dibenzo[a,e]pyrene	192-65-4
7. Dibenzo[a,h]pyrene	189-64-0
8. Dibenzo[a,i]pyrene	189-55-9
9. Dibenzo[a,l]pyrene	191-30-0
10. 7H-Dibenzo[c,g]carbazole	194-59-2
11. 1,6-Dinitropyrene	42397-64-8
12. 1,8-Dinitropyrene	42397-65-9
13. 5-Nitroacenaphthene	602-87-9
14. 6-Nitrochrysene	7496-02-8
15. 2-Nitrofluorene	607-57-8
16. 1-Nitropyrene	5522-43-0
17. 4-Nitropyrene	57835-92-4
18. 5-Methylchrysene	3697-24-3

It remains to be seen if application of ADAF will lead to greater numbers of Second Tier Review permit activities. It might not but if it does, the number will be relative to the small number required under the current version. In any case, application of ADAF is justified by the need to reduce health cost burden among TAP-exposed populations, which is consistent with the purpose of Chapter 173-460 WAC and the Washington Clean Air Act.

It would be impossible to measure the health benefits of incorporating these age-dependent adjustment factors into the ASILs mostly because it is not possible to measure health outcomes at the very low risk levels considered acceptable in this rule (i.e., 1 in one million increased cancer risk). While we can't measure the actual health benefits of this approach, it is appropriate to follow EPA's guidelines to derive ASILs that represent acceptable levels of risk for everyone.

Comments on Expand data sources

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-1

SWCAA appreciates Ecology updating the science behind many of the pollutants listed in the proposed rule. While this is a good task, there are many toxic chemicals that are not on the list. SWCAA understands the need to have high quality data in which to evaluate public risk from pollutants, to ignore hundreds of pollutants that have not yet been evaluated by one of the three "acceptable" agency is not in the best interest of the public. Many other states and countries have identified methodologies for determining health impacts to the public without being identified on one of the three agencies lists. One must recognize that there is limited funding for the identified three agencies and as such one could not hope that all the cancer-causing pollutants or unhealthy pollutants could be evaluated by these groups in a timely fashion as well as keep the toxicity values for those on the list up to date.

Response to Expand data sources

During the previous rulemaking in 2009, Ecology derived our ASILs from three reputable sources:

- EPA's Integrated Risk Information System (IRIS)
- California Office of Environmental Health Hazard Assessment's (OEHHA) reference exposure levels and cancer potency factors
- The Agency for Toxic Substances and Disease Registry's (ATSDR) minimal risk levels.

Typically, these agencies involve panels of scientists with expertise on specific chemicals to perform a comprehensive review of the literature and set values based on the weight of existing scientific evidence and degree of consensus within the scientific community. These agencies also provide documentation of the rationale behind the toxicity values they derive. These agencies continue to represent the best scientific authorities.

The Oregon Department of Environmental Quality completed a comprehensive two-year effort in November 2018 to develop its own state health-based air toxics regulatory program. Oregon noted, "While other authoritative agencies exist, [we] … have concluded that EPA, ATSDR, and California OEHHA meet high standards for scientific credibility. These authoritative sources were also selected because the [toxicity reference values] TRVs they develop are intended to protect sensitive populations, including children."[5]

One of the goals of the current rule revision was to update the ASILs based on the most recent inhalation toxicity values available from these three agencies. We expanded the list of authoritative sources to include Ecology for developing the toxicity value for diethyl mercury and dimethyl mercury.[6] While we did not consider alternative sources of toxicity values for this rulemaking, we are willing to consider and discuss other sources of toxicity values during the course of a future rulemaking to explore the need for other requirements related to toxic air pollutants.

We did not change the rule in response to this comment.

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[5] Oregon Department of Environmental Quality Agency Staff Report, Action Item G. Nov. 15-16, 2018. https://www.oregon.gov/deq/EQCdocs/11152018_ItemG_CAOReport.pdf. Toxicity Reference Values Selection pages 6-7.

[6] Ecology's October 10, 2018, Kadlec Presentation "A Dimethyl Mercury Inhalation Risk Screening Concentration." Kadlec, Matt. A Dimethyl Mercury Inhalation Risk Screening Concentration for Public Health Protection. Poster presented at International Society of Exposure Science Conference, 2012 Oct. 28 – Nov. 1; Seattle, WA. Both available at https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC173-460.

Comments on Expand the scope of the rule

Commenter: Jesse Hoffmann - Comment I-2-1

I would like the following considered in the new rule-making:

1. Consider combined effects of pollutants on health where there may be synergistic detrimental effects as more substances and therefore more variables are introduced.
2. Measure which toxins are currently being emitted but not monitored that present hazards to human health and include these in the inventory to monitor in the future.
3. Account for quality-of-life impact and symptomatic results of acute emissions exposure.

Response to Expand the scope of the rule

This proposal is outside the scope of the current rulemaking process. However, we are willing to consider and discuss your suggestions under the exploratory rulemaking process. In August 2018, we announced our intent to update the air toxics rule in stages. This rulemaking action is the first phase of that effort. Once we complete this action, we will begin to look at other updates to the rule and prioritize the changes we may want to make. Refer to the exploratory rulemaking website for more information on this effort (https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC-173-460-Exploratory-rulemaking). You can also join our air toxics email list to stay informed about this effort.

Comments on General comment

Commenter: Northwest Pulp and Paper Association, Christian McCabe - Comment O-2-5

The Department of Ecology can be complimented on conducting a thorough public involvement/advisory committee process and with the preparation of topic-specific white papers, Preliminary Regulatory Analysis, Decision-Making Documentation, etc.

Response to General comment

Thank you for your comment.

Comments on Include hazardous air pollutants

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-3

As a minimum, all of the hazardous air pollutants (HAPs) listed in Title III of the Federal Clean Air Act (except those specifically delisted) should be on the list of pollutants regulated under WAC 173-460. To not have them listed means that a significant number of Hazardous Air

Pollutants - specifically identified by Congress, are not otherwise regulated under the New Source Review provisions of WAC 173-460-040. This ignores sound science that serves as the basis for these pollutants being identified by Congress as representing a risk to the public. This unnecessarily complicates and underestimates the health risk to the public when reviewing a new source or modified source under WAC 173-460-040.

Response to Include hazardous air pollutants

Title III of the Clean Air Act established a list of 187 hazardous air pollutants (originally 189). The Act establishes an air quality permitting structure that relies on emission control equipment to reduce emissions from categories of businesses that emit hazardous air pollutants rather than on an evaluation of the public health impact from a specific pollutant.

Your proposal to regulate the 40 hazardous air pollutants without an inhalation toxicity value as toxic air pollutants is outside the scope of the current rule making process. The state rule relies on an inhalation toxicity value to quantify the human health risk or other serious health effects for each toxic air pollutant. Without a toxicity value, the rule would not establish the acceptable source impact level (ASIL) for these pollutants. Without an ASIL, the rule would not include a small quantity emission rate, nor a de minimis emission value.

Your suggestion presents a concept that is substantially different from the proposed rule. Revising the rule to subject a subset of pollutants to best available control technology for toxics (t-BACT) in WAC 173-460-040 without being subject to the other review requirements in this rule would alter the fundamental design of the rule.

We will have another opportunity to discuss this issue as part of the exploratory rule process. In August 2018, we announced our intent to update the air toxics rule in stages. This rulemaking action is the first phase of that effort. Once we complete this action, we will begin to look at other updates to the rule and prioritize the changes we may want to make. Refer to the exploratory rulemaking website for more information on this effort (https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC-173-460-Exploratory-rulemaking). You can also join our air toxics email list to stay informed about this effort.

We did not change the rule in response to this comment.

Comments on Review least burdensome analysis

Commenter: Northwest Pulp and Paper Association, Christian McCabe - Comment O-2-4

In its rule development efforts, Ecology has the responsibility to examine alternative versions of a proposed regulation and select the option which is "least burdensome for those required to

comply with it and that will achieve the general goals and specific objectives... (of the statute the rule implements)" RCW 34.05.328. There are at least two examples where the agency ignored or conducted a perfunctory analysis that with a more thorough evaluation would have led to a less burdensome rule while meeting the goals/objectives of RCW 70.94. This omission needs to be addressed.

Age Dependent Adjustment Factor – Ecology's discretionary decision to add this factor into ASIL derivations will trigger an increase in the number of new source review projects subject to WAC 173-460 permitting activities. This means incremental cost and application processing time for both the permittee and jurisdictional agency. The NCASI comment letter points to a lack of tangible/measurable health benefit associated with ADAF. Removing the ADAF would result in a less burdensome regulation without negatively impacting chemical exposures and adverse health outcomes.

Establishing de minimis values – A Small Quantity Emission Rate is recognized as a conservative threshold value, derived from the best science information available, that assumes the acceptable fence line concentration of the TAP will not be exceeded; i.e., the ASIL. Ecology concedes that achievement of the SQER means dispersion modeling to prove ASIL attainment is not required. If the SQER for a TAP is demonstrated, the applicant will assert that tBACT is provided. In its Least Burdensome analysis, the agency choses to retain the derivation of de minimis values at 1/20 of the SQER. The agency analysis on this matter concludes that 1) setting de minimis equal to the SQER or 2) establishing the de minimis values at 1/10 of the SQER would not meet the goals and objective of the statute; i.e., be protective of human health and the environment. But if demonstrating achievement of the conservative SQER provides sufficient evidence of protection, why would setting a de minimis value at 1/10 of the SQER, or even the SQER, not be sufficiently acceptable? De minimis at SQER or 1/10 SQER would trigger fewer projects into WAC 173-460 permitting and is thus clearly less burdensome. Ecology should reconsider its perfunctory analysis which retained the 1/20 factor.

Response to Review least burdensome analysis

Refer to Response to Age Dependent Adjustment Factor for the response on this point.

The development of the updated de minimis emission values involved consideration and balancing of several goals and objectives:

- Protection of human health and the environment.
- Prevent emissions from many small sources.
- Keep the table simple and straightforward.
- Provide consistency by standardizing actions between the two air permitting rules.

The purpose of Washington Clean Air Act, Chapter 70.94 RCW, is to establish the systematic control of new or modified sources emitting toxic air pollutants (TAPs) to

prevent air pollution, reduce emissions to the extent reasonably possible, and maintain such levels of air quality as will protect human health and safety.

A notice of construction application must include a determination that the source will achieve best available control technology. No person is required to submit a notice of construction or receive approval for a new source that Ecology deemed to have de minimis impact on air quality. The Act directs Ecology to identify de minimis new sources by category, size, or emission thresholds. De minimis means "trivial levels of emissions that do not pose a threat to human health or the environment."

De minimis equal to SQER

The current rule subjects a project with emissions of any toxic air pollutants equal to or greater than the de minimis emission threshold in WAC 173-460-150 to air toxics permitting requirements.

Emissions less than the de minimis emission threshold require no regulatory review, nor does tBACT apply. Raising the de minimis emission value to equal the higher SQER does not protect human health and the environment because SQER values are not trivial levels of emissions.

The SQERs are a screening tool to simplify permitting. New sources with emissions at or below the SQER satisfy the acceptable source impact analysis requirement of WAC 173-460-070. The purpose of the SQER is to establish a conservative emission level to minimize dispersion modeling requirements for those new sources emitting small quantities.

The rule compares controlled emissions after applying tBACT to the SQER. As discussed during stakeholder meetings, some new sources with emissions lower than the SQER could potentially have ambient impacts in excess of an ASIL. For this reason, many permitting agency staff in the stakeholder group felt it was important to have a de minimis emission value lower than the SQER so that they could consider tBACT. tBACT in these cases would serve to reduce the chances that emissions at or below the SQER could potentially cause a theoretical exceedance of an ASIL.

Establishing the small quantity emission rate as the de minimis emission value would remove most contributors to emissions of toxic air pollution from the permitting arena. Eliminating these projects from any permit review, especially from tBACT analysis, does not protect human health and the environment. We considered this alternative during rulemaking and concluded that it does not meet the goals and objectives of the Washington Clean Air Act.

De minimis equal to 1/10 SQER

We added de minimis emission values in 2009 as part of a rulemaking action that integrated the air toxics rule into the overall procedures of permitting air emissions (new source review) in Chapter 173-400 WAC.

We established the de minimis emission values as five percent of the SQER to maintain consistency between these two rules. The general air quality rules in Chapter 173-400 WAC establish de minimis emission values for criteria pollutants equal to five percent of the Prevention of Significant Deterioration significance levels.

The current value represents a protective approach for defining de minimis in the context of permitting. Doubling the threshold could potentially result in fewer projects being subject to permitting and the associated requirement to comply with the control technology to reduce emissions (tBACT). Emissions by multiple small sources can combine concentrations high enough to pose risks to human health and the environment. The Legislature also recognizes this in RCW 70.94.011.

Therefore, we did not evaluate qualitative or quantitative compliance burden of both alternatives in the Regulatory Analyses because the alternatives do not meet the goals and objectives of the Washington Clean Air Act.

Comments on Confusing names

Cresols

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-5

Cresols (mixture), including m-cresol, o-cresol, p-cresol is on the list with CAS No 1319-77-3. The three isomers each have their own CAS No. Should a person interpret that a single isomer is not toxic but only a mixture of the three is toxic and on the list? All three isomers should be listed separately with their own CAS number.

Xylene

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-12

The last pollutant listed in the table is "Xylene (mixture), including m-xylene, o-xylene, p-xylene" however the CAS No is 1330-20-7. The individual monomers are also listed with their individual CAS Nos but it is recommended that the naming convention be changed to reflect xylene, m-, xylene, o-, and xylene, p- so these monomers sort next to the mixed isomer listing.

Response to Confusing names

We agree that the proposed method to list the pollutants in the table is confusing so the table will list chemicals alphabetically based on their root name rather than by the positional prefix letter or number at the beginning of a chemical. Under this system, similar chemical names will appear near each other as shown in Table 2 below.

The proposed rule included the three cresol isomers under 2-Methylphenol (o-cresol), 3-Methylphenol (m-cresol), and 4-Methylphenol (p-cresol) each with its own CAS number. We renamed these three chemicals by cresol name followed by the synonym in parentheses.

Table 2: New table structure in WAC 173-460-150

Common Name	CAS #	Averaging Period	ASIL (µg/m^3)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Cresols (mixture), including m-cresol, o-cresol, p-cresol	1319-77-3	24-hr	6.0E+02	4.4E+01	2.2E+00
m-Cresol (3-methylphenol)	108-39-4	24-hr	6.0E+02	4.4E+01	2.2E+00
o-Cresol (2-methylphenol)	95-48-7	24-hr	6.0E+02	4.4E+01	2.2E+00
p-Cresol (4-methylphenol)	106-44-5	24-hr	6.0E+02	4.4E+01	2.2E+00
Xylene (mixture), including m-xylene, o-xylene, p-xylene	1330-20-7	24-hr	2.2E+02	1.6E+01	8.2E-01
m-Xylene	108-38-3	24-hr	2.2E+02	1.6E+01	8.2E-01
o-Xylene	95-47-6	24-hr	2.2E+02	1.6E+01	8.2E-01
p-Xylene	106-42-3	24-hr	2.2E+02	1.6E+01	8.2E-01

Comments on specific toxic air pollutants

Asbestos

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-4

Asbestos by name is listed in the table of pollutants with CAS No 1332-21-4. Asbestos is defined in 40 CFR 61 Subpart M as follows: "Asbestos means the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite." Only these specific zeolites are regulated as asbestos. If I was to do a search for tremolite asbestos I would find CAS No 14567-73-8 - not necessarily CAS No 1332-21-4. This may lead a person to determine that tremolite is not on the toxic pollutant list. This should be clarified for each of the zeolites identified as asbestos and listed separately with their specific CAS number.

Erionite is a zeolite commonly thought of as asbestos-like but is not listed in the rule. Erionite is known to be a human carcinogen and is listed by the International Agency for Research on Cancer as a Group 1 Carcinogen. It exists in rock deposits in Oregon and North Dakota among other places in the US. Health Departments in those States have severely restricted mining activities in areas where erionite exists. If found in Washington it could not be regulated under WAC 173-460 because it is not on the list.

Response to Asbestos

Asbestos is the broad name for a group of naturally occurring silicate minerals that crystallize in long thin fibers. There are two main classes of asbestos: serpentine and amphibole.

The only member of the serpentine class is chrysotile. Historically, industry used this form of asbestos most commonly in various fabricated asbestos-containing materials (insulation, brake linings, floor tiles, etc.). There are many different types of amphibole asbestos. The most common types used in commercial products include:

- Actinolite,
- Amosite (occasionally referred to as cummingtonite-grunerite asbestos),
- Anthophyllite.
- Crocidolite, and
- Tremolite,

These forms of asbestos are now regulated.

We agree that we should name specific asbestos types on the list in addition to the general asbestos listing. Therefore, we added these asbestos types and CAS numbers to the list of toxic air pollutants as shown in Table 3 below. The ASIL, SQER, and de minimis emission values are identical to those of the general listing for "Asbestos (fibers/cubic centimeter)."

Table 3: Asbestos toxic air pollutants

Common Name	CAS #	Averaging Period	ASIL (µg/m^3)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Asbestos (fibers/cubic centimeter)	1332-21-4	year	4.3E-06	7.1E-04	3.5E-05
Actinolite asbestos (fibers/cubic centimeter)	12172-67-7	year	4.3E-06	7.1E-04	3.5E-05
Amosite asbestos (fibers/cubic centimeter)	12172-73-5	year	4.3E-06	7.1E-04	3.5E-05
Anthophylite asbestos (fibers/cubic centimeter)	17068-78-9	year	4.3E-06	7.1E-04	3.5E-05
Chrysotile asbestos (fibers/cubic centimeter)	12001-29-5	year	4.3E-06	7.1E-04	3.5E-05
Crocidolite asbestos (fibers/cubic centimeter)	12001-28-4	year	4.3E-06	7.1E-04	3.5E-05
Tremolite asbestos (fibers/cubic centimeter)	14567-73-8	year	4.3E-06	7.1E-04	3.5E-05

Numerous other amphiboles exist, even though commercial products never used them and current federal regulations do not name them.

In 2014, EPA published a toxicological review of Libby amphibole asbestos. In this assessment, they identified various forms of amphibole fibers present in Libby amphibole asbestos that caused adverse effects. Based on this assessment, EPA developed a new unit risk factor and reference concentration for Libby amphibole asbestos. Based on the unit risk factor, we included a new toxic air pollutant specific to Libby amphibole asbestos. See response to comment A-2-6 for more details.

While we share concerns regarding the toxicity of erionite fibers, quantitative toxicity values for erionite fibers do not currently exist. Therefore, Ecology did not include it on the list of toxic air pollutants in the rule. We are willing to consider and discuss ways to address or regulate erionite as a toxic air pollutant during the course of a future rulemaking.

Cobalt

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-14

Cobalt is on the list with CAS No 7440-48-4. This is similar to Comment A-2-8 but in this case cobalt compounds or NOS, are not identified. Is this an oversight? Is there a reason that cobalt would or should be listed by itself as just elemental (without saying elemental)? Previously it was listed as (metal dust or fume).

Response to Cobalt

The 2009 rulemaking changed "cobalt-metal dust or fume" (based on the ACGIH TLV) to "cobalt" based on the minimal risk level (MRL) for cobalt provided by the Agency for Toxic Substances and Disease Registry. A study of respiratory effects in diamond polishers exposed to cobalt particles in the air provided the basis for the MRL for cobalt. The form of cobalt exposure in this study was likely metallic cobalt particles.

The available studies are not adequate to derive separate toxicity values for different cobalt compounds. Therefore, we assume that all forms of cobalt compounds are equally toxic based on the mass of cobalt in a cobalt compound. We selected this approach to be protective of public health.

We renamed the listing for this pollutant as "Cobalt and compounds, NOS."

Dimethyl mercury

Commenter: Matt Kadlec - Comment I-1-1

Methylmercury [CH_3Hg] is not synonymous with Dimethyl mercury [$(CH_3)_2Hg$] but you have it listed as "Methyl mercury (Dimethyl mercury)" with the CAS for dimethyl mercury 593-74-8.

The CAS for Methylmercury (synonym mono-methylmercury ion) is 22967-92-6. It can be emitted into air as different compounds. These forms are about as toxic as dimethyl mercury so it's wise that you listed it, but it should be as "Organomercury Compounds, NOS. CAS ----" in keeping, for example, with the way you listed "Lead & Compounds, NOS." The ASIL, SQER and De minimis for Organomercury Compounds, NOS. should be the same as those for dimethyl mercury.

Response to Dimethyl mercury

We mistakenly changed the name of this toxic air pollutant from "dimethyl mercury" to "methyl mercury (dimethyl mercury)" when we proposed the rule.

Our rulemaking intent was to propose a new ASIL value for dimethyl mercury based on our review of the associated scientific information. We did not intend to change the chemical name nor its CAS number from the current rule. We will retain the name "dimethyl mercury" as it currently exists.

Fluorides

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-7

The pollutant list contains "Fluorides (flouride containing chemicals), NOS." It is unclear what is meant by fluoride containing chemicals - is it meant to say fluorine containing chemicals? If what is meant is truly fluorides then more explanation is necessary. If it means fluorine, I suspect you do not intend to capture all the PFCs, CFCs or HCFCs. Any listing without a CAS No has great potential to cause confusion.

Response to Fluorides

As fluoride is the negative ion of fluorine, the toxic air pollutants list is referring to ionic compounds of fluoride, such as potassium fluoride, sodium fluoride, and calcium fluoride.

The toxic air pollutant listing for fluorides does not cover all non-ionic (covalent) compounds that contain fluorine (e.g., per- and polyfluoroalkyl substances), only those compounds that contain fluoride.

We did not change the rule as a result of this comment.

Libby amphibole asbestos

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-6

Libby amphibole asbestos is identified on the proposed list without a CAS No. Is this different than the listing for asbestos CAS No 1332-21-4 - I assume so, and where does it fit in the federal

definition of asbestos as described in Comment A-2-4? On EPA's webpage https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Cleanup&id=0801744 Libby asbestos is referred to as tremolite-actinolite series asbestos, is often called Libby Amphibole asbestos (LA). It seems to fit the definition of asbestos under CAS No 1332-21-4 under Comment A-2-4. Should it be listed separately?

Response to Libby amphibole asbestos

Libby amphibole asbestos does not have an applicable CAS number.

Libby amphibole asbestos does not fit the federal definition of asbestos, but it is a "mixture of amphibole fibers identified in the Rainy Creek complex and present in ore from the vermiculite mine near Libby, Montana."* Libby amphibole asbestos includes fibers with a range of mineral compositions, including amphibole fibers primarily identified as winchite, richterite, and tremolite, along with magnesio-riebeckite, magnesio-arfvedsonite, and edenite.

The listing of Libby amphibole asbestos as a toxic air pollutant is based on EPA's 2014 toxicological review, which established a reference concentration and unit risk factor (URF) for this mixture of amphibole fibers. The unit risk factors for "Libby amphibole asbestos" and "asbestos" are similar (0.17 per f/cc vs 0.23 per f/cc respectively). Because EPA's toxicological review of Libby amphibole asbestos highlights concerns about a variety of amphiboles, we changed the chemical name in the table from "Libby amphibole asbestos" to "Libby amphibole asbestos, and amphiboles, NOS."

We did not change the rule in response to this comment.

* U.S. EPA. IRIS Toxicological Review of Libby Amphibole Asbestos (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/635/R-11/002F, 2014.

Mercury averaging period

Commenter: NCASI, Giffe Johnson - Comment O-1-2

There appears to be a technical error in the proposed ASIL value or averaging period for mercury. It appears that WAC proposes to adjust the mercury ASIL to 0.03 µg/m3, equal to the value selected by the California Office of Environmental Health Hazard Assessment (OEHHA) for chronic inhalation risk. However, WAC does not propose to adjust the averaging period for the mercury ASIL. This presents a mismatch between a concentration representing a chronic (i.e., yearly) exposure and an averaging period more closely related to an acute exposure (i.e., 24 hour). If WAC is to use the OEHHA values for mercury exposure, it would be more correct to either use the OEHHA acute value of 0.6 µg/m3 or to adjust the averaging time to yearly.

Commenter: Northwest Pulp and Paper Association, Christian McCabe - Comment O-2-3

The NCASI letter identifies that the proposed ASIL of 0.030 µg/m3 for Mercury, elemental should appropriately be matched with a yearly averaging period (not the 24-hour period shown in the proposed rule). Please review this discrepancy and resolve the difference.

Response to Mercury averaging period

Consistent with the ASIL derivation method used in the 2009 revision of the rule, we are adopting an ASIL for total inorganic mercury derived by applying a 24-hour time-weighted average to the corresponding OEHHA chronic Reference Exposure Level concentration. This compromise allows issuance of a single ASIL that limits both chronic and acute toxicity risk potentials.

We did not change the rule in response to this comment.

Mercury, elemental

Commenter: NCASI, Giffe Johnson - Comment O-1-3

Clarity will be needed for implementation of the mercury ASIL. There is an implementation issue with the mercury ASIL. The draft of Table 150 lists "Mercury, CAS # 7439-97-6"; this is the CAS # for elemental mercury (i.e., not oxidized or organic bound). Previous versions of Table 150 have this entry listed as "Mercury, Elemental." The focus on elemental mercury as a key risk driver is reasonable, and care should be taken that oxidized forms of mercury are not subjected to an ASIL developed for elemental mercury. This could be addressed by changing the draft of Table 150 to read "Mercury, Elemental" or through implementation guidance.

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-8

The proposed list contains "Mercury, elemental" as a pollutant. This appears to be the only metal listed this way. Several other metals like copper, nickel, lead, manganese, selenium, chromium, etc., should be listed separately as an elemental component and then separately, as nickel compounds, NOS, as an example. They all should be consistent unless there is a good reason not to be.

Response to Mercury, elemental

The table lists "Mercury, elemental, CAS # 7439-97-6." We intend for the ASIL to encompass total inorganic mercury.

Total inorganic mercury emissions from sources subject to our rule may exist in different forms. i.e., as gaseous elemental and gaseous oxidized mercury (GEM and GOM). Even though the speciation of the forms emitted is likely to vary among source types and

between facilities, emissions are likely to be mostly GEM. Implementation of the rule will require summing the amounts of mercury in the various inorganic forms a source emits to determine the total inorganic mercury emission.

We did not change the rule in response to this comment.

Nickel carbonate hydroxide

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-10

It appears that the CAS No for nickel carbonate hydroxide is incorrect. The correct CAS No is 12607-70-4. The listed CAS No 1346-39-3 is not a valid CAS number.

Response to Nickel carbonate hydroxide

We agree that the CAS number for nickel carbonate hydroxide should be 12607-70-4 so we made that correction.

Nickel oxide black

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-11

Nickel oxide black is listed without a CAS No. An appropriate CAS No may be 12137-09-6.

Response to Nickel oxide black

Nickel oxide black is synonymous with nickel sesquioxide or nickel(III) oxide. The U.S. National Library of Medicine's ChemIDplus database reports a CAS Number of 1314-06-3 so we used this number.

Trichloropropane

Commenter: Northwest Pulp & Paper Association, Christian McCabe - Comment O-2-2

Table 9 of the Decision-Making Documentation identifies 1,2,3-Trichloropropane as being adjusted by an early-life adjustment factor. The proposed ASIL is based on a 24-hour exposure evaluation. Page 7 of the Decision-Making Documentation identifies the appropriateness of the ADAF only for ASIL's with an annual averaging time. Please review this apparent discrepancy and resolve the difference.

Response to Trichloropropane

You are correct that Table 9 of the Decision Making Document identifies 1,2,3-Trichloropropane as having an ASIL value that includes an early-life adjustment factor. This chemical was included on Table 9 of the Decision-Making Documentation in error. While EPA's Regional Screening Level User's Guide identifies this chemical as a mutagen, there is no unit risk value for quantifying increased cancer risk from inhalation exposure to 1,2,3-trichloroprapane. Therefore, the ASIL does not reflect the use of an early-life adjustment factor.

We did not change the rule as a result of this comment.

Remove banned/restricted pollutants

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-13

There are several pollutants (compounds) on the list that are now banned or severely restricted for use in the US. These include several insecticides and pesticides. Why are these on the list? These pollutants/compounds are not allowed in the US by federal rule. It would be better if these items would be separated into their own list in the rule as being prohibited rather than developing or displaying ASILs or SQERs, because they should not be present in our environment. Remember the rule is generally used for permitting purposes, there is no way an agency should be permitting a pollutant that has been federally listed and banned unless it is for a cleanup. This is another example that the basis for listing an item be predicated on the pollutant being listed on one of the three agency's lists. This is a faulty place to build your whole concept of what should be on the state-wide list. It would suggest that these items could be manufactured and/or emitted as part of an NSR activity.

Response to Remove banned/restricted pollutants

Although existing federal laws ban some toxic air pollutants from use or manufacture in the U.S., there are some instances where new or modified sources of air pollution may emit these pollutants into the air. For example, a cleanup of a contaminated site that contains banned chemicals may involve remedies involving the extraction of these pollutants from the soil or groundwater into air.

Another example is that solid waste incinerators may inadvertently produce PCBs or other banned chemicals during the combustion process. While these situations are not common, the rule provides a safeguard by which a permitting agency could include conditions in the permit to limit or prevent the release of these chemicals.

We did not change the rule as a result of this comment.

Remove criteria air pollutants

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-2

Remove the criteria air pollutants from the list that have established National Ambient Air Quality Standards (NAAQS) and State Ambient Air Quality Standards (SAAQS). By having these pollutants listed in separate rules with separate values is confusing at best. If the SAAQS is not sufficient to protect the public, then the SAAQS should be updated. Having these criteria air pollutants on the list just because they exist on one of the three agency lists is a "flag" that maybe the criteria for listing in this rule is not robust and discerning or that the SAAQS should be updated.

Response to Remove criteria air pollutants

We have regulated five criteria air pollutants - carbon monoxide, lead, nitrogen dioxide, ozone, and sulfur dioxide - as toxic air pollutants since 2009 because they met the listing criteria.

During the rule development process, we evaluated whether to retain these pollutants. We reviewed:

- Whether the pollutants continue to meet the listing criteria.
- Current status as a national ambient air quality standard (NAAQS).
- NAAQS status compared to the toxic air pollutant levels.

We decided to retain these chemicals as toxic air pollutants because they meet the listing criteria and including them provides additional consideration of potential public health impacts that NAAQS compliance alone does not provide.

The de minimis emission values for the criteria pollutants reflect an emission rate in pounds per averaging period based on the levels in WAC 173-400-110(5). Except for lead, the table in WAC 173-460-160 establishes values based on pounds per hour compared to tons per year in the general air quality rule. Providing a shorter averaging period considers the potential for acute health effects from potential short-term spikes of these emissions.

We agree that it would be clearer if the toxic de minimis emission values for criteria pollutants were included in the table in WAC 173-400-110(5). Unfortunately, revising another rule is outside the scope of the current rulemaking process. To ensure this comment is evaluated as part of a future revision, we have added it to our rule-tracking database.

We did not change the rule in response to this comment.

Spelling mistakes

Commenter: Olympic Region Clean Air Agency, Robert Moody - Comment A-1-1; Southwest Clean Air Agency, Paul Mairose - Comment A-2-15

Libby “amphipole” asbestos should be Libby "amphibole" asbestos.

Commenter: Paul Mairose - Comment A-2-16

The second fluoride in "Fluorides (flouride containing chemicals), NOS" is misspelled.

Response to Spelling mistakes

Thank-you for your comments. We corrected these spelling errors.

Table formatting

Commenter: Southwest Clean Air Agency, Paul Mairose - Comment A-2-9

Many of the pollutant names in the list have a period after the name. Is this intentional or is this an oversight?

Response to Table formatting

After reviewing the list of pollutants, we did not find any names followed by a period in the proposed rule language (OTS-1329.5).

Appendix A: Decision-Making Documentation

DEPARTMENT OF ECOLOGY
State of Washington

Decision-Making Documentation

Updating Chapter 173-460 WAC Controls for New Sources of TAPs

Final November 2019

Publication and Contact Information

This document is available for two years on the Department of Ecology's website at: https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC173-460

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Decision-Making Document

Updating Chapter 173-460 WAC Controls for New Sources of TAPs

Air Quality Program

Washington State Department of Ecology

Olympia, Washington

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Table of Contents

Tables

Acronyms

AERSCREEN	U.S. Environmental Protection Agency Air Quality Screening Model
ASIL	Acceptable Source Impact Level
ATSDR	Agency for Toxic Substances and Disease Registry
CO	Carbon Monoxide
EPA	U.S. Environmental Protection Agency
OEHHA	California Office of Environmental Health Hazard Assessment
IRIS	Integrated Risk Information System
MRL	Minimal Risk Level
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen Dioxide
OEHHA	California Office of Environmental Health Hazard Assessment
O_3	Ozone
Pb	Lead
PBDE	Polybrominated Diphenyl Ethers
PPB	Parts per Billion
REL	Reference Exposure Level
RfC	Reference Concentration
SO_2	Sulfur Dioxide
SQER	Small Quantity Emissions Rate
TAP	TAP
$\mu g/m^3$	Micrograms per Meter Cubed
URF	Unit Risk Factor

Decision-Making Documentation

The purpose of this rulemaking is to update the list of TAPs (TAPs) in Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollution Sources, to reflect the latest, best available health effects information. This rule includes air quality permitting requirements for businesses that emit TAPs.

What we said we would do

In our July 18, 2018 rulemaking announcement, we said we would:

- Update the list of TAPs.
- Recalculate:
  - Acceptable source impact levels (ASILs).
  - Small quantity emission rates (SQERs).
  - De minimis emission values.
- Update the rule to support the changes described above.

Specifically, we said we intended to update the list of TAPs to:

- Add or subtract chemicals based on updated toxicity information available from the U.S. Environmental Protection Agency (EPA), California Office of Environmental Health Hazard Assessment (OEHHA), and Agency for Toxic Substances and Disease Registry (ATSDR). We based our list of TAPs on the inhalation toxicity values established by these three agencies.
- Review ammonium sulfate as a TAP and its associated toxicity value. This is in response to a request from the Far West Agribusiness Association to remove ammonium sulfate from the list of TAPs.
- Evaluate whether the rule should continue to list criteria pollutants as TAPs.
- Evaluate whether to establish additional acceptable source impact levels for specific groups of chemicals with established toxic equivalency factors. This approach would consider mixtures of similar chemicals (i.e., dioxin-like compounds and carcinogenic polycyclic aromatic hydrocarbons) to be a single TAP based on toxic equivalency.
- Revise the small quantity emission rates and de minimis values based on updates to the acceptable source impact levels and the use of the latest version of EPA's AERSCREEN air quality dispersion model.

- Evaluate the use of early life adjustment factors when deriving acceptable source impact levels for chemicals that are considered to cause cancer through a mutagenic mode of action. These chemicals may pose a greater risk to infants and children than is reflected in their toxicity value.

What we did

During the rule development process, we held seven stakeholder meetings from August 2018 through March 2019. During those meetings, we discussed various topics related to updating the list of TAPs in WAC 173-460-150. This document discusses each topic and our final decision.

Update the list of TAPs (add or subtract chemicals)

The TAP list in WAC 173-460-150 adopted in 2009 contains 395 chemicals:

- Cancer-causing chemicals (averaging period of one year): 288
- Chemicals with 24-hour averaging period: 93
- Chemicals with 1-hour averaging period: 14

We used the process from the 2009 rulemaking[1] to identify chemicals to add or remove from the list of TAPs:[2]

- The chemical must be listed in one or more of the acceptable data sources; and
- The chemical must have an associated inhalation toxicity value established to quantify human health risk and hazard.

Acceptable data sources that meet high standards for scientific credibility include:

- EPA Integrated Risk Information System (IRIS).
- California Office of Environmental Health Hazard Assessment (OEHHA) reference exposure levels and cancer potency factors.
- Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels.

By applying this process, the updated list of TAPs in Appendix A consists of 438 chemicals:[3]

- Cancer-causing chemicals (averaging period of one year): 307
- Chemicals with 24-hour averaging period: 116

[1] Appendix B: Setting the Acceptable Source Impact Level, Small Quantity Emission Rates, and De Minimis Values in Patora, K. Final Cost Benefit Analysis Chapter 173-400 WAC and Chapter 173-401 WAC. May 2009. Publication no. 09-02-010.
[2] See "Methods to Update the List of TAPs," August 2018 for more details on the process to update the list.
[3] See also Annotated 2019 TAP Table June 2019 (Excel spreadsheet).

- Chemicals with 1-hour averaging period: 15

Table 1 summarizes the changes to the 2009 list of TAPs.[4]

Table 1. Changes to the 2009 list of TAPs

Change	2009 Table (# of TAPs)	Percentage	2019 Table (# of TAPs)	Percentage
Retained TAPs (Appendix B)	387	98	387	88
Removed TAPs (Table 2)	8	2	----	----
New TAPs (Appendix C)	----	----	51	12
Total	395	100	438	100

We removed eight TAPs for the reasons noted in Table 2.

Table 2. Removed TAPs

Chemical Common Name	CAS #	Reason
5-Nitro-o-anisidine	99-59-2	Delisted by California
Ammonium sulfate	7783-20-2	Ecology approved petition for removal
Chromic acid	11115-74-5	Redundant – covered by Chromic(VI) acid
Chromium hexavalent: soluble, except chromic trioxide	----	Redundant – covered by Chromium(VI) & compounds, NOS
Dibromochloromethane	124-48-1	Delisted by California
Melphalan hydrochloride	3223-07-2	Chemical does not meet TAP listing criteria (no unit risk factor)
Pentabromodiphenyl ether	32534-81-9	Redundant – covered by Polybrominated diphenyl ethers (PBDEs) (Containing less than 10 bromine atoms).[5]
Tetrabromodiphenyl ether	40088-47-9	Redundant – covered by Polybrominated diphenyl ethers (PBDEs) (Containing less than 10 bromine atoms).[5]

Chemicals considered but not added to the TAP list

Twelve chemicals met the listing criteria noted above that we do not include as TAPs (Table 3):

- Five chemicals are redundant with another TAP.

[4] The 2009 TAP list does not include the insecticide malathion although it met the listing criteria. It is included as a new TAP because it meets the 2019 listing criteria.

[5] The ASIL for PBDEs is based on ATSDRs minimal risk level (MRL). An inhalation MRL (or inhalation toxicity value) specific to PBDE-99 [2,2',4,4',5-pentabromodiphenyl ether] does not exist. The MRL does not specify individual PBDE congeners, only that they are "lower brominated."

- Seven chemicals would result in more burden for regulated facilities without providing added public health protection.

Table 3. Chemicals considered but not added to the TAP list

Chemical Common Name	CAS #	Comment
Acetone	67-64-1	Solvent
Chromium(VI), chromic acid aerosol mist	18540-29-9	Covered by Chromic(VI) chromic acid
Fuel oil no. 2	68476-30-2	Home heating oil (dyed diesel fuel)
JP-4*	50815-00-4	U.S. Airforce aircraft fuel (phased out)
JP-5*	8008-20-6	Primary fuel used in U.S. Navy aircraft carriers (MIL-DTL-5624)
JP-7*	HZ0600-22-T	U.S. Air Force aircraft fuel (MIL-DTL-38219)
JP-8*	8008-20-6	U.S. Air Force military jet fuel (MIL-DTL-83133)
Kerosene	8008-20-6	Aviation fuel, heating fuel, solvent
PBDE-99 [2,2',4,4',5-pentabromodiphenyl ether]	60348-60-9	Covered by Polybrominated diphenyl ethers (PBDEs) [Containing less than 10 bromine atoms][5]
Pentabromodiphenyl ether	32534-81-9	Covered by Polybrominated diphenyl ethers (PBDEs) [Containing less than 10 bromine atoms] [5]
Polybrominated diphenyl ethers (PBDEs)	32536-52-0	Covered by Polybrominated diphenyl ethers (PBDEs) [Containing less than 10 bromine atoms][5]
Selenium sulfide	7446-34-6	Covered by Selenium & selenium compounds (other than hydrogen selenide)

* JP means jet propellant.

Acetone

Including acetone on the TAP list would have imposed more burden on businesses and permitting agencies. EPA promotes acetone as a Safer Choice[6] chemical because it is best in class for specific functions. EPA notes that acetone has a "low potential for harming either human health or the environment."[7] Including it as a TAP could have unintended consequences by disincentivizing the use of a chemical that we promote as a substitute for more harmful chemicals. Adding the chemical as a TAP does not align the level of review by an applicant and the permitting agency with the risk associated with the emissions from the project.

Fuels

We did not include these fuels to the TAP list because the rule already regulates the volatile TAPs that comprise each fuel:

[6] Refer to EPA's Safer Choice Standard and Criteria found at https://www.epa.gov/saferchoice/standard#tab-2.
[7] EPA Memorandum from Dan Rosenblatt to Lois Rossi, "Reassessment of One Exemption from the Requirement of a Tolerance for Acetone," June 13, 2005, page 2.

- Gasoline and diesel fuel contain TAPS such as benzene, toluene, xylenes, n-hexane, and naphthalene.
- Jet fuel contains different TAPs such as benzene, toluene, ethylbenzene, xylene, and naphthalene.[8,9] ATSDR establishes the minimal risk level for jet fuels based on the jet fuel mixture, rather than individual components. Using naphthalene as an example, consideration of these individual TAPs would likely be more stringent than an ASIL based on the jet fuel mixture that is the basis for the JP-8 minimal risk level.

Including these fuels would therefore be duplicative and provide no regulatory benefit.

Evaluation of ammonium sulfate

Ammonium sulfate is on the 2009 list of TAPs based on California OEHHA's acute reference exposure level for "sulfates." On July 25, 2017, Far West Agribusiness Association (Far West) petitioned Ecology to remove ammonium sulfate from the list of TAPs.[10] Far West contended that Ecology should not consider ammonium sulfate a TAP. As part of this rulemaking, we agreed to evaluate the petition and supporting information provided by consultants for Simplot[11] and Two Rivers Terminal,[12] and existing literature around the short-term respiratory effects of ammonium sulfate. The McGregor Company[13] and Far West Agribusiness Association[14] also supported the removal of this chemical from the list.

We reviewed and considered:

- The basis for including ammonium sulfate on the 2009 list of TAPs.
- Information about potential health effects associated with inhalation of ammonium sulfate.
- Levels of short-term exposure that could pose mild adverse respiratory effects.
- Public health implications of removing ammonium sulfate from the list of TAPs.

Based on our review, we removed ammonium sulfate from the TAP list because this action is not likely to result in increased hazards from new sources of air pollution.[15]

We formed this decision by the following key considerations:

[8] ATSDR Jet Fuels JP-4 and JP-7 found at https://www.atsdr.cdc.gov/ToxProfiles/tp76-c3.pdf.
[9] ATSDR JP-5, JP-8 and Jet A-Fuels found at https://www.atsdr.cdc.gov/toxprofiles/tp121-c3.pdf.
[10] Lukins & Annis, Petition Letter from Far West Agribusiness requesting rulemaking to remove ammonium sulfate as a TAP in WAC 173-460-150. July 25, 2017.
[11] Arcadis U.S., Inc. Technical Report Supporting Petition to Remove Ammonium Sulfate from the TAP List. Prepared for J.R. Simplot Company. December 7, 2018.
[12] Weeks, D. Comments by Two Rivers Terminal LLC. Submitted December 10, 2018.
[13] Morscheck, F. Email from The McGregor Company. January 8, 2019.
[14] Fitzgerald, J. Letter from Far West Agribusiness Association. January 16, 2019.
[15] Refer to the February 14, 2019 Memorandum "Petition to remove ammonium sulfate for the list of TAPs in WAC 173-460-150" for Ecology's response (Thursday, Feb. 21, 2019 stakeholder meeting).

- The primary study used to determine the reference level (which forms the basis for the ASIL) observed slight changes in airway function after exposure to sulfuric acid and ammonium bisulfate, but not after exposure to ammonium sulfate;
- Sulfates of greater acidity than ammonium sulfate appear to be more likely to cause short-term respiratory effects;
- Ammonium sulfate as a constituent of ambient particulate matter is not unequivocally known to be more toxic than other forms of particulate matter; and
- Existing regulations that address particulate matter emissions from new and existing sources likely address emissions of ammonium sulfate.

We concluded that removing ammonium sulfate from the list of TAPs will not likely result in an increase in short-term respiratory hazards from new sources of air pollution.

Recalculation of ASILs

The ASIL for each chemical reflects the following considerations:

- We derived ASIL values for pollutants in which inhalation toxicity values were available from EPA's IRIS, California OEHHA, and ATSDR minimal risk levels.
    - We deviated from this approach for diethyl and dimethyl mercury. We derived the ASIL for diethyl and dimethyl mercury based on our evaluation of research and other available information.
- We assigned only one ASIL and one concentration averaging period for each TAP.
- We assigned either a short-term ASIL value or a long-term ASIL value but not both.
- We established a short-term ASIL value for a 1-hour or 24-hour averaging period.
- If a TAP has toxicity values based on cancer and non-cancer effects, we established the ASIL based on cancer risk. We used this approach because the concentrations resulting in a lifetime increased cancer risk of one in one million are usually much lower than concentrations associated with non-cancer reference concentrations.
    - We deviated from this approach for 2,4- and 2,6- toluene diisocyanates because the chronic reference exposure level is lower than a level that results in a one in a million lifetime cancer risk.
- We accounted for children's susceptibility from early-life exposure to carcinogens.
- If more than one toxicity value is available for the same TAP, we established the ASIL based on the most recently adopted value.
- In deriving ASIL values based on noncancerous effects, we gave preference to toxicity values based on chronic effects, followed by intermediate values, followed by acute values as shown in Table 4.
    - We deviated from the hierarchy for two chemicals:

  - Isoprophyl alcohol. We deviated from the hierarchy for isoprophyl alcohol because the 1-hour acute reference exposure level is lower than the chronic reference exposure level.
  - Sulfur dioxide. We deviated from the hierarchy for sulfur dioxide to maintain consistency with how the ASILs values are set for the other criteria pollutants.
- We established ASILs based on chronic RELs, RfCs, and MRLs with 24-hour time weighted averages rather than with annual averages to reflect the decision of one ASIL value per TAP while ensuring that we did not overlook the acute effects of TAPs.
- We established the 24-hour averaging period when the data source did not provide one.
- We did not use draft MRLs, RELs, URFs, or RfCs.
- We converted an MRL from parts-per-billion (ppb) to micrograms per meter cubed ($\mu g/m^3$) assuming 20 degrees Celsius at 1 atmosphere pressure.
- We rounded all values for emission rates and concentrations to two significant digits.
- We retained one look-up table for the TAP values.

Table 4. ASIL hierarchy

Hierarchy	Toxicity Value	Averaging Period
1	Cancer-causing chemical	Year (annual)
2	Chronic RfC, chronic REL, or MRL	24-hour
3	Intermediate MRL	24-hour
4	Acute MRL	24-hour
5	Acute REL	1-hour

We established an ASIL for each TAP using one of the following three formulas.

Calculating ASIL values (averaging period of one year)

ASIL = target cancer risk (1 in one million or 1×10^{-6}) divided by unit risk factor $((\mu g/m^3)^{-1})$ times early life adjustment factor

Calculating ASIL values (24-hour averaging period)

ASIL = chronic reference concentration ($\mu g/m^3$), chronic reference exposure level ($\mu g/m^3$), or minimal risk level ($\mu g/m^3$)

Calculating ASIL values (1-hour averaging period)

ASIL = acute reference exposure level ($\mu g/m^3$)

The 2019 changes modified ASIL values for 150 TAPs (including new and removed TAPs). Nine percent of ASILs would become less stringent (values increase), and 27 percent (including new TAPs) would become more stringent (values decrease). ASIL values for 65 percent of TAPs would not change under the 2019 changes (Table 5).

Table 5. 2019 Changes to ASILs

Changes	2019 ASIL # of TAPs	Percentage
More stringent than existing value (value decreases)	67	15
Less stringent than existing value (value increases)	38*	9
No change	105	24
No change; value adjusted by significant digits	181	41
New TAP	51	12
Total	442	100

* Includes the four TAPs that were removed and not covered by a 2019 TAP (see Table 2).

For more information on a specific TAP, refer to:

- Appendix A. Complete list of 2019 TAPs.
- Appendix D. TAPs with a More Stringent ASIL.
- Appendix E. TAPs with a Less Stringent ASIL.
- Appendix F. TAPs with an Unchanged ASIL.
- Appendix G. TAPs with an Unchanged ASIL (adjusted by significant digits).

Other changes to specific ASIL values reflect:

- Corrections due to errors in the 2009 table:
    - Averaging period (Table 6).
    - ASIL values (Table 7).
- Deviations to ASIL methodology (Table 8):
    - The ASIL for isopropyl alcohol reflects the 1-hour chronic reference exposure level rather than the 24-hour acute level because it was lower and more protective. The 2019 ASIL is unchanged because the 2009 ASIL already reflects this deviation from the hierarchy.
    - The ASIL for three toluene diisocyanates reflects the lower, more protective, non-cancer value rather than the cancer-causing value. We set the ASIL for all other TAPs based on cancer risk if a TAP has toxicity values based on cancer and non-cancer effects.

Table 6. TAP with corrected averaging period

Chemical Common Name	CAS #	2009 Averaging Period	2019 Averaging Period
Acetonitrile	75-05-8	Year	24-hour

Table 7. TAP with corrected ASIL value

Chemical Common Name	CAS #	2009 ASIL	2019 ASIL
4-Dimethylaminoazobenzene	60-11-7	76900	7.70E-04
Direct black 38	1937-37-7	47600	4.80E-04

Table 8. TAP with ASIL deviating from listing hierarchy

Chemical Common Name	CAS #	2019 ASIL ($\mu g/m^3$)	2019 Averaging Period	ASIL (based on hierarchy) ($\mu g/m^3$)	Averaging Period (based on hierarchy)
Isopropyl alcohol	67-63-0	3.20E+03	1-hr	7.0E+03	24-hour
Toluene diisocyanates (2,4- and 2,6-)	26471-62-5	8.00E-03	24-hr	9.10E-02	Year
Toluene-2,4-diisocyanate	584-84-9	8.00E-03	24-hr	9.10E-02	Year
Toluene-2,6-diisocyanate	91-08-7	8.00E-03	24-hr	9.10E-02	Year

Evaluation of excluding criteria pollutants as TAPs

The following five TAPs are also criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), and sulfur dioxide (SO_2). EPA set National Ambient Air Quality Standards (NAAQS) for these pollutants. Chapter 173-476 WAC, Ambient Air Quality Standards contains the federal NAAQS for these pollutants and large and small particles, and a state annual ambient standard for SO_2 that will apply until an area meets the 2010 federal hourly standard.

WAC 173-400-110(5) establishes exemption levels for pollutants subject to air quality permitting in tons per year. This provision also references the de minimis emission levels in WAC 173-460-150 without listing the values.

The rule includes CO, Pb, NO_2, O_3, and SO_2 as TAPs because they meet the TAP listing criteria. The ASIL values for NO_2, SO_2, and CO reflect a one-hour averaging period because these are non-cancer causing chemicals. Lead is a cancer-causing chemical so its ASIL reflects an averaging period of one year.[16]

We reviewed the NAAQS status and compared it to TAP levels.[17] We retained these chemicals as TAPs because they meet the listing criteria and including them provides additional consideration of potential public health impacts that NAAQS compliance alone does not provide.

[16] "Concise Explanatory Statement and Responsiveness Summary for the Adoption of WAC 173-400-110, General Regulations for Air Pollution Sources and Chapter 173-460 WAC, Controls for New Sources of TAPs," May 19, 2009, Publication number 09-02-008, pages 3, 40, and 41.
[17] See Gary Palcisko "Criteria Air Pollutants as TAPs" PowerPoint presentation, Nov. 16, 2018.

Evaluation of the use of early life adjustment factors

The 2009 ASIL values do not reflect an early life adjustment factor for cancer risk. In the 2005 Guidelines for Carcinogen Risk Assessment, EPA recognized that "childhood may be a susceptible period" in that "exposures during childhood generally are not equivalent to exposures at other times and may be treated differently from exposures occurring later in life …. In addition, adjustment of unit risk estimates may be warranted when used to estimate risks from childhood exposure …."[18] The Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens[19] describes age dependent adjustment factors as a way of addressing uncertainty related to an absence of toxicity data from exposures that occur during early-life. EPA recommends using these factors because risk estimates based on exposures occurring at various life stages may not consider the potential for higher cancer risks from early-life exposures. EPA developed procedures for adjusting cancer potency estimates only for those carcinogens that act through a mutagenic mode of action.

We relied on three EPA documents to determine which chemicals act through a mutagenic mode of action:

- Integrated Risk Information System (IRIS)
    - Chemical assessment summary for vinyl chloride[20]
    - Chemical assessment summary for trichlorethylene[21]
- Regional Screening Levels (RSLs) – User's Guide[22]
- Supplemental Guidance for Assessing Susceptibility from Early-life Exposure to Carcinogens[23]

We adjusted the ASIL values for the 30 TAPs in Table 9 based on EPA's age dependent adjustment factor:[24]

- 1.66 to account for increased susceptibility among infants and children exposed to mutagenic chemicals.

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[18] https://www.epa.gov/risk/guidelines-carcinogen-risk-assessment page 1-18.
[19] https://www.epa.gov/risk/supplemental-guidance-assessing-susceptibility-early-life-exposure-carcinogens

[20] Date last revised 8/7/2000. Available at URL: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/1001_summary.pdf.
[21] Date last revised 9/28/2011. Available at URL: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0199_summary.pdf.
[22] EPA Risk Assessment. Regional Screening Levels (RSLs) – Users Guide. November 2018. Available at URL: https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide#mutagens.
[23] U.S. EPA (Environmental Protection Agency). (2005). Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. U.S. Environmental Protection Agency, Washington, DC, EPA/630/R-03/003F, 2005. Available at URL: https://www.epa.gov/sites/production/files/2013-09/documents/childrens_supplement_final.pdf.
[24] See February 14, 2019 Memorandum "Use of early-life adjustment factors in deriving acceptable source impact levels for a subset of TAPs," February 14, 2019 Memorandum "Recommendations for Updating WAC 173-460-150," and October 10, 2019 PowerPoint presentation "Toxicity Equivalence (TEQ) & Relative Potency."

- 1.22 for trichloroethylene because the mutagenic mode of action applies to kidney tumors, but not for other cancers included in the derivation of the unit risk factor.

We did not adjust two chemicals EPA listed as a mutagen.

- Vinyl chloride was not adjusted because the toxicity value already accounts for continuous lifetime exposure from birth.
- 1,2,3-Trichloropropane was not adjusted because there is no unit risk value for quantifying increased cancer risk from inhalation exposure to this chemical.

Table 9. TAPs adjusted by age dependent adjustment factor

	Chemical Common Name	CAS #
1	1,2-Dibromo-3-chloropropane	96-12-8
2	3-Methylcholanthrene	56-49-5
3	4,4'-Methylenebis(2-chloroaniline) (MOCA)	101-14-4
4	7,12-Dimethylbenz[a]anthracene	57-97-6
5	Acrylamide	79-06-1
6	Barium chromate	10294-40-3
7	Benz(a)anthracene	56-55-3
8	Benzidine	92-87-5
9	Benzo(a)pyrene	50-32-8
10	Benzo(b)fluoranthene	205-99-2
11	Bnezo(k)fluoranthene	207-08-9
12	Chloroprene	126-99-8
13	Chromic trioxide	1333-82-0
14	Chromic(VI) acid	7738-94-5
15	Chromium(VI) & compounds, NOS	----
16	Chrysene	218-01-9
17	Coke oven emissions	----
18	Dibenz(a,h)anthracene	53-70-3
19	Dichloromethane (methylene chloride)	75-09-2
20	Ethyl carbamate (urethane)	51-79-6
21	Ethylene oxide	75-21-8
22	Indeno(1,2,3-cd)pyrene	193-39-5
23	Lead chromate	7758-97-6
24	Lead chromate oxide	18454-12-1
25	N-Nitrosodiethylamine	55-18-5
26	N-Nitrosodimethylamine	62-75-9
27	N-nitroso-N-ethylurea	759-73-9
28	N-nitroso-N-methylurea	684-93-5

	Chemical Common Name	CAS #
29	Safrole	94-59-7
30	Trichloroethylene	79-01-6

We also adjusted the ASIL values for the 18 PAH compounds in Table 10 based on EPA's early-life adjustment factor. We listed these chemicals because the California OEHHA reports an inhalation unit risk value for these PAHs. They are assumed to cause toxicity in a similar manner as benzo(a)pyrene, a chemical EPA determined acts through a mutagenic mode of action, so we applied an adjustment factor of 1.66.

Table 10. PAHs adjusted by age dependent adjustment factor

	Chemical Common Name	CAS#
1	2-Acetylaminofluorene	53-96-3
2	2-Aminoanthraquinone	117-79-3
3	Benzo[j]fluoranthene	205-82-3
4	Dibenz[a,h]acridine	226-36-8
5	Dibenz[a,j]acridine	224-42-0
6	Dibenzo[a,e]pyrene	192-65-4
7	Dibenzo[a,h]pyrene	189-64-0
8	Dibenzo[a,i]pyrene	189-55-9
9	Dibenzo[a,l]pyrene	191-30-0
10	7H-Dibenzo[c,g]carbazole	194-59-2
11	1,6-Dinitropyrene	42397-64-8
12	1,8-Dinitropyrene	42397-65-9
13	5-Nitroacenaphthene	602-87-9
14	6-Nitrochrysene	7496-02-8
15	2-Nitrofluorene	607-57-8
16	1-Nitropyrene	5522-43-0
17	4-Nitropyrene	57835-92-4
18	5-Methylchrysene	3697-24-3

Review of the existing ASIL for diethyl and dimethyl mercury

Due to concerns with the neurotoxicity of diethyl and dimethyl mercury, the 2009 rulemaking established the same ASIL, SQER, and de minimis emission value for these TAPs at a number that is extremely close to zero. This value requires regulatory review of every project with any emissions of these chemicals.[16]

We reviewed the health impacts assessments of several Hanford site cleanup projects that have potential emissions of dimethyl mercury; we have not received any project applications for diethyl mercury emissions. We also evaluated dimethyl mercury research and other available

information.[25] Prenatal brain development is sensitive to very small amounts of dimethyl and diethyl mercury. Maternal inhalation of contaminated air exposes the fetus via placental transfer from the maternal bloodstream. Based on our evaluation of this material, we adopted an ASIL of 0.14 ($\mu g/m^3$) for diethyl and dimethyl mercury.

Since we established a new ASIL, we applied the standardized methodology to determine the 2019 SQERs and de minimis emission values for diethyl and dimethyl mercury as we did for the other TAPs.

Evaluation of ASILs for groups of chemicals (toxicity equivalency)

We considered adding steps to address the toxic equivalence of mixtures of TAPs. We based this on EPA's determination that an individual TAP does not adequately consider the impact of mixtures of dioxin-like compounds and carcinogenic polycyclic aromatic hydrocarbons.[26]

Addressing the toxic equivalency of mixtures would have required adding steps to determine a threshold value. This conflicts with the rulemaking goal of establishing one value for each TAP in the look-up table. By having a single set of comparison values, the 2019 amendments facilitate straightforward, scientifically based compliance. Listing individual chemicals with sufficient supporting information as TAPs with appropriate screening values allows facilities to make individual comparisons.

Revision of the small quantity emission rate modeling parameters

We established the 2009 SQER value for each ASIL using a screening level air dispersion model (SCREEN 3 Version 96043). Since EPA no longer supports this model, we updated the modeling using AERSCREEN Version 16216. Rather than use one conservative scenario, we examined several possible source and building configurations likely to simulate a realistic yet conservative scenario that is more broadly applicable.[27] Table 11 provides the 2019 modeling parameters.

Table 11. SQER modeling parameters

Questions in the dispersion model	Point source – parameters reflect	Volume source – parameters reflect
Model?	AERSCREEN Version 16216	AERSCREEN Version 16216
Emission rate?	1 gram per second	1 gram per second
Stack height?	10, 10.5, and 11	N/A

[25] "A Dimethyl Mercury Inhalation Risk Screening Concentration," Matt Kadlec, October 10, 2018. PowerPoint presentation. See also "A Dimethyl Mercury Inhalation Risk Screening Concentration for Public Health Protection," poster presentation, International Society of Exposure Science Conference, October 28 - November 1, 2012, Seattle, Washington.

[26] Refer to Palcisko, G. Toxicity Equivalence (TEQ0 & relative potency. October 10, 2018 PowerPoint. Also February 14, 2019 Memorandum by Palcisko, G., and Guilfoil, E. Deriving ASILs for mixtures of dioxin-like compounds and mixtures of polycyclic aromatic hydrocarbon.

[27] See January 16, 2019 Memorandum "Updating the Small Quantity Emission Rates," January 23, 2019 PowerPoint "Small Quantity Emission Rates and De Minimis Emission Values," and March 4, 2019 Memorandum "Recommendations for Updating Chapter 173-460 WAC."

Questions in the dispersion model	Point source – parameters reflect	Volume source – parameters reflect
Stack diameter?	0.33 meters	N/A
Exit velocity?	1, 5, and 10 meters per second	N/A
Stack temperature? (assume ambient)	Same as ambient	Same as ambient
Receptors above ground?	Yes, 1.5 meters	Yes, 1.5 meters
Urban or rural?	Rural	Rural
Building downwash?	Yes	N/A[1]
Building height?	10 meters	10 meters
Minimum horizontal dimension?	10 meters	10 meters
Maximum horizontal dimension?	20 meters	20 meters
Complex terrain?	No	No
Meteorology?	Full	Full
Use discrete distances?	Yes, 5 to 50 meters in 5 m increments	Yes, 5 to 50 meters in 5 m increments
Terrain height above stack base?	No	No

Recalculation of the small quantity emission rates

We simulated 124 scenarios with AERSCREEN using the various modeling parameters in Table 11. The median of all of the concentrations from the 124 simulations resulted in 4282 µg/m³. We consider this a robust and sufficiently conservative estimate of the concentration resulting from an emission rate of 1 gram per second.

We used the following calculations, and the conversion factors in Tables 12 and 13 to establish SQER values for the year (annual), 24-hour, and 1-hour ASIL. The 2019 SQERs are 17 percent lower than the 2009 values. Only diethyl and dimethyl mercury are less stringent.

Convert Year ASIL to Pounds per Year SQER

SQER (pound/year) =

$$\left[\frac{\text{Annual ASIL } \left(\frac{\mu g}{m^3}\right) \text{x } 60 \left(\frac{sec}{min}\right) \text{x } 60 \left(\frac{min}{hr}\right) \text{x } 8760 \left(\frac{hr}{yr}\right)}{4282 \left(\frac{\mu g}{m^3}\right) \text{x } 0.1 \text{ x } 453.6 \left(\frac{g}{lb}\right)}\right] \Big/ 1 \left(\frac{g}{sec}\right)$$

Convert 24-hour ASIL to Pounds per Day SQER

SQER (pound/day) =

$$\left[\frac{24-\text{hr ASIL } \left(\frac{\mu g}{m^3}\right) \text{x } 60 \left(\frac{sec}{min}\right) \text{x } 60 \left(\frac{min}{hr}\right) \text{x } 24 \left(\frac{hr}{day}\right)}{4282 \left(\frac{\mu g}{m^3}\right) \text{x } 0.6 \text{ x } 453.6 \left(\frac{g}{lb}\right)}\right] \Big/ 1 \left(\frac{g}{sec}\right)$$

Convert 1-hour ASIL to Pounds per Hour SQER

SQER (pound/hour) =

$$\left[\frac{1-\text{hr ASIL}\left(\frac{\mu g}{m^3}\right) \text{x } 60\left(\frac{\text{sec}}{\text{min}}\right) \text{x } 60\left(\frac{\text{min}}{\text{hr}}\right)}{4282\left(\frac{\mu g}{m^3}\right) \text{x } 453.6\left(\frac{g}{lb}\right)}\right] \Big/ 1\left(\frac{g}{sec}\right)$$

Convert ppm to µg/m³

$$Y\left(\frac{\mu g}{m^3}\right) = \frac{(\text{X ppm})(\text{molecular weight})}{24.45}\ x\ 1000$$

Table 12. SQER conversion factors

Calculation	Carcinogenic TAP	Non-carcinogenic TAP	Acute reference exposure level
Averaging period	Year	24-hour	1-hour
Emission unit	Grams/second	Grams/second	Grams/second
Formula	ASIL/(4282*0.1)	ASIL/(4282*0.6)	ASIL/4282
Result	Pounds/year	Pounds/day	Pounds/hour

Table 13: AERSCREEN conversion factors

Convert from	Convert to	Multiply hourly value by
1-hour average	1-hour or 3-hour average	1
1-hour average	8-hour average	0.9
1-hour average	24-hour average	0.6
1-hour average	Annual average	0.1

Recalculation of the de minimis emission values

De minimis emission values are trivial levels of emissions below which an air permit is not required. After evaluating two alternatives to establish de minimis (de minimis equal to SQER, and SQER divided by 10), we retained the current structure.[28] That is, the rule sets de minimis values 20 times lower than the SQER (SQER/20), except for criteria pollutants. 98.6 percent of the 2019 TAPs have values that are more stringent; 0.5 percent of TAPs have values that are less stringent; and less than one percent of TAPs remain the same (Table 14). We discuss the exception for criteria pollutants in more detail below.

Table 14. Changes to de minimis emission values

Change	# of TAPs	Percentage
More stringent than existing value (value decreases)*	432	98.6
Less stringent than existing value (value increases)**	2	0.5
No change (includes adjustment by significant digits)***	4	0.9
Total	438	100

* Includes 51 new TAPs

[28] Ibid. Also January 17, 2019 Memorandum "Establishing the Small Quantity Emission Rate as the De Minimis Emission Value," and Ecology 460 Rulemaking Stakeholder Meeting Summary, January 23, 2019 (revised).

** Diethyl and dimethyl mercury
*** Nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead & compounds, NOS

Exception - criteria pollutants

We retained the 2009 de minimis emission values for nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead. The 2009 rulemaking established a single de minimis emissions value for criteria pollutants that applies to the permitting provisions in two complementary rules: Chapter 173-400 WAC and Chapter 173-460 WAC.[16] Without translating the de minimis emission rates in WAC 173-400-110(5) into 1-hour values for WAC 173-460-150, most projects with a combustion component would not qualify for the de minimis exemption because the values in the air toxics rule would have been lower.

Updating the rule to support the rule changes

The 2009 rule varies in the number of significant digits used for emission rates and concentrations. To standardize this, we rounded all values to two-significant digits in the table (WAC 173-460-150) and specified that emissions rates (i.e., de minimis and SQERs) and concentrations (i.e., ASILs and modeled ambient impact) in WAC 173-460-040(1), -080(2)(a) and -080(2)(b) must be provided to two-significant digits.

We simplified the table by providing all values in the scientific notation format. Displaying ASILs, SQERs, and de minimis emission values in the table in two formats – decimal and scientific notation – was confusing.

We also updated language in Section 040 and 080 to use the acronym “TAP” instead of TAP.

Appendices

Appendix A
2019 Table of ASILs, SQERs, and De Minimis Emission Values

The following table contains the final 2019 acceptable source impact level (ASIL), small quantity emission rate (SQER), and de minimis emission value for each of the 438 TAPs. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m^3)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Acetaldehyde	75-07-0	year	3.7E-01	6.0E+01	3.0E+00
Acetamide	60-35-5	year	5.0E-02	8.1E+00	4.1E-01
Acetonitrile	75-05-8	24-hr	6.0E+01	4.4E+00	2.2E-01
2-Acetylaminofluorene	53-96-3	year	4.6E-04	7.5E-02	3.8E-03
Acrolein	107-02-8	24-hr	3.5E-01	2.6E-02	1.3E-03
Acrylamide	79-06-1	year	6.0E-03	9.8E-01	4.9E-02
Acrylic acid	79-10-7	24-hr	1.0E+00	7.4E-02	3.7E-03
Acrylonitrile	107-13-1	year	3.4E-03	5.6E-01	2.8E-02
Actinomycin D	50-76-0	year	4.0E-07	6.5E-05	3.2E-06
Alar (daminsozide)	1596-84-5	year	2.0E-01	3.2E+01	1.6E+00
Aldrin	309-00-2	year	2.0E-04	3.3E-02	1.7E-03
Allyl chloride	107-05-1	year	1.7E-01	2.7E+01	1.4E+00
3-Amino-9-ethylcarbazole hydrochloride	6109-97-3	year	4.5E-02	7.4E+00	3.7E-01
2-Amino-3-methyl-9H-pyrido[2,3-b]indole	68006-83-7	year	2.9E-03	4.8E-01	2.4E-02
1-Amino-2-methylanthraquinone	82-28-0	year	2.3E-02	3.8E+00	1.9E-01
2-Amino-3-methylimidazo-[4,5-f]quinoline	76180-96-6	year	2.5E-03	4.1E-01	2.0E-02
2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazol	712-68-5	year	2.2E-04	3.5E-02	1.8E-03
A-alpha-c(2-amino-9h-pyrido[2,3-b]indole)	26148-68-5	year	8.7E-03	1.4E+00	7.1E-02
2-Aminoanthraquinone	117-79-3	year	6.4E-02	1.0E+01	5.2E-01
o-Aminoazotoluene	97-56-3	year	9.1E-04	1.5E-01	7.4E-03
4-Aminobiphenyl	92-67-1	year	1.7E-04	2.7E-02	1.4E-03
Amitrole	61-82-5	year	3.7E-03	6.0E-01	3.0E-02
Ammonia	7664-41-7	24-hr	5.0E+02	3.7E+01	1.9E+00
Ammonium bisulfate	7803-63-6	1-hr	1.2E+02	2.2E-01	1.1E-02
Aniline	62-53-3	year	6.3E-01	1.0E+02	5.1E+00

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
o-Anisidine	90-04-0	year	2.5E-02	4.1E+00	2.0E-01
o-Anisidine hydrochloride	134-29-2	year	3.2E-02	5.2E+00	2.6E-01
Antimony trioxide	1309-64-4	24-hr	2.0E-01	1.5E-02	7.4E-04
Aramite	140-57-8	year	1.2E-01	1.9E+01	9.4E-01
Tris(1-aziridinyl)phosphine sulfide	52-24-4	year	2.9E-04	4.8E-02	2.4E-03
Arsenic & inorganic arsenic compounds, NOS	—	year	3.0E-04	4.9E-02	2.5E-03
Arsine	7784-42-1	24-hr	1.5E-02	1.1E-03	5.6E-05
Asbestos (fibers/cubic centimeter)	1332-21-4	year	4.3E-06	7.1E-04	3.5E-05
Actinolite asbestos (fibers/cubic centimeter)	12172-67-7	year	4.3E-06	7.1E-04	3.5E-05
Amosite asbestos (fibers/cubic centimeter)	12172-73-5	year	4.3E-06	7.1E-04	3.5E-05
Anthophylite asbestos (fibers/cubic centimeter)	17068-78-9	year	4.3E-06	7.1E-04	3.5E-05
Chrysotile asbestos (fibers/cubic centimeter)	12001-29-5	year	4.3E-06	7.1E-04	3.5E-05
Crocidolite asbestos (fibers/cubic centimeter)	12001-28-4	year	4.3E-06	7.1E-04	3.5E-05
Libby amphibole asbestos and amphiboles, NOS (fibers/cubic centimeter)	—	year	5.9E-06	9.6E-04	4.8E-05
Tremolite asbestos (fibers/cubic centimeter)	14567-73-8	year	4.3E-06	7.1E-04	3.5E-05
Auramine	492-80-8	year	4.0E-03	6.5E-01	3.2E-02
Azaserine	115-02-6	year	3.2E-04	5.2E-02	2.6E-03
Azathioprine	446-86-6	year	2.0E-03	3.2E-01	1.6E-02
Azobenzene	103-33-3	year	3.2E-02	5.2E+00	2.6E-01
Barium chromate	10294-40-3	year	2.0E-05	3.2E-03	1.6E-04
Benz[a]anthracene	56-55-3	year	5.5E-03	8.9E-01	4.5E-02
Benzene	71-43-2	year	1.3E-01	2.1E+01	1.0E+00
Benzidine	92-87-5	year	4.3E-06	7.0E-04	3.5E-05
Benzo[a]pyrene	50-32-8	year	1.0E-03	1.6E-01	8.2E-03
Benzo[b]fluoranthene	205-99-2	year	5.5E-03	8.9E-01	4.5E-02
Benzo[j]fluoranthene	205-82-3	year	5.5E-03	8.9E-01	4.5E-02
Benzo[k]fluoranthene	207-08-9	year	5.5E-03	8.9E-01	4.5E-02
Benzyl chloride	100-44-7	year	2.0E-02	3.3E+00	1.7E-01
Benzyl violet 4B	1694-09-3	year	1.8E-01	2.8E+01	1.4E+00
Beryllium & compounds, NOS	—	year	4.2E-04	6.8E-02	3.4E-03
Beryllium oxide	1304-56-9	year	4.2E-04	6.8E-02	3.4E-03
Beryllium sulfate	13510-49-1	year	1.2E-06	1.9E-04	9.4E-06

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
beta-Butyrolactone	3068-88-0	year	3.4E-03	5.6E-01	2.8E-02
beta-Propiolactone	57-57-8	year	2.5E-04	4.1E-02	2.0E-03
Bis(2-chloroethyl) ether	111-44-4	year	1.4E-03	2.3E-01	1.1E-02
Bis(chloromethyl) ether	542-88-1	year	7.7E-05	1.2E-02	6.2E-04
Boron & compounds, NOS	—	24-hr	3.0E+02	2.2E+01	1.1E+00
Bromobenzene	108-86-1	24-hr	6.0E+01	4.4E+00	2.2E-01
Bromodichloromethane	75-27-4	year	2.7E-02	4.4E+00	2.2E-01
Bromoform	75-25-2	year	9.1E-01	1.5E+02	7.4E+00
Bromomethane (methyl bromide)	74-83-9	24-hr	5.0E+00	3.7E-01	1.9E-02
1-Bromopropane	106-94-5	24-hr	1.0E+02	7.4E+00	3.7E-01
1,3-Butadiene	106-99-0	year	3.3E-02	5.4E+00	2.7E-01
Butylated hydroxyanisole	25013-16-5	year	1.8E+01	2.8E+03	1.4E+02
C.I. basic red 9 monohydrochloride	569-61-9	year	1.4E-02	2.3E+00	1.1E-01
Cadmium & compounds, NOS	—	year	2.4E-04	3.9E-02	1.9E-03
Caprolactam	105-60-2	24-hr	2.2E+00	1.6E-01	8.2E-03
Captafol	2425-06-1	year	2.3E-02	3.8E+00	1.9E-01
Captan	133-06-2	year	1.5E+00	2.5E+02	1.2E+01
Carbon disulfide	75-15-0	24-hr	8.0E+02	5.9E+01	3.0E+00
Carbon monoxide	630-08-0	1-hr	2.3E+04	4.3E+01	1.1E+00
Carbon tetrachloride	56-23-5	year	1.7E-01	2.7E+01	1.4E+00
Carbonyl sulfide	463-58-1	24-hr	1.0E+01	7.4E-01	3.7E-02
Cerium oxide	1306-38-3	24-hr	9.0E-01	6.7E-02	3.3E-03
Chlorambucil	305-03-3	year	7.7E-06	1.2E-03	6.2E-05
Chlordane	57-74-9	year	1.0E-02	1.6E+00	8.1E-02
Chlordecone	143-50-0	year	2.2E-04	3.5E-02	1.8E-03
Chlorendic acid	115-28-6	year	3.8E-02	6.2E+00	3.1E-01
Chlorinated paraffins	108171-26-2	year	4.0E-02	6.5E+00	3.2E-01
Chlorine	7782-50-5	24-hr	1.5E-01	1.1E-02	5.6E-04
Chlorine dioxide	10049-04-4	24-hr	6.0E-01	4.4E-02	2.2E-03
1-Chloro-1,1-difluoroethane	75-68-3	24-hr	5.0E+04	3.7E+03	1.9E+02
3-Chloro-2-methyl-1-propene	563-47-3	year	2.5E-02	4.1E+00	2.0E-01
2-Chloroacetophenone	532-27-4	24-hr	3.0E-02	2.2E-03	1.1E-04
Chloroalkanes C10-13 (chlorinated paraffins)	85535-84-8	year	4.0E-02	6.5E+00	3.2E-01
Chlorobenzene	108-90-7	24-hr	1.0E+03	7.4E+01	3.7E+00
Chlorobenzilate	510-15-6	year	3.2E-02	5.2E+00	2.6E-01
Chlorodifluoromethane (Freon 22)	75-45-6	24-hr	5.0E+04	3.7E+03	1.9E+02
Chloroethane (ethyl chloride)	75-00-3	24-hr	3.0E+04	2.2E+03	1.1E+02

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Chloroform	67-66-3	year	4.3E-02	7.1E+00	3.5E-01
Chloromethane (methyl chloride)	74-87-3	24-hr	9.0E+01	6.7E+00	3.3E-01
Chloromethyl methyl ether	107-30-2	year	1.4E-03	2.4E-01	1.2E-02
4-Chloro-o-phenylenediamine	95-83-0	year	2.2E-01	3.5E+01	1.8E+00
p-Chloro-o-toluidine	95-69-2	year	1.3E-02	2.1E+00	1.1E-01
Chloropicrin	76-06-2	24-hr	4.0E-01	3.0E-02	1.5E-03
Chloroprene	126-99-8	year	2.0E-03	3.3E-01	1.6E-02
Chlorothalonil	1897-45-6	year	1.1E+00	1.8E+02	9.1E+00
Chlorozotocin	54749-90-5	year	1.4E-05	2.4E-03	1.2E-04
Chromic trioxide	1333-82-0	year	7.7E-06	1.3E-03	6.3E-05
Chromic(VI) acid	7738-94-5	year	9.1E-06	1.5E-03	7.4E-05
Chromium(III), insoluble particulates, NOS	—	24-hr	5.0E+00	3.7E-01	1.9E-02
Chromium(III), soluble particulates, NOS	—	24-hr	1.0E-01	7.4E-03	3.7E-04
Chromium(VI) & compounds, NOS	—	year	4.0E-06	6.5E-04	3.3E-05
Chrysene	218-01-9	year	5.5E-02	8.9E+00	4.5E-01
Cinnamyl anthranilate	87-29-6	year	7.7E-01	1.2E+02	6.2E+00
Cobalt and compounds, NOS	7440-48-4	24-hr	1.0E-01	7.4E-03	3.7E-04
Coke oven emissions	—	year	9.7E-04	1.6E-01	7.9E-03
Copper & compounds	—	1-hr	1.0E+02	1.9E-01	9.3E-03
p-Cresidine	120-71-8	year	2.3E-02	3.8E+00	1.9E-01
Cresols (mixture), including m-cresol, o-cresol, p-cresol	1319-77-3	24-hr	6.0E+02	4.4E+01	2.2E+00
m-Cresol (3-methylphenol)	108-39-4	24-hr	6.0E+02	4.4E+01	2.2E+00
o-Cresol (2-methylphenol)	95-48-7	24-hr	6.0E+02	4.4E+01	2.2E+00
p-Cresol (4-methylphenol)	106-44-5	24-hr	6.0E+02	4.4E+01	2.2E+00
Cumene	98-82-8	24-hr	4.0E+02	3.0E+01	1.5E+00
Cupferron	135-20-6	year	1.6E-02	2.6E+00	1.3E-01
Cyclohexane	110-82-7	24-hr	6.0E+03	4.4E+02	2.2E+01
Cyclophosphamide (anhydrous)	50-18-0	year	5.9E-03	9.6E-01	4.8E-02
Cyclophosphamide (hydrated)	6055-19-2	year	6.3E-03	1.0E+00	5.1E-02
D & C red no. 9	5160-02-1	year	6.7E-01	1.1E+02	5.4E+00
Dacarbazine	4342-03-4	year	7.1E-05	1.2E-02	5.8E-04
Dantron	117-10-2	year	4.5E-02	7.4E+00	3.7E-01
Di(2-ethylhexl)phthalate	117-81-7	year	4.2E-01	6.8E+01	3.4E+00
2,4-Diaminoanisole	615-05-4	year	1.5E-01	2.5E+01	1.2E+00
2,4-Diaminoanisole sulfate	39156-41-7	year	2.7E-01	4.4E+01	2.2E+00
4,4'-Diaminodiphenyl ether	101-80-4	year	2.5E-02	4.1E+00	2.0E-01

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
2,4-Diaminotoluene (2,4-toluene diamine)	95-80-7	year	9.1E-04	1.5E-01	7.4E-03
Diazinon	333-41-5	24-hr	1.0E+01	7.4E-01	3.7E-02
Dibenz[a,h]acridine	226-36-8	year	5.5E-03	8.9E-01	4.5E-02
Dibenz[a,h]anthracene	53-70-3	year	5.0E-04	8.2E-02	4.1E-03
Dibenz[a,j]acridine	224-42-0	year	5.5E-03	8.9E-01	4.5E-02
Dibenzo[a,e]pyrene	192-65-4	year	5.5E-04	8.9E-02	4.5E-03
Dibenzo[a,h]pyrene	189-64-0	year	5.5E-05	8.9E-03	4.5E-04
Dibenzo[a,i]pyrene	189-55-9	year	5.5E-05	8.9E-03	4.5E-04
Dibenzo[a,l]pyrene	191-30-0	year	5.5E-05	8.9E-03	4.5E-04
7H-Dibenzo[c,g]carbazole	194-59-2	year	5.5E-04	8.9E-02	4.5E-03
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	year	3.2E-04	5.2E-02	2.6E-03
Tris(2,3-dibromopropyl)phosphate	126-72-7	year	1.5E-03	2.5E-01	1.2E-02
1,4-Dichlorobenzene	106-46-7	year	9.1E-02	1.5E+01	7.4E-01
3,3'-Dichlorobenzidine	91-94-1	year	2.9E-03	4.8E-01	2.4E-02
DDD (dichlorodiphenyldichloroethane)	72-54-8	year	1.4E-02	2.4E+00	1.2E-01
DDE (dichlorodiphenyldichloroethylene)	72-55-9	year	1.0E-02	1.7E+00	8.4E-02
DDT(dichlorodiphenyltrichloroethane)	50-29-3	year	1.0E-02	1.7E+00	8.4E-02
1,1-Dichloroethane (ethylidene dichloride)	75-34-3	year	6.3E-01	1.0E+02	5.1E+00
trans-1,2-Dichloroethene	156-60-5	24-hr	8.1E+02	6.0E+01	3.0E+00
1,1-Dichloroethylene (1,1-DCE)	75-35-4	24-hr	2.0E+02	1.5E+01	7.4E-01
Dichloromethane	75-09-2	year	6.0E+01	9.8E+03	4.9E+02
1,2-Dichloropropane (propylene dichloride)	78-87-5	year	1.0E-01	1.6E+01	8.1E-01
1,3-Dichloropropene	542-75-6	year	2.5E-01	4.1E+01	2.0E+00
2,3-Dichloropropene	78-88-6	24-hr	9.2E+00	6.8E-01	3.4E-02
Dichlorvos (DDVP)	62-73-7	year	1.2E-02	2.0E+00	9.8E-02
Dieldrin	60-57-1	year	2.2E-04	3.5E-02	1.8E-03
Diesel engine exhaust, particulate	—	year	3.3E-03	5.4E-01	2.7E-02
Diethanolamine	111-42-2	24-hr	3.0E+00	2.2E-01	1.1E-02
Diethylstilbestrol	56-53-1	year	1.0E-05	1.6E-03	8.1E-05
1,1-Difluoroethane	75-37-6	24-hr	4.0E+04	3.0E+03	1.5E+02
Diglycidyl resorcinol ether	101-90-6	year	2.0E-03	3.3E-01	1.7E-02
Dihydrosafrole	94-58-6	year	7.7E-02	1.2E+01	6.2E-01
4-Dimethylaminoazobenzene	60-11-7	year	7.7E-04	1.2E-01	6.2E-03

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
trans-2[(dimethylamino)-methylimino]-5-[2-(5-nitro-2-furyl)-vinyl]-1,3,4-oxadiazole	55738-54-0	year	7.7E-03	1.2E+00	6.2E-02
7,12-Dimethylbenz[a]anthracene	57-97-6	year	8.5E-06	1.4E-03	6.9E-05
Dimethyl carbamoyl chloride	79-44-7	year	2.7E-04	4.4E-02	2.2E-03
1,1-Dimethylhydrazine	57-14-7	24-hr	5.0E-01	3.7E-02	1.9E-03
1,2-Dimethylhydrazine	540-73-8	year	6.3E-06	1.0E-03	5.1E-05
Dimethylvinylchloride	513-37-1	year	7.7E-02	1.2E+01	6.2E-01
1,6-Dinitropyrene	42397-64-8	year	5.5E-05	8.9E-03	4.5E-04
1,8-Dinitropyrene	42397-65-9	year	5.5E-04	8.9E-02	4.5E-03
2,4-Dinitrotoluene	121-14-2	year	1.1E-02	1.8E+00	9.1E-02
1,4-Dioxane	123-91-1	year	2.0E-01	3.2E+01	1.6E+00
1,2-Diphenylhydrazine (hydrazobenzene)	122-66-7	year	4.0E-03	6.5E-01	3.2E-02
Direct black 38	1937-37-7	year	4.8E-04	7.7E-02	3.9E-03
Direct blue 6	2602-46-2	year	4.8E-04	7.7E-02	3.9E-03
Direct brown 95	16071-86-6	year	5.3E-04	8.5E-02	4.3E-03
Disperse blue 1	2475-45-8	year	7.7E-01	1.2E+02	6.2E+00
Disulfoton	298-04-4	24-hr	2.0E-01	1.5E-02	7.4E-04
Epichlorohydrin	106-89-8	year	4.3E-02	7.1E+00	3.5E-01
1,2-Epoxybutane	106-88-7	24-hr	2.0E+01	1.5E+00	7.4E-02
Estradiol 17B	50-28-2	year	9.1E-05	1.5E-02	7.4E-04
Ethyl benzene	100-41-4	year	4.0E-01	6.5E+01	3.2E+00
Ethyl carbamate (urethane)	51-79-6	year	2.1E-03	3.4E-01	1.7E-02
Ethylene dibromide (EDB, 1,2-dibromoethane)	106-93-4	year	1.7E-03	2.7E-01	1.4E-02
Ethylene dichloride (EDC, 1,2-dichloroethane)	107-06-2	year	3.8E-02	6.2E+00	3.1E-01
Ethylene glycol	107-21-1	24-hr	4.0E+02	3.0E+01	1.5E+00
Ethylene glycol monobutyl ether	111-76-2	24-hr	8.2E+01	6.1E+00	3.0E-01
Ethylene glycol monoethyl ether (2-ethoxyethanol)	110-80-5	24-hr	7.0E+01	5.2E+00	2.6E-01
Ethylene glycol monoethyl ether acetate	111-15-9	24-hr	3.0E+02	2.2E+01	1.1E+00
Ethylene glycol monomethyl ether (2-methoxyethanol)	109-86-4	24-hr	6.0E+01	4.4E+00	2.2E-01
Ethylene glycol monomethyl ether acetate	110-49-6	24-hr	9.0E+01	6.7E+00	3.3E-01
Ethylene oxide	75-21-8	year	2.0E-04	3.3E-02	1.6E-03
Ethylene thiourea	96-45-7	year	7.7E-02	1.2E+01	6.2E-01
Ethyleneimine	151-56-4	year	5.3E-05	8.5E-03	4.3E-04

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Ferric sulfate	10028-22-5	1-hr	1.2E+02	2.2E-01	1.1E-02
Fluorides (fluoride containing chemicals), NOS	—	24-hr	1.3E+01	9.6E-01	4.8E-02
Fluorine gas F_2	7782-41-4	24-hr	1.6E+01	1.2E+00	5.9E-02
Formaldehyde	50-00-0	year	1.7E-01	2.7E+01	1.4E+00
Furmecyclox	60568-05-0	year	1.2E-01	1.9E+01	9.4E-01
Furylfuramide	3688-53-7	year	1.4E-02	2.4E+00	1.2E-01
Glu-P-1	67730-11-4	year	7.1E-04	1.2E-01	5.8E-03
Glu-P-2	67730-10-3	year	2.5E-03	4.1E-01	2.0E-02
Glutaraldehyde	111-30-8	24-hr	8.0E-02	5.9E-03	3.0E-04
Guthion (azinphos-methyl)	86-50-0	24-hr	1.0E+01	7.4E-01	3.7E-02
Gyromitrin	16568-02-8	year	3.4E-04	5.6E-02	2.8E-03
HC blue 1	2784-94-3	year	6.7E-02	1.1E+01	5.4E-01
Heptachlor	76-44-8	year	7.7E-04	1.2E-01	6.2E-03
Heptachlor epoxide	1024-57-3	year	3.8E-04	6.2E-02	3.1E-03
Heptachlorodibenzo-p-dioxin, NOS	37871-00-4	year	2.6E-06	4.3E-04	2.1E-05
Hexachlorobenzene	118-74-1	year	2.2E-03	3.5E-01	1.8E-02
Hexachlorobutadiene	87-68-3	year	4.5E-02	7.4E+00	3.7E-01
Hexachlorocyclohexane	608-73-1	year	9.1E-04	1.5E-01	7.4E-03
alpha-Hexachlorocyclohexane	319-84-6	year	1.3E-03	2.1E-01	1.1E-02
beta-Hexachlorocyclohexane	319-85-7	year	2.3E-03	3.8E-01	1.9E-02
gamma-Hexachlorocyclohexane (lindane)	58-89-9	year	3.2E-03	5.2E-01	2.6E-02
Hexachlorocyclopentadiene	77-47-4	24-hr	2.0E-01	1.5E-02	7.4E-04
Hexachlorodibenzo-p-dioxins, NOS	34465-46-8	year	2.6E-07	4.3E-05	2.1E-06
Hexachloroethane	67-72-1	year	9.1E-02	1.5E+01	7.4E-01
Hexamethylene diisocyanate	822-06-0	24-hr	7.0E-02	5.2E-03	2.6E-04
n-Hexane	110-54-3	24-hr	7.0E+02	5.2E+01	2.6E+00
2-Hexanone	591-78-6	24-hr	3.0E+01	2.2E+00	1.1E-01
Hydrazine	302-01-2	year	2.0E-04	3.3E-02	1.7E-03
Hydrazine sulfate	10034-93-2	year	1.2E-03	1.9E-01	9.4E-03
Hydrogen chloride	7647-01-0	24-hr	9.0E+00	6.7E-01	3.3E-02
Hydrogen cyanide	74-90-8	24-hr	8.0E-01	5.9E-02	3.0E-03
Hydrogen fluoride	7664-39-3	24-hr	1.4E+01	1.0E+00	5.2E-02
Hydrogen sulfide	7783-06-4	24-hr	2.0E+00	1.5E-01	7.4E-03
Indeno[1,2,3-cd]pyrene	193-39-5	year	5.5E-03	8.9E-01	4.5E-02
Isophorone	78-59-1	24-hr	2.0E+03	1.5E+02	7.4E+00
Isopropyl alcohol	67-63-0	1-hr	3.2E+03	5.9E+00	3.0E-01

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Lasiocarpine	303-34-4	year	4.5E-04	7.4E-02	3.7E-03
Lead & compounds, NOS	—	year	8.3E-02	1.4E+01	1.0E+01
Lead acetate	301-04-2	year	1.3E-02	2.0E+00	1.0E-01
Lead chromate oxide	18454-12-1	year	4.2E-05	6.9E-03	3.4E-04
Lead chromate	7758-97-6	year	2.5E-05	4.1E-03	2.0E-04
Lead phosphate	7446-27-7	year	8.3E-02	1.4E+01	6.8E-01
Lead subacetate	1335-32-6	year	9.1E-02	1.5E+01	7.4E-01
Malathion	121-75-5	24-hr	2.0E+01	1.5E+00	7.4E-02
Maleic anhydride	108-31-6	24-hr	7.0E-01	5.2E-02	2.6E-03
Manganese & compounds	—	24-hr	3.0E-01	2.2E-02	1.1E-03
Melphalan	148-82-3	year	2.7E-05	4.4E-03	2.2E-04
Mercury, elemental	7439-97-6	24-hr	3.0E-02	2.2E-03	1.1E-04
Diethyl mercury	627-44-1	24-hr	1.4E-01	1.0E-02	5.2E-04
Dimethyl mercury	593-74-8	24-hr	1.4E-01	1.0E-02	5.2E-04
Methyl alchohol (methanol)	67-56-1	24-hr	2.0E+04	1.5E+03	7.4E+01
3-Methylcholanthrene	56-49-5	year	9.6E-05	1.6E-02	7.8E-04
5-Methylchrysene	3697-24-3	year	5.5E-04	8.9E-02	4.5E-03
4,4'-Methylenebis(2-chloroaniline) (MOCA)	101-14-4	year	1.4E-03	2.3E-01	1.1E-02
4,4'-Methylenebis(2-methylaniline)	838-88-0	year	3.8E-03	6.2E-01	3.1E-02
4,4'-Methylenebis(N,N'-dimethyl)aniline	101-61-1	year	7.7E-02	1.2E+01	6.2E-01
4,4'-Methylenedianiline	101-77-9	year	2.2E-03	3.5E-01	1.8E-02
4,4'-Methylenedianiline dihydrochloride	13552-44-8	year	2.2E-03	3.5E-01	1.8E-02
Methylene diphenyl diisocyanate (MDI)	101-68-8	24-hr	8.0E-02	5.9E-03	3.0E-04
Methyl ethyl ketone	78-93-3	24-hr	5.0E+03	3.7E+02	1.9E+01
Methyl isobutyl ketone (MIBK, hexone)	108-10-1	24-hr	3.0E+03	2.2E+02	1.1E+01
Methyl isocyanate	624-83-9	24-hr	1.0E+00	7.4E-02	3.7E-03
Methyl methacrylate	80-62-6	24-hr	7.0E+02	5.2E+01	2.6E+00
Methyl methanesulfonate	66-27-3	year	3.6E-02	5.8E+00	2.9E-01
2-Methyl-1-nitroanthraquinone	129-15-7	year	8.3E-04	1.4E-01	6.8E-03
N-Methyl-N-nitro-N-nitrosoguanidine	70-25-7	year	4.2E-04	6.8E-02	3.4E-03
Methyl tert-butyl ether	1634-04-4	year	3.8E+00	6.2E+02	3.1E+01
Methylthiouracil	56-04-2	year	9.1E-03	1.5E+00	7.4E-02
Michler's ketone	90-94-8	year	4.0E-03	6.5E-01	3.2E-02
Mirex	2385-85-5	year	2.0E-04	3.2E-02	1.6E-03

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Mitomycin C	50-07-7	year	4.3E-07	7.1E-05	3.5E-06
Monocrotaline	315-22-0	year	3.4E-04	5.6E-02	2.8E-03
N,N-Dimethylformamide	68-12-2	24-hr	8.0E+01	5.9E+00	3.0E-01
Naphthalene	91-20-3	year	2.9E-02	4.8E+00	2.4E-01
2-Naphthylamine	91-59-8	year	2.0E-03	3.2E-01	1.6E-02
Nickel & compounds, NOS	—	year	3.8E-03	6.2E-01	3.1E-02
Nickel acetate	373-02-4	year	1.2E-02	1.9E+00	9.4E-02
Nickel carbonate	3333-67-3	year	7.8E-03	1.3E+00	6.3E-02
Nickel carbonate hydroxide	12607-70-4	year	6.6E-03	1.1E+00	5.4E-02
Nickel carbonyl	13463-39-3	year	1.1E-02	1.8E+00	9.1E-02
Nickel chloride	7718-54-9	year	8.5E-03	1.4E+00	6.9E-02
Nickel hydroxide	12054-48-7	year	6.1E-03	9.9E-01	4.9E-02
Nickel nitrate hexahydrate	13478-00-7	year	1.9E-02	3.1E+00	1.5E-01
Nickel oxide (nickel monoxide, nickel(II) oxide)	1313-99-1	year	4.9E-03	7.9E-01	4.0E-02
Nickel oxide black (nickel sesquioxide, nickel(III) oxide)	1314-06-3	year	5.4E-03	8.8E-01	4.4E-02
Nickel refinery dust	—	year	4.2E-03	6.8E-01	3.4E-02
Nickel subsulfide	12035-72-2	year	2.1E-03	3.4E-01	1.7E-02
Nickel sulfate	7786-81-4	year	1.0E-02	1.6E+00	8.2E-02
Nickel sulfate hexahydrate	10101-97-0	year	1.7E-02	2.8E+00	1.4E-01
Nickel sulfide	11113-75-0	year	6.0E-03	9.7E-01	4.8E-02
Nickelocene	1271-28-9	year	1.2E-02	2.0E+00	1.0E-01
Nifurthiazole	3570-75-0	year	1.5E-03	2.5E-01	1.2E-02
Nitric acid	7697-37-2	1-hr	8.6E+01	1.6E-01	8.0E-03
Nitrilotriacetic acid	139-13-9	year	6.7E-01	1.1E+02	5.4E+00
Nitrilotriacetic acid, trisodium salt monohydrate	18662-53-8	year	3.4E-01	5.6E+01	2.8E+00
Nitrobenzene	98-95-3	year	2.5E-02	4.1E+00	2.0E-01
Nitrofen	1836-75-5	year	4.3E-02	7.1E+00	3.5E-01
2-Nitrofluorene	607-57-8	year	5.5E-02	8.9E+00	4.5E-01
Nitrofurazone	59-87-0	year	2.7E-03	4.4E-01	2.2E-02
1-[(5-Nitrofurfurylidene)-amino]-2-imidazolidinone	555-84-0	year	2.0E-03	3.2E-01	1.6E-02
N-[4-(5-nitro-2-furyl)-2-thiazolyl]-acetamide	531-82-8	year	2.3E-03	3.8E-01	1.9E-02
Nitrogen dioxide	10102-44-0	1-hr	4.7E+02	8.7E-01	4.6E-01
2-Nitropropane	79-46-9	24-hr	2.0E+01	1.5E+00	7.4E-02
1-Nitropyrene	5522-43-0	year	5.5E-03	8.9E-01	4.5E-02
4-Nitropyrene	57835-92-4	year	5.5E-03	8.9E-01	4.5E-02

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
5-Nitroacenaphthene	602-87-9	year	1.6E-02	2.6E+00	1.3E-01
6-Nitrochrysene	7496-02-8	year	5.5E-05	8.9E-03	4.5E-04
N-Nitrosodiethanolamine	1116-54-7	year	1.3E-03	2.0E-01	1.0E-02
N-Nitrosodiethylamine	55-18-5	year	6.0E-05	1.0E-02	4.9E-04
N-Nitrosodimethylamine	62-75-9	year	1.3E-04	2.1E-02	1.1E-03
N-Nitrosodi-N-butylamine	924-16-3	year	3.2E-04	5.2E-02	2.6E-03
N-Nitrosodi-N-propylamine	621-64-7	year	5.0E-04	8.1E-02	4.1E-03
N-Nitrosodiphenylamine	86-30-6	year	3.8E-01	6.2E+01	3.1E+00
p-Nitrosodiphenylamine	156-10-5	year	1.6E-01	2.6E+01	1.3E+00
N-Nitrosomorpholine	59-89-2	year	5.3E-04	8.5E-02	4.3E-03
N-Nitroso-N-ethylurea	759-73-9	year	7.8E-05	1.3E-02	6.4E-04
N-Nitroso-N-methylethylamine	10595-95-6	year	1.6E-04	2.6E-02	1.3E-03
N-Nitroso-N-methylurea	684-93-5	year	1.8E-05	2.9E-03	1.4E-04
N-Nitroso-N-methylurethane	615-53-2	year	3.2E-05	5.2E-03	2.6E-04
N-Nitrosonornicotine	16543-55-8	year	2.5E-03	4.1E-01	2.0E-02
N-Nitrosopiperidine	100-75-4	year	3.7E-04	6.0E-02	3.0E-03
N-Nitrosopyrrolidine	930-55-2	year	1.7E-03	2.7E-01	1.4E-02
Oleum	8014-95-7	1-hr	1.2E+02	2.2E-01	1.1E-02
Ozone	10028-15-6	1-hr	1.8E+02	3.3E-01	2.0E-02
Parathion	56-38-2	24-hr	2.0E-05	1.5E-06	7.4E-08
Pentachlorophenol	87-86-5	year	2.2E-01	3.5E+01	1.8E+00
Perchloroethylene	127-18-4	year	1.6E-01	2.7E+01	1.3E+00
Phenacetin	62-44-2	year	1.6E+00	2.6E+02	1.3E+01
Phenazopyridine	94-78-0	year	2.0E-02	3.3E+00	1.7E-01
Phenazopyridine hydrochloride	136-40-3	year	2.3E-02	3.8E+00	1.9E-01
Phenesterin	3546-10-9	year	2.3E-05	3.8E-03	1.9E-04
Phenobarbital	50-06-6	year	7.7E-03	1.2E+00	6.2E-02
Phenol	108-95-2	24-hr	2.0E+02	1.5E+01	7.4E-01
Phenoxybenzamine	59-96-1	year	1.1E-03	1.8E-01	9.1E-03
Phenoxybenzamine hydrochloride	63-92-3	year	1.3E-03	2.1E-01	1.1E-02
o-Phenylphenate, sodium	132-27-4	year	1.2E+00	1.9E+02	9.4E+00
Phosgene	75-44-5	24-hr	3.0E-01	2.2E-02	1.1E-03
Phosphine	7803-51-2	24-hr	8.0E-01	5.9E-02	3.0E-03
Phosphoric acid	7664-38-2	24-hr	7.0E+00	5.2E-01	2.6E-02
Phosphorus	7723-14-0	24-hr	2.0E+01	1.5E+00	7.4E-02
Phosphorus, white	12185-10-3	24-hr	2.0E+01	1.5E+00	7.4E-02
Phthalic anhydride	85-44-9	24-hr	2.0E+01	1.5E+00	7.4E-02
Polybrominated biphenyls	—	year	1.2E-04	1.9E-02	9.4E-04

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Polybrominated diphenyl ethers (PBDEs) [containing less than 10 bromine atoms]	—	24-hr	6.0E+00	4.4E-01	2.2E-02
Polychlorinated biphenyls (PCBs), NOS	1336-36-3	year	1.8E-03	2.8E-01	1.4E-02
PCB 77 (3,3',4,4'-tetrachlorobiphenyl)	32598-13-3	year	2.6E-04	4.3E-02	2.1E-03
PCB 81 (3,4,4',5-tetrachlorobiphenyl)	70362-50-4	year	9.1E-05	1.5E-02	7.4E-04
PCB 105 (2,3,3',4,4'-pentachlorobiphenyl)	32598-14-4	year	9.1E-04	1.5E-01	7.4E-03
PCB 114 (2,3,4,4',5-pentachlorobiphenyl)	74472-37-0	year	9.1E-04	1.5E-01	7.4E-03
PCB 118 (2,3',4,4',5-pentachlorobiphenyl)	31508-00-6	year	9.1E-04	1.5E-01	7.4E-03
PCB 123 (2,3',4,4',5'-pentachlorobiphenyl)	65510-44-3	year	9.1E-04	1.5E-01	7.4E-03
PCB 126 (3,3',4,4',5-pentachlorobiphenyl)	57465-28-8	year	2.6E-07	4.3E-05	2.1E-06
PCB 156 (2,3,3',4,4',5-hexachlorobiphenyl)	38380-08-4	year	9.1E-04	1.5E-01	7.4E-03
PCB 157 (2,3,3',4,4',5'-hexachlorobiphenyl)	69782-90-7	year	9.1E-04	1.5E-01	7.4E-03
PCB 167 (2,3',4,4',5,5'-hexachlorobiphenyl)	52663-72-6	year	9.1E-04	1.5E-01	7.4E-03
PCB 169 (3,3',4,4',5,5'-hexachlorobiphenyl)	32774-16-6	year	9.1E-07	1.5E-04	7.4E-06
PCB 189 (2,3,3',4,4',5,5'-heptachlorobiphenyl)	39635-31-9	year	9.1E-04	1.5E-01	7.4E-03
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	year	2.6E-06	4.3E-04	2.1E-05
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9	year	9.1E-05	1.5E-02	7.4E-04
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	40321-76-4	year	2.6E-08	4.3E-06	2.1E-07
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	year	2.6E-08	4.3E-06	2.1E-07
2,3,7,8-Tetrachlorodibenzo-p-dioxin & related compounds, NOS	—	year	2.6E-08	4.3E-06	2.1E-07

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4	year	2.6E-06	4.3E-04	2.1E-05
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7	year	2.6E-06	4.3E-04	2.1E-05
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9	year	2.6E-07	4.3E-05	2.1E-06
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5	year	2.6E-07	4.3E-05	2.1E-06
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0	year	9.1E-05	1.5E-02	7.4E-04
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6	year	9.1E-07	1.5E-04	7.4E-06
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4	year	9.1E-08	1.5E-05	7.4E-07
2,3,7,8-Tetrachlorodibenzofuran (TcDF)	51207-31-9	year	2.6E-07	4.3E-05	2.1E-06
Ponceau 3R	3564-09-8	year	2.2E-01	3.5E+01	1.8E+00
Ponceau MX	3761-53-3	year	7.7E-01	1.2E+02	6.2E+00
Potassium bromate	7758-01-2	year	7.1E-03	1.2E+00	5.8E-02
Procarbazine	671-16-9	year	2.5E-04	4.1E-02	2.0E-03
Procarbazine hydrochloride	366-70-1	year	2.9E-04	4.8E-02	2.4E-03
1,3-Propane sultone	1120-71-4	year	1.4E-03	2.4E-01	1.2E-02
Propionaldehyde	123-38-6	24-hr	8.0E+00	5.9E-01	3.0E-02
Propylene	115-07-1	24-hr	3.0E+03	2.2E+02	1.1E+01
Propylene glycol	57-55-6	24-hr	2.8E+01	2.1E+00	1.1E-01
Propylene glycol dinitrate	6423-43-4	24-hr	2.8E-01	2.1E-02	1.0E-03
Propylene glycol monomethyl ether	107-98-2	24-hr	7.0E+03	5.2E+02	2.6E+01
Propylene oxide	75-56-9	year	2.7E-01	4.4E+01	2.2E+00
Propylthiouracil	51-52-5	year	3.4E-03	5.6E-01	2.8E-02
Refractory ceramic fibers (fibers/cubic centimeter)	—	24-hr	3.0E-02	2.2E-03	1.1E-04
Reserpine	50-55-5	year	3.2E-04	5.2E-02	2.6E-03
Safrole	94-59-7	year	9.6E-03	1.6E+00	7.8E-02
Selenide, hydrogen	7783-07-5	1-hr	5.0E+00	9.3E-03	4.6E-04
Selenium & selenium compounds (other than hydrogen selenide)	—	24-hr	2.0E+01	1.5E+00	7.4E-02

Chemical Common Name	CAS #	Averaging Period	ASIL (µg/m³)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
Silica, crystalline (respirable)	7631-86-9	24-hr	3.0E+00	2.2E-01	1.1E-02
Sodium hydroxide	1310-73-2	1-hr	8.0E+00	1.5E-02	7.4E-04
Sodium sulfate	7757-82-6	1-hr	1.2E+02	2.2E-01	1.1E-02
Sterigmatocystin	10048-13-2	year	1.0E-04	1.6E-02	8.1E-04
Streptozotocin	18883-66-4	year	3.2E-05	5.2E-03	2.6E-04
Styrene	100-42-5	24-hr	8.7E+02	6.5E+01	3.2E+00
Styrene oxide	96-09-3	year	2.2E-02	3.5E+00	1.8E-01
Sulfallate	95-06-7	year	1.9E-02	3.0E+00	1.5E-01
Sulfur dioxide	7446-09-5	1-hr	6.6E+02	1.2E+00	4.6E-01
Sulfur mustard	505-60-2	24-hr	2.0E-02	1.5E-03	7.4E-05
Sulfur trioxide	7446-11-9	1-hr	1.2E+02	2.2E-01	1.1E-02
Sulfuric acid	7664-93-9	24-hr	1.0E+00	7.4E-02	3.7E-03
Tertiary-butyl acetate	540-88-5	year	7.7E-01	1.2E+02	6.2E+00
1,1,1,2-Tetrachloroethane	630-20-6	year	1.4E-01	2.2E+01	1.1E+00
1,1,2,2-Tetrachloroethane	79-34-5	year	1.7E-02	2.8E+00	1.4E-01
1,1,1,2-Tetrafluoroethane	811-97-2	24-hr	8.0E+04	5.9E+03	3.0E+02
Tetrahydrofuran	109-99-9	24-hr	2.0E+03	1.5E+02	7.4E+00
Thioacetamide	62-55-5	year	5.9E-04	1.0E-01	4.8E-03
4,4-Thiodianiline	139-65-1	year	2.3E-04	3.8E-02	1.9E-03
Thiourea	62-56-6	year	4.8E-02	7.7E+00	3.9E-01
Titanium tetrachloride	7550-45-0	24-hr	1.0E-01	7.4E-03	3.7E-04
Toluene	108-88-3	24-hr	5.0E+03	3.7E+02	1.9E+01
Toluene diisocyanates (2,4- and 2,6-)	26471-62-5	24-hr	8.0E-03	5.9E-04	3.0E-05
Toluene-2,4-diisocyanate	584-84-9	24-hr	8.0E-03	5.9E-04	3.0E-05
Toluene-2,6-diisocyanate	91-08-7	24-hr	8.0E-03	5.9E-04	3.0E-05
o-Toluidine	95-53-4	year	2.0E-02	3.2E+00	1.6E-01
o-Toluidine hydrochloride	636-21-5	year	2.7E-02	4.4E+00	2.2E-01
Toxaphene (polychlorinated camphenes)	8001-35-2	year	2.9E-03	4.8E-01	2.4E-02
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	24-hr	5.0E+03	3.7E+02	1.9E+01
1,1,2-Trichloroethane (vinyl trichloride)	79-00-5	year	6.3E-02	1.0E+01	5.1E-01
Trichloroethylene (TCE)	79-01-6	year	2.1E-01	3.4E+01	1.7E+00
2,4,6-Trichlorophenol	88-06-2	year	3.2E-01	5.2E+01	2.6E+00
1,2,3-Trichloropropane	96-18-4	24-hr	3.0E-01	2.2E-02	1.1E-03
Triethylamine	121-44-8	24-hr	2.0E+02	1.5E+01	7.4E-01
1,2,3-Trimethylbenzene	526-73-8	24-hr	6.0E+01	4.4E+00	2.2E-01
1,2,4-Trimethylbenzene	95-63-6	24-hr	6.0E+01	4.4E+00	2.2E-01

Chemical Common Name	**CAS #**	**Averaging Period**	**ASIL** (µg/m^3)	**SQER** (lb/averaging period)	**De Minimis** (lb/averaging period)
1,3,5-Trimethylbenzene	108-67-8	24-hr	6.0E+01	4.4E+00	2.2E-01
Tryptophan-P-1	62450-06-0	year	1.4E-04	2.2E-02	1.1E-03
Tryptophan-P-2	62450-07-1	year	1.1E-03	1.8E-01	8.9E-03
Uranium, insoluble compounds, NOS	—	24-hr	8.0E-01	5.9E-02	3.0E-03
Uranium, soluble salts, NOS	—	24-hr	4.0E-02	3.0E-03	1.5E-04
Vanadium (fume or dust)	7440-62-2	24-hr	1.0E-01	7.4E-03	3.7E-04
Vanadium pentoxide	1314-62-1	1-hr	3.0E+01	5.6E-02	2.8E-03
Vinyl acetate	108-05-4	24-hr	2.0E+02	1.5E+01	7.4E-01
Vinyl bromide	593-60-2	24-hr	3.0E+00	2.2E-01	1.1E-02
Vinyl chloride	75-01-4	year	1.1E-01	1.8E+01	9.2E-01
Xylene (mixture), including m-xylene, o-xylene, p-xylene	1330-20-7	24-hr	2.2E+02	1.6E+01	8.2E-01
m-Xylene	108-38-3	24-hr	2.2E+02	1.6E+01	8.2E-01
o-Xylene	95-47-6	24-hr	2.2E+02	1.6E+01	8.2E-01
p-Xylene	106-42-3	24-hr	2.2E+02	1.6E+01	8.2E-01

Appendix B
Retained TAPs

The following table contains the list of 387 TAPs from the 2009 rule that remain on the final 2019 list. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

	Chemical Common Name for TAP Remaining on List	CAS #
1	1,1,1,2-Tetrachloroethane	630-20-6
2	1,1,1,2-Tetrafluoroethane	811-97-2
3	1,1,1-Trichloroethane (methyl chloroform)	71-55-6
4	1,1,2,2-Tetrachloroethane	79-34-5
5	1,1,2-Trichloroethane (vinyl trichloride)	79-00-5
6	1,1-Dichloroethane (ethylidene dichloride)	75-34-3
7	1,1-Dichloroethylene (1,1-DCE)	75-35-4
8	1,1-Difluoroethane	75-37-6
9	1,1-Dimethylhydrazine	57-14-7
10	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0
11	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9
12	1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4
13	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9
14	1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7
15	1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9
16	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6
17	1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9
18	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7
19	1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9
20	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3
21	1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6
22	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	40321-76-4
23	1,2,3-Trichloropropane	96-18-4
24	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8
25	1,2-Dichloropropane (propylene dichloride)	78-87-5
26	1,2-Dimethylhydrazine	540-73-8
27	1,2-Diphenylhydrazine (hydrazobenzene)	122-66-7
28	1,2-Epoxybutane	106-88-7
29	1,3-Butadiene	106-99-0
30	1,3-Dichloropropene	542-75-6
31	1,3-Propane sultone	1120-71-4
32	1,4-Dichlorobenzene	106-46-7
33	1,4-Dioxane	123-91-1

	Chemical Common Name for TAP Remaining on List	CAS #
34	1,6-Dinitropyrene	42397-64-8
35	1,8-Dinitropyrene	42397-65-9
36	1-[(5-Nitrofurfurylidene)-amino]-2-imidazolidinone	555-84-0
37	1-Amino-2-methylanthraquinone	82-28-0
38	1-Chloro-1,1-difluoroethane	75-68-3
39	1-Nitropyrene	5522-43-0
40	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5
41	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4
42	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	51207-31-9
43	2,3,7,8-Tetrachlorodibenzo-p-dioxin & related compounds, NOS	----
44	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6
45	2,4,6-Trichlorophenol	88-06-2
46	2,4-Diaminoanisole	615-05-4
47	2,4-Diaminoanisole sulfate	39156-41-7
48	2,4-Diaminotoluene (2,4-toluene diamine)	95-80-7
49	2,4-Dinitrotoluene	121-14-2
50	2-Acetylaminofluorene	53-96-3
51	2-Amino-3-methyl-9H pyrido[2,3-b]indole	68006-83-7
52	2-Amino-3-methylimidazo-[4,5-f]quinoline	76180-96-6
53	2-Amino-5-(5-Nitro-2-Furyl)-1,3,4-Thiadiazol	712-68-5
54	2-Aminoanthraquinone	117-79-3
55	2-Chloroacetophenone	532-27-4
56	2-Methyl-1-nitroanthraquinone	129-15-7
57	2-Methylphenol (o-cresol)	95-48-7
58	2-Naphthylamine	91-59-8
59	2-Nitrofluorene	607-57-8
60	2-Nitropropane	79-46-9
61	3,3'-Dichlorobenzidine	91-94-1
62	3-Amino-9-ethylcarbazole hydrochloride	6109-97-3
63	3-Chloro-2-methyl-1-propene	563-47-3
64	3-Methylcholanthrene	56-49-5
65	3-Methylphenol (m-cresol)	108-39-4
66	4,4'-Diaminodiphenyl ether	101-80-4
67	4,4'-Methylenebis(2-chloroaniline) (MOCA)	101-14-4
68	4,4'Methylenebis(2-methylaniline)	838-88-0
69	4,4'-Methylenebis(n,n'-dimethyl)aniline	101-61-1
70	4,4'-Methylenedianiline	101-77-9
71	4,4'-Methylenedianiline dihydrochloride	13552-44-8
72	4,4-Thiodianiline	139-65-1
73	4-Aminobiphenyl	92-67-1
74	4-Chloro-o-phenylenediamine	95-83-0
75	4-Dimethylaminoazobenzene	60-11-7

	Chemical Common Name for TAP Remaining on List	CAS #
76	4-Methylphenol (p-cresol)	106-44-5
77	4-Nitropyrene	57835-92-4
78	5-Methylchrysene	3697-24-3
79	5-Nitroacenaphthene	602-87-9
80	6-Nitrochrysene	7496-02-8
81	7,12-Dimethylbenz[a]anthracene	57-97-6
82	7H-Dibenzo[c,g]carbazole	194-59-2
83	A-alpha-c(2-amino-9h-pyrido[2,3-b]indole)	26148-68-5
84	Acetaldehyde	75-07-0
85	Acetamide	60-35-5
86	Acetonitrile	75-05-8
87	Acrolein	107-02-8
88	Acrylamide	79-06-1
89	Acrylic acid	79-10-7
90	Acrylonitrile	107-13-1
91	Actinomycin D	50-76-0
92	Alar (daminsozide)	1596-84-5
93	Aldrin	309-00-2
94	Allyl chloride	107-05-1
95	Amitrole	61-82-5
96	Ammonia	7664-41-7
97	Ammonium bisulfate	7803-63-6
98	Aniline	62-53-3
99	Antimony trioxide	1309-64-4
100	Aramite	140-57-8
101	Arsenic & inorganic arsenic compounds, NOS	----
102	Arsine	7784-42-1
103	Asbestos (fibers/cubic centimeter)	1332-21-4
104	Auramine	492-80-8
105	Azaserine	115-02-6
106	Azathioprine	446-86-6
107	Azobenzene	103-33-3
108	Barium chromate	10294-40-3
109	Benz[a]anthracene	56-55-3
110	Benzene	71-43-2
111	Benzidine	92-87-5
112	Benzo[a]pyrene	50-32-8
113	Benzo[b]fluoranthene	205-99-2
114	Benzo[j]fluoranthene	205-82-3
115	Benzo[k]fluoranthene	207-08-9
116	Benzyl chloride	100-44-7
117	Benzyl violet 4B	1694-09-3

	Chemical Common Name for TAP Remaining on List	CAS #
118	Beryllium & compounds, NOS	----
119	Beryllium oxide	1304-56-9
120	Beryllium sulfate	13510-49-1
121	beta-Butyrolactone	3068-88-0
122	beta-Propiolactone	57-57-8
123	Bis(2-chloroethyl) ether	111-44-4
124	Bis(chloromethyl) ether	542-88-1
125	Bromodichloromethane	75-27-4
126	Bromoform	75-25-2
127	Bromomethane (methyl bromide)	74-83-9
128	Butylated hydroxyanisole	25013-16-5
129	C.I. basic red 9 monohydrochloride	569-61-9
130	Cadmium & compounds, NOS	----
131	Captafol	2425-06-1
132	Captan	133-06-2
133	Carbon disulfide	75-15-0
134	Carbon monoxide	630-08-0
135	Carbon tetrachloride	56-23-5
136	Chlorambucil	305-03-3
137	Chlordane	57-74-9
138	Chlordecone	143-50-0
139	Chlorendic Acid	115-28-6
140	Chlorinated paraffins	108171-26-2
141	Chlorine	7782-50-5
142	Chlorine dioxide	10049-04-4
143	Chloroalkanes C10-13 (chlorinated paraffins)	85535-84-8
144	Chlorobenzene	108-90-7
145	Chlorobenzilate (ethyl-4,4'-dichlorobenzilate)	510-15-6
146	Chlorodifluoromethane (Freon 22)	75-45-6
147	Chloroethane (ethyl chloride)	75-00-3
148	Chloroform	67-66-3
149	Chloromethane (methyl chloride)	74-87-3
150	Chloromethyl methyl ether	107-30-2
151	Chloropicrin	76-06-2
152	Chlorothalonil	1897-45-6
153	Chlorozotocin	54749-90-5
154	Chromic trioxide	1333-82-0
155	Chromic(VI) acid	7738-94-5
156	Chromium(VI) & compounds, NOS	----
157	Chrysene	218-01-9
158	Cinnamyl Anthranilate	87-29-6
159	Cobalt and compounds, NOS	7440-48-4

	Chemical Common Name for TAP Remaining on List	CAS #
160	Coke oven emissions	----
161	Copper & compounds	----
162	Cumene	98-82-8
163	Cupferron	135-20-6
164	Cyclohexane	110-82-7
165	Cyclophosphamide (anhydrous)	50-18-0
166	Cyclophosphamide (hydrated)	6055-19-2
167	D & C red no. 9	5160-02-1
168	Dacarbazine	4342-03-4
169	Dantron	117-10-2
170	Di(2-ethylhexl)phthalate	117-81-7
171	Diazinon	333-41-5
172	Dibenz[a,h]acridine	226-36-8
173	Dibenz[a,h]anthracene	53-70-3
174	Dibenz[a,j]acridine	224-42-0
175	Dibenzo[a,e]pyrene	192-65-4
176	Dibenzo[a,h]pyrene	189-64-0
177	Dibenzo[a,i]pyrene	189-55-9
178	Dibenzo[a,l]pyrene	191-30-0
179	Dichlorodiphenyldichloroethane (DDD)	72-54-8
180	Dichlorodiphenyldichloroethylene (DDE)	72-55-9
181	Dichlorodiphenyltrichloroethane (DDT)	50-29-3
182	Dichloromethane (methylene chloride)	75-09-2
183	Dichlorvos (DDVP)	62-73-7
184	Dieldrin	60-57-1
185	Diesel engine exhaust, particulate	----
186	Diethanolamine	111-42-2
187	Diethyl mercury	627-44-1
188	Diethylstilbestrol	56-53-1
189	Diglycidyl resorcinol ether	101-90-6
190	Dihydrosafrole	94-58-6
191	Dimethyl carbamoyl chloride	79-44-7
192	Dimethylvinylchloride	513-37-1
193	Direct black 38	1937-37-7
194	Direct blue 6	2602-46-2
195	Direct brown 95	16071-86-6
196	Disperse blue 1	2475-45-8
197	Disulfoton	298-04-4
198	Epichlorohydrin	106-89-8
199	Estradiol 17B	50-28-2
200	Ethyl benzene	100-41-4
201	Ethyl carbamate (urethane)	51-79-6

	Chemical Common Name for TAP Remaining on List	CAS #
202	Ethylene dibromide (EDB, 1,2-Dibromoethane)	106-93-4
203	Ethylene dichloride (EDC, 1,2-Dichloroethane)	107-06-2
204	Ethylene glycol	107-21-1
205	Ethylene glycol monobutyl ether (2-Butoxyethanol)	111-76-2
206	Ethylene glycol monoethyl ether (2-Ethoxyethanol)	110-80-5
207	Ethylene glycol monoethyl ether acetate	111-15-9
208	Ethylene glycol monomethyl ether (2-Methoxyethanol)	109-86-4
209	Ethylene glycol monomethyl ether acetate	110-49-6
210	Ethylene oxide	75-21-8
211	Ethylene thiourea	96-45-7
212	Ethyleneimine	151-56-4
213	Ferric sulfate	10028-22-5
214	Fluorides (fluride ocontaining chemicals), NOS	----
215	Fluorine gas	7782-41-4
216	Formaldehyde	50-00-0
217	Furmecyclox	60568-05-0
218	Furylfuramide	3688-53-7
219	Glu-P-1	67730-11-4
220	Glu-P-2	67730-10-3
221	Glutaraldehyde	111-30-8
222	Gyromitrin	16568-02-8
223	HC Blue 1	2784-94-3
224	Heptachlor	76-44-8
225	Heptachlor epoxide	1024-57-3
226	Heptachlorodibenzo-p-dioxin, NOS	37871-00-4
227	Hexachlorobenzene	118-74-1
228	Hexachlorobutadiene	87-68-3
229	alpha-Hexachlorocyclohexane	319-84-6
230	beta-Hexachlorocyclohexane	319-85-7
231	gamma-Hexachlorocyclohexane (lindane)	58-89-9
232	Hexachlorocyclohexanes	608-73-1
233	Hexachlorocyclopentadiene	77-47-4
234	Hexachlorodibenzo-p-dioxin, NOS	34465-46-8
235	Hexachloroethane	67-72-1
236	Hexamethylene diisocyanate	822-06-0
237	Hydrazine	302-01-2
238	Hydrazine sulfate	10034-93-2
239	Hydrochloric acid	7647-01-0
240	Hydrogen cyanide	74-90-8
241	Hydrogen fluoride	7664-39-3
242	Hydrogen sulfide	7783-06-4
243	Indeno[1,2,3-cd]pyrene	193-39-5

	Chemical Common Name for TAP Remaining on List	CAS #
244	Isophorone	78-59-1
245	Isopropyl alcohol	67-63-0
246	Lasiocarpine	303-34-4
247	Lead & compounds, NOS	----
248	Lead acetate	301-04-2
249	Lead chromate oxide	18454-12-1
250	Lead chromate	7758-97-6
251	Lead subacetate	1335-32-6
252	Maleic anhydride	108-31-6
253	Manganese & compounds	----
254	Melphalan	148-82-3
255	Mercury, elemental	7439-97-6
256	Methanol	67-56-1
257	Methyl ethyl ketone	78-93-3
258	Methyl isobutyl ketone (MIBK, hexone)	108-10-1
259	Methyl isocyanate	624-83-9
260	Dimethyl mercury	593-74-8
261	Methyl methacrylate	80-62-6
262	Methyl methanesulfonate	66-27-3
263	Methyl tert-butyl ether	1634-04-4
264	Methylene diphenyl diisocyanate (MDI)	101-68-8
265	Methylthiouracil	56-04-2
266	Michler's ketone	90-94-8
267	Mirex	2385-85-5
268	Mitomycin C	50-07-7
269	Monocrotaline	315-22-0
270	N,N-Dimethylformamide	68-12-2
271	n-[4-(5-nitro-2-furyl)-2-thiazolyl]-acetamide	531-82-8
272	Naphthalene	91-20-3
273	n-Hexane	110-54-3
274	Nickel refinery dust	----
275	Nickel subsulfide	12035-72-2
276	Nifurthiazole	3570-75-0
277	Nitric acid	7697-37-2
278	Nitrilotriacetic acid	139-13-9
279	Nitrilotriacetic acid, trisodium salt monohydrate	18662-53-8
280	Nitrofen	1836-75-5
281	Nitrofurazone	59-87-0
282	Nitrogen dioxide	10102-44-0
283	N-Methyl-N-nitro-N-nitrosoguanidine	70-25-7
284	N-Nitrosodiethanolamine	1116-54-7
285	N-Nitrosodiethylamine	55-18-5

	Chemical Common Name for TAP Remaining on List	CAS #
286	N-Nitrosodimethylamine	62-75-9
287	N-Nitrosodi-n-butylamine	924-16-3
288	N-Nitrosodi-n-propylamine	621-64-7
289	N-Nitrosodiphenylamine	86-30-6
290	N-Nitrosomorpholine	59-89-2
291	N-Nitroso-N-ethylurea	759-73-9
292	N-Nitroso-N-methylethylamine	10595-95-6
293	N-Nitroso-N-methylurea	684-93-5
294	N-Nitroso-n-methylurethane	615-53-2
295	N-Nitrosonornicotine	16543-55-8
296	N-Nitrosopiperidine	100-75-4
297	N-Nitrosopyrrolidine	930-55-2
298	o-Aminoazotoluene	97-56-3
299	o-Anisidine	90-04-0
300	o-Anisidine hydrochloride	134-29-2
301	o-Phenylphenate, sodium	132-27-4
302	o-Toluidine	95-53-4
303	o-Toluidine hydrochloride	636-21-5
304	Ozone	10028-15-6
305	PCB 77 [3,3',4,4'-tetrachlorobiphenyl]	32598-13-3
306	PCB 81 [3,4,4',5-tetrachlorobiphenyl]	70362-50-4
307	PCB 105 [2,3,3',4,4'-pentachlorobiphenyl]	32598-14-4
308	PCB 114 [2,3,4,4',5-pentachlorobiphenyl]	74472-37-0
309	PCB 118 [2,3',4,4',5-pentachlorobiphenyl]	31508-00-6
310	PCB 123 [2,3',4,4',5'-pentachlorobiphenyl]	65510-44-3
311	PCB 126 [3,3',4,4',5-pentachlorobiphenyl]	57465-28-8
312	PCB 156 [2,3,3',4,4',5-hexachlorobiphenyl]	38380-08-4
313	PCB 157 [2,3,3',4,4',5'-hexachlorobiphenyl]	69782-90-7
314	PCB 167 [2,3',4,4',5,5'-hexachlorobiphenyl]	52663-72-6
315	PCB 169 [3,3',4,4',5,5'-hexachlorobiphenyl]	32774-16-6
316	PCB 189 [2,3,3',4,4',5,5'-heptachlorobiphenyl]	39635-31-9
317	p-Chloro-o-toluidine	95-69-2
318	p-Cresidine	120-71-8
319	Pentachlorophenol	87-86-5
320	Perchloroethylene	127-18-4
321	Phenacetin	62-44-2
322	Phenazopyridine	94-78-0
323	Phenazopyridine hydrochloride	136-40-3
324	Phenesterin	3546-10-9
325	Phenobarbital	50-06-6
326	Phenol	108-95-2
327	Phenoxybenzamine	59-96-1

	Chemical Common Name for TAP Remaining on List	CAS #
328	Phenoxybenzamine hydrochloride	63-92-3
329	Phosgene	75-44-5
330	Phosphine	7803-51-2
331	Phosphoric acid	7664-38-2
332	Phosphorus	7723-14-0
333	Phthalic anhydride	85-44-9
334	p-Nitrosodiphenylamine	156-10-5
335	Polybrominated biphenyls	----
336	Polychlorinated biphenyls (PCBs)	1336-36-3
337	Ponceau 3R	3564-09-8
338	Ponceau MX	3761-53-3
339	Potassium bromate	7758-01-2
340	Procarbazine	671-16-9
341	Procarbazine hydrochloride	366-70-1
342	Propylene	115-07-1
343	Propylene glycol	57-55-6
344	Propylene glycol dinitrate	6423-43-4
345	Propylene glycol monomethyl ether	107-98-2
346	Propylene oxide	75-56-9
347	Propylthiouracil	51-52-5
348	Refractory ceramic fibers (fibers/cubic centimeter)	----
349	Reserpine	50-55-5
350	Safrole	94-59-7
351	Selenide, hydrogen	7783-07-5
352	Selenium & selenium compounds (other than hydrogen selenide)	----
353	Silica, crystalline (respirable)	7631-86-9
354	Sodium hydroxide	1310-73-2
355	Sodium sulfate	7757-82-6
356	Sterigmatocystin	10048-13-2
357	Streptozotocin	18883-66-4
358	Styrene	100-42-5
359	Styrene oxide	96-09-3
360	Sulfallate	95-06-7
361	Sulfur dioxide	7446-09-5
362	Sulfur mustard	505-60-2
363	Sulfuric acid	7664-93-9
364	Thioacetamide	62-55-5
365	Thiourea	62-56-6
366	Titanium tetrachloride	7550-45-0
367	Toluene	108-88-3
368	Toluene diisocyanates (2,4- and 2,6-)	26471-62-5

	Chemical Common Name for TAP Remaining on List	CAS #
369	Toluene-2,4-diisocyanate	584-84-9
370	Toluene-2,6-diisocyanate	91-08-7
371	Toxaphene (polychlorinated camphenes)	8001-35-2
372	Trans-1,2-dichloroethene	156-60-5
373	Trans-2[(dimethylamino)-methylimino]-5-[2-(5-nitro-2-furyl)-vinyl]-1,3,4-oxadiazole	55738-54-0
374	Trichloroethylene (TCE)	79-01-6
375	Triethylamine	121-44-8
376	Tris-(1-Aziridinyl)phosphine sulfide	52-24-4
377	Tris(2,3-dibromopropyl)phosphate	126-72-7
378	Tryptophan-P-1	62450-06-0
379	Tryptophan-P-2	62450-07-1
380	Vanadium (fume or dust)	7440-62-2
381	Vanadium pentoxide	1314-62-1
382	Vinyl acetate	108-05-4
383	Vinyl bromide	593-60-2
384	Vinyl chloride	75-01-4
385	m-Xylene	108-38-3
386	o-Xylene	95-47-6
387	p-Xylene	106-42-3

Appendix C
New TAPs

The following table contains the list of 51 chemicals added in 2019. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

	Chemical Common Name for New TAP	CAS #
1	Libby amphibole asbestos and amphiboles, NOS (fibers/cubic centimeter)	----
2	Actinolite asbestos (fibers/cubic centimeter)	12172-67-7
3	Amosite asbestos (fibers/cubic centimeter)	12172-73-5
4	Anthophylite asbestos (fibers/cubic centimeter)	17068-78-9
5	Chrysotile asbestos (fibers/cubic centimeter)	12001-29-5
6	Crocidolite asbestos (fibers/cubic centimeter)	12001-28-4
7	Tremolite asbestos (fibers/cubic centimeter)	14567-73-8
8	Boron & compounds, NOS	----
9	Bromobenzene	108-86-1
10	1-Bromopropane	106-94-5
11	Caprolactam	105-60-2
12	Carbonyl sulfide	463-58-1
13	Cerium oxide	1306-38-3
14	Chloroprene	126-99-8
15	Chromium(III), insoluble particulates	----
16	Chromium(III), soluble particulates	----
17	Cresols (mixture), including m-cresol, o-cresol, p-cresol	1319-77-3
18	2,3-Dichloropropene	78-88-6
19	Guthion (azinphos-methyl)	86-50-0
20	2-Hexanone	591-78-6
21	Lead phosphate	7446-27-7
22	Malathion	121-75-5
23	Nickel & compounds, NOS	----
24	Nickel acetate	373-02-4
25	Nickel carbonate	3333-67-3
26	Nickel carbonate hydroxide	12607-70-4
27	Nickel carbonyl	13463-39-3
28	Nickel chloride	7718-54-9
29	Nickel hydroxide	12054-48-7
30	Nickel nitrate hexahydrate	13478-00-7
31	Nickel oxide (nickel monoxide, nickel(II) oxide)	1313-99-1

	Chemical Common Name for New TAP	CAS #
32	Nickel oxide black (nickel sesquioxide, nickel(III) oxide)	1314-06-3
33	Nickel sulfate	7786-81-4
34	Nickel sulfate hexahydrate	10101-97-0
35	Nickel sulfide	11113-75-0
36	Nickelocene	1271-28-9
37	Nitrobenzene	98-95-3
38	Oleum	8014-95-7
39	Parathion	56-38-2
40	Phosphorus, white	12185-10-3
41	Polybrominated diphenyl ethers (PBDEs) [Containing less than 10 bromine atoms]	---
42	Propionaldehyde	123-38-6
43	Sulfur trioxide	7446-11-9
44	Tertiary-butyl acetate	540-88-5
45	Tetrahydrofuran	109-99-9
46	1,2,3-Trimethylbenzene	526-73-8
47	1,2,4-Trimethylbenzene	95-63-6
48	1,3,5-Trimethylbenzene	108-67-8
49	Uranium, insoluble compounds, NOS	----
50	Uranium, soluble salts, NOS	----
51	Xylene (mixture), including m-xylene, o-xylene, p-xylene	1330-20-7

Appendix D
TAPs with a More Stringent ASIL

The following table contains the list of 67 TAPs with a 2019 ASIL that is more stringent than the 2009 ASIL. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

	Chemical Common Name with More Stringent ASIL	CAS #
1	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0
2	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9
3	1,2,3-Trichloropropane	96-18-4
4	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8
5	1,6-Dinitropyrene	42397-64-8
6	1,8-Dinitropyrene	42397-65-9
7	1-Nitropyrene	5522-43-0
8	2-Acetylaminofluorene	53-96-3
9	2-Aminoanthraquinone	117-79-3
10	2-Nitrofluorene	607-57-8
11	3-Methylcholanthrene	56-49-5
12	4,4'-Methylenebis(2-chloroaniline) (MOCA)	101-14-4
13	4,4'-Methylenedianiline dihydrochloride	13552-44-8
14	4-Dimethylaminoazobenzene	60-11-7
15	4-Nitropyrene	57835-92-4
16	5-Methylchrysene	3697-24-3
17	5-Nitroacenaphthene	602-87-9
18	6-Nitrochrysene	7496-02-8
19	7,12-Dimethylbenz[a]anthracene	57-97-6
20	7H-Dibenzo[c,g]carbazole	194-59-2
21	Arsine	7784-42-1
22	Asbestos (fibers/cubic centimeter)	1332-21-4
23	Benz[a]anthracene	56-55-3
24	Benzidine	92-87-5
25	Benzo[b]fluoranthene	205-99-2
26	Benzo[j]fluoranthene	205-82-3
27	Benzo[k]fluoranthene	207-08-9
28	Chlorine	7782-50-5
29	Chromic trioxide	1333-82-0
30	Chromic(VI) acid	7738-94-5
31	Chromium(VI) & compounds, NOS	**----**

	Chemical Common Name with More Stringent ASIL	CAS #
32	Chrysene	218-01-9
33	Coke oven emissions	**----**
34	Dibenz[a,h]acridine	226-36-8
35	Dibenz[a,h]anthracene	53-70-3
36	Dibenz[a,j]acridine	224-42-0
37	Dibenzo[a,e]pyrene	192-65-4
38	Dibenzo[a,h]pyrene	189-64-0
39	Dibenzo[a,i]pyrene	189-55-9
40	Dibenzo[a,l]pyrene	191-30-0
41	Dimethylvinylchloride	513-37-1
42	Direct black 38	1937-37-7
43	Disulfoton	298-04-4
44	Ethyl carbamate (urethane)	51-79-6
45	Ethylene dibromide (EDB, 1,2-Dibromoethane)	106-93-4
46	Ethylene glycol monobutyl ether (2-Butoxyethanol)	111-76-2
47	Ethylene oxide	75-21-8
48	Hydrogen cyanide	74-90-8
49	Indeno[1,2,3-cd]pyrene	193-39-5
50	Lead chromate oxide	18454-12-1
51	Lead chromate	7758-97-6
52	Mercury, elemental	7439-97-6
53	Methylene diphenyl diisocyanate (MDI)	101-68-8
54	N-Nitrosodiethylamine	55-18-5
55	N-Nitrosodimethylamine	62-75-9
56	N-Nitroso-N-ethylurea	759-73-9
57	N-Nitroso-N-methylurea	684-93-5
58	PCB 169 [3,3',4,4',5,5'-hexachlorobiphenyl]	32774-16-6
59	PCB 81 [3,4,4',5-tetrachlorobiphenyl]	70362-50-4
60	Perchloroethylene	127-18-4
61	Safrole	94-59-7
62	Sulfur mustard	505-60-2
63	Toluene diisocyanates (2,4- and 2,6-)	26471-62-5
64	Toluene-2,4-diisocyanate	584-84-9
65	Toluene-2,6-diisocyanate	91-08-7
66	Trichloroethylene (TCE)	79-01-6
67	Vanadium (fume or dust)	7440-62-2

Appendix E
TAPs with a Less Stringent ASIL

The following table contains the list of 38 TAPs with a 2019 ASIL that is less stringent than the 2009 ASIL. The list includes the four removed TAPs in Table 2 not covered by a 2019 TAP. CAS means chemical abstract service.

	Chemical Common Name with Less Stringent ASIL	CAS #
1	Acrolein	107-02-8
2	Acrylamide	79-06-1
3	Ammonia	7664-41-7
4	Ammonium sulfate (removed)	7783-20-2
5	5-Nitro-o-anisidine (removed)	99-59-2
6	Barium chromate	10294-40-3
7	Benzene	71-43-2
8	Benzo[a]pyrene	50-32-8
9	1,3-Butadiene	106-99-0
10	Carbon tetrachloride	56-23-5
11	Chlordane	57-74-9
12	Chlorine dioxide	10049-04-4
13	Di(2-ethylhexl)phthalate	117-81-7
14	Diazinon	333-41-5
15	Dibromochloromethane (removed)	124-48-1
16	Dichloromethane (methylene chloride)	75-09-2
17	1,3-Dichloropropene	542-75-6
18	Diethyl mercury	627-44-1
19	1,4-Dioxane	123-91-1
20	Heptachlor	76-44-8
21	Hexachlorobenzene	118-74-1
22	Manganese & compounds	**----**
23	Melphalan hydrochloride (removed)	3223-07-2
24	Methanol	67-56-1
25	Dimethyl mercury	593-74-8
26	PCB 105 [2,3,3',4,4'-pentachlorobiphenyl]	32598-14-4
27	PCB 114 [2,3,4,4',5-pentachlorobiphenyl]	74472-37-0
28	PCB 118 [2,3',4,4',5-pentachlorobiphenyl]	31508-00-6
29	PCB 123 [2,3',4,4',5'-pentachlorobiphenyl]	65510-44-3
30	PCB 156 [2,3,3',4,4',5-hexachlorobiphenyl]	38380-08-4
31	PCB 157 [2,3,3',4,4',5'-hexachlorobiphenyl]	69782-90-7
32	PCB 167 [2,3',4,4',5,5'-hexachlorobiphenyl]	52663-72-6

	Chemical Common Name with Less Stringent ASIL	CAS #
33	PCB 189 [2,3,3',4,4',5,5'-heptachlorobiphenyl]	39635-31-9
34	1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6
35	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4
36	1,1,1-Trichloroethane (Methyl chloroform)	71-55-6
37	2,4,6-Trichlorophenol	88-06-2
38	Vinyl chloride	75-01-4

Appendix F
TAPs with an Unchanged ASIL

The following table contains the list of 105 TAPs with a 2019 ASIL unchanged from the 2009 ASIL. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

	Chemical Common Name with Unchanged ASIL Value	CAS #
1	Acetaldehyde	75-07-0
2	Acetonitrile	75-05-8
3	Acrylic acid	79-10-7
4	Actinomycin D	50-76-0
5	2-Amino-3-methylimidazo-[4,5-f]quinoline	76180-96-6
6	Amitrole	61-82-5
7	Ammonium bisulfate	7803-63-6
8	o-Anisidine	90-04-0
9	beta-Propiolactone	57-57-8
10	Bromodichloromethane	75-27-4
11	Bromomethane (methyl bromide)	74-83-9
12	Carbon disulfide	75-15-0
13	Carbon monoxide	630-08-0
14	1-Chloro-1,1-difluoroethane	75-68-3
15	3-Chloro-2-methyl-1-propene	563-47-3
16	Chlorinated paraffins	108171-26-2
17	Chloroalkanes C10-13 (chlorinated paraffins)	85535-84-8
18	Chlorobenzene	108-90-7
19	Chlorodifluoromethane (Freon 22)	75-45-6
20	Chloroethane (ethyl chloride)	75-00-3
21	Chloromethane (methyl chloride)	74-87-3
22	Chloropicrin	76-06-2
23	Cobalt and compounds, NOS	7440-48-4
24	Copper & compounds	**----**
25	o-Cresol (2-Methylphenol)	95-48-7
26	m-Cresol (3-Methylphenol)	108-39-4
27	p-Cresol (4-Methylphenol)	106-44-5
28	Cumene	98-82-8
29	Cyclohexane	110-82-7
30	2,4-Diaminoanisole sulfate	39156-41-7
31	4,4'-Diaminodiphenyl ether	101-80-4

	Chemical Common Name with Unchanged ASIL Value	CAS #
32	1,1-Dichloroethylene (1,1-DCE)	75-35-4
33	Dichlorvos (DDVP)	62-73-7
34	Diethanolamine	111-42-2
35	Diethylstilbestrol	56-53-1
36	1,1-Difluoroethane	75-37-6
37	Dimethyl carbamoyl chloride	79-44-7
38	1,1-Dimethylhydrazine	57-14-7
39	1,2-Epoxybutane	106-88-7
40	Ethyl benzene	100-41-4
41	Ethylene glycol	107-21-1
42	Ethylene glycol monoethyl ether (2-Ethoxyethanol)	110-80-5
43	Ethylene glycol monoethyl ether acetate	111-15-9
44	Ethylene glycol monomethyl ether (2-Methoxyethanol)	109-86-4
45	Ethylene glycol monomethyl ether acetate	110-49-6
46	Ferric sulfate	10028-22-5
47	Fluorides (fluoride containing chemicals), NOS	**----**
48	Glu-P-2	67730-10-3
49	Glutaraldehyde	111-30-8
50	Hexachlorocyclohexane, alpha-	319-84-6
51	Hexachlorocyclopentadiene	77-47-4
52	Hexamethylene diisocyanate	822-06-0
53	n-Hexane	110-54-3
54	Hydrochloric acid	7647-01-0
55	Hydrogen fluoride	7664-39-3
56	Hydrogen sulfide	7783-06-4
57	Isophorone	78-59-1
58	Isopropyl alcohol	67-63-0
59	Maleic anhydride	108-31-6
60	Melphalan	148-82-3
61	Methyl ethyl ketone	78-93-3
62	Methyl isobutyl ketone (MIBK, hexone)	108-10-1
63	Methyl isocyanate	624-83-9
64	Methyl methacrylate	80-62-6
65	Michler's ketone	90-94-8
66	N,N-Dimethylformamide	68-12-2
67	Nickel refinery dust	**----**
68	Nitric acid	7697-37-2

	Chemical Common Name with Unchanged ASIL Value	CAS #
69	Nitrofurazone	59-87-0
70	Nitrogen dioxide	10102-44-0
71	2-Nitropropane	79-46-9
72	N-Nitrosodi-n-propylamine	621-64-7
73	N-Nitrosonornicotine	16543-55-8
74	N-Nitrosopiperidine	100-75-4
75	Ozone	10028-15-6
76	p-Chloro-o-toluidine	95-69-2
77	Phenol	108-95-2
78	Phenoxybenzamine hydrochloride	63-92-3
79	Phosgene	75-44-5
80	Phosphine	7803-51-2
81	Phosphoric acid	7664-38-2
82	Phosphorus	7723-14-0
83	Phthalic anhydride	85-44-9
84	Procarbazine	671-16-9
85	Propylene	115-07-1
86	Propylene glycol monomethyl ether	107-98-2
87	Propylene oxide	75-56-9
88	Refractory ceramic fibers (fibers/cubic centimeter)	**----**
89	Selenide, hydrogen	7783-07-5
90	Selenium & selenium compounds (other than hydrogen selenide)	----
91	Silica, crystalline (respirable)	7631-86-9
92	Sodium hydroxide	1310-73-2
93	Sodium sulfate	7757-82-6
94	Sterigmatocystin	10048-13-2
95	Sulfur dioxide	7446-09-5
96	Sulfuric acid	7664-93-9
97	1,1,1,2-Tetrafluoroethane	811-97-2
98	Titanium tetrachloride	7550-45-0
99	Toluene	108-88-3
100	o-Toluidine hydrochloride	636-21-5
101	Triethylamine	121-44-8
102	Tryptophan-P-2	62450-07-1
103	Vanadium pentoxide	1314-62-1
104	Vinyl acetate	108-05-4

	Chemical Common Name with Unchanged ASIL Value	CAS #
105	Vinyl bromide	593-60-2

Appendix G
TAPs with an Unchanged ASIL Value (Adjusted by Significant Digits)

The following table contains the list of 181 TAPs with a 2019 ASIL adjusted for two significant digits from the 2009 ASIL. We consider these unchanged values. NOS means not otherwise specified and applies to situations where emission factors for a group of pollutants is reported, but specific isomers, congeners, or chemicals are not reported. CAS means chemical abstract service.

	Chemical Common Name with Unchanged ASIL (Adjusted by Significant Digits)	CAS #
1	1,1,1,2-Tetrachloroethane	630-20-6
2	1,1,2,2-Tetrachloroethane	79-34-5
3	1,1,2-Trichloroethane (vinyl trichloride)	79-00-5
4	1,1-Dichloroethane (ethylidene dichloride)	75-34-3
5	1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9
7	1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7
8	1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9
9	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6
10	1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9
11	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7
12	1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9
13	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3
14	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	40321-76-4
15	1,2-Dichloropropane (propylene dichloride)	78-87-5
16	1,2-Dimethylhydrazine	540-73-8
17	1,2-Diphenylhydrazine (hydrazobenzene)	122-66-7
18	1,3-Propane sultone	1120-71-4
19	1,4-Dichlorobenzene	106-46-7
20	1-[(5-Nitrofurfurylidene)-amino]-2-imidazolidinone	555-84-0
21	1-Amino-2-methylanthraquinone	82-28-0
22	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5
23	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	51207-31-9
24	2,3,7,8-Tetrachlorodibenzo-p-dioxin & related compounds, NOS	**----**
25	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6
26	2,4-Diaminoanisole	615-05-4
27	2,4-Diaminotoluene (2,4-Toluene diamine)	95-80-7
28	2,4-Dinitrotoluene	121-14-2
29	2-Amino-3-methyl-9H pyrido[2,3-b]indole	68006-83-7
30	2-Amino-5-(5-Nitro-2-Furyl)-1,3,4-Thiadiazol	712-68-5

	Chemical Common Name with Unchanged ASIL (Adjusted by Significant Digits)	CAS #
31	2-Chloroacetophenone	532-27-4
32	2-Methyl-1-nitroanthraquinone	129-15-7
33	2-Naphthylamine	91-59-8
34	3,3'-Dichlorobenzidine	91-94-1
35	3-Amino-9-ethylcarbazole hydrochloride	6109-97-3
36	4,4'Methylenebis(2-methylaniline)	838-88-0
37	4,4'-Methylenebis(N,N'-dimethyl)aniline	101-61-1
38	4,4'-Methylenedianiline	101-77-9
39	4,4-Thiodianiline	139-65-1
40	4-Aminobiphenyl	92-67-1
41	4-Chloro-o-phenylenediamine	95-83-0
42	A-alpha-c(2-amino-9h-pyrido[2,3-b]indole)	26148-68-5
43	Acetamide	60-35-5
44	Acrylonitrile	107-13-1
45	Alar (daminsozide)	1596-84-5
46	Aldrin	309-00-2
47	Allyl chloride	107-05-1
48	Aniline	62-53-3
49	Antimony trioxide	1309-64-4
50	Aramite	140-57-8
51	Arsenic & inorganic arsenic compounds, NOS	**----**
52	Auramine	492-80-8
53	Azaserine	115-02-6
54	Azathioprine	446-86-6
55	Azobenzene	103-33-3
56	Benzyl chloride	100-44-7
57	Benzyl violet 4B	1694-09-3
58	Beryllium & compounds, NOS	**----**
59	Beryllium oxide	1304-56-9
60	Beryllium sulfate	13510-49-1
61	beta-Butyrolactone	3068-88-0
62	Bis(2-chloroethyl) ether	111-44-4
63	Bis(chloromethyl) ether	542-88-1
64	Bromoform	75-25-2
65	Butylated hydroxyanisole	25013-16-5
66	C.I. basic red 9 monohydrochloride	569-61-9
67	Cadmium & compounds, NOS	**----**
68	Captafol	2425-06-1
69	Captan	133-06-2
70	Chlorambucil	305-03-3
71	Chlordecone	143-50-0

	Chemical Common Name with Unchanged ASIL (Adjusted by Significant Digits)	CAS #
72	Chlorendic Acid	115-28-6
73	Chlorobenzilate (ethyl-4,4'-dichlorobenzilate)	510-15-6
74	Chloroform	67-66-3
75	Chloromethyl methyl ether	107-30-2
76	Chlorothalonil	1897-45-6
77	Chlorozotocin	54749-90-5
78	Cinnamyl Anthranilate	87-29-6
79	Cupferron	135-20-6
80	Cyclophosphamide (anhydrous)	50-18-0
81	Cyclophosphamide (hydrated)	6055-19-2
82	D & C red no. 9	5160-02-1
83	Dacarbazine	4342-03-4
84	Dantron	117-10-2
85	Dichlorodiphenyldichloroethane (DDD)	72-54-8
86	Dichlorodiphenyldichloroethylene (DDE)	72-55-9
87	Dichlorodiphenyltrichloroethane (DDT)	50-29-3
88	Dieldrin	60-57-1
89	Diesel engine exhaust, particulate	**----**
90	Diglycidyl resorcinol ether	101-90-6
91	Dihydrosafrole	94-58-6
92	Direct blue 6	2602-46-2
93	Direct brown 95	16071-86-6
94	Disperse blue 1	2475-45-8
95	Epichlorohydrin	106-89-8
96	Estradiol 17B	50-28-2
97	Ethylene dichloride (EDC, 1,2-dichloroethane)	107-06-2
98	Ethylene thiourea	96-45-7
99	Ethyleneimine	151-56-4
100	Fluorine gas	7782-41-4
101	Formaldehyde	50-00-0
102	Furmecyclox	60568-05-0
103	Furylfuramide	3688-53-7
104	Glu-P-1	67730-11-4
105	Gyromitrin	16568-02-8
106	HC Blue 1	2784-94-3
107	Heptachlor epoxide	1024-57-3
108	Heptachlorodibenzo-p-dioxin, NOS	37871-00-4
109	Hexachlorobutadiene	87-68-3
110	beta-Hexachlorocyclohexane	319-85-7
111	gamma-Hexachlorocyclohexane (lindane)	58-89-9
112	Hexachlorocyclohexanes	608-73-1

	Chemical Common Name with Unchanged ASIL (Adjusted by Significant Digits)	CAS #
113	Hexachlorodibenzo-p-dioxin, NOS	34465-46-8
114	Hexachloroethane	67-72-1
115	Hydrazine	302-01-2
116	Hydrazine sulfate	10034-93-2
117	Lasiocarpine	303-34-4
118	Lead & compounds, NOS	**----**
119	Lead acetate	301-04-2
120	Lead subacetate	1335-32-6
121	Methyl methanesulfonate	66-27-3
122	Methyl tert-butyl ether	1634-04-4
123	Methylthiouracil	56-04-2
124	Mirex	2385-85-5
125	Mitomycin C	50-07-7
126	Monocrotaline	315-22-0
127	m-Xylene	108-38-3
128	n-[4-(5-nitro-2-furyl)-2-thiazolyl]-acetamide	531-82-8
129	Naphthalene	91-20-3
130	Nickel subsulfide	12035-72-2
131	Nifurthiazole	3570-75-0
132	Nitrilotriacetic acid	139-13-9
133	Nitrilotriacetic acid, trisodium salt monohydrate	18662-53-8
134	Nitrofen	1836-75-5
135	N-Methyl-N-nitro-N-nitrosoguanidine	70-25-7
136	N-Nitrosodiethanolamine	1116-54-7
137	N-Nitrosodi-n-butylamine	924-16-3
138	N-Nitrosodiphenylamine	86-30-6
139	N-Nitrosomorpholine	59-89-2
140	N-Nitroso-N-methylethylamine	10595-95-6
141	N-Nitroso-n-methylurethane	615-53-2
142	N-Nitrosopyrrolidine	930-55-2
143	o-Aminoazotoluene	97-56-3
144	o-Anisidine hydrochloride	134-29-2
145	o-Phenylphenate, sodium	132-27-4
146	o-Toluidine	95-53-4
147	o-Xylene	95-47-6
148	PCB 126 [3,3',4,4',5-pentachlorobiphenyl]	57465-28-8
149	PCB 77 [3,3',4,4'-tetrachlorobiphenyl]	32598-13-3
150	p-Cresidine	120-71-8
151	Pentachlorophenol	87-86-5
152	Phenacetin	62-44-2
153	Phenazopyridine	94-78-0

	Chemical Common Name with Unchanged ASIL (Adjusted by Significant Digits)	CAS #
154	Phenazopyridine hydrochloride	136-40-3
155	Phenesterin	3546-10-9
156	Phenobarbital	50-06-6
157	Phenoxybenzamine	59-96-1
158	p-Nitrosodiphenylamine	156-10-5
159	Polybrominated biphenyls	**----**
160	Polychlorinated biphenyls (PCBs)	1336-36-3
161	Ponceau 3R	3564-09-8
162	Ponceau MX	3761-53-3
163	Potassium bromate	7758-01-2
164	Procarbazine Hydrochloride	366-70-1
165	Propylene glycol	57-55-6
166	Propylene glycol dinitrate	6423-43-4
167	Propylthiouracil	51-52-5
168	p-Xylene	106-42-3
169	Reserpine	50-55-5
170	Streptozotocin	18883-66-4
171	Styrene	100-42-5
172	Styrene oxide	96-09-3
173	Sulfallate	95-06-7
174	Thioacetamide	62-55-5
175	Thiourea	62-56-6
176	Toxaphene (polychlorinated camphenes)	8001-35-2
177	Trans-1,2-dichloroethene	156-60-5
178	Trans-2[(dimethylamino)-methylimino]-5-[2-(5-nitro-2-furyl)-vinyl]-1,3,4-oxadiazole	55738-54-0
179	Tris-(1-Aziridinyl)phosphine sulfide	52-24-4
180	Tris(2,3-dibromopropyl)phosphate	126-72-7
181	Tryptophan-P-1	62450-06-0

Appendix H
2019 Rule Language

The table in WAC 173-460-150 (Appendix A) adjusts all values to two significant digits for emissions rates (i.e., de minimis and SQERs) and concentrations (i.e., ASILs). To align with this action, the 2019 rule language specifies that all emission rates and concentrations must be rounded to two significant digits. The rule also updates the rule language to use the acronym "TAP" instead of TAP. Existing language is struck out and new language is underlined.

WAC 173-460-040 New source review.

(1) Applicability and exemptions. This chapter supplements the new source review requirements of WAC 173-400-110 by adding review requirements for new and modified TAP sources. … An action that requires a notice of construction application under WAC 173-400-110 is subject to the review requirements of this chapter, unless the emissions before control equipment of each ((~~TAP~~)) TAP (rounded to two significant digits) from a new source or the increase in emissions from each modification is less than the applicable de minimis emission threshold for that TAP listed in WAC 173-460-150.

(2) …

(3) The permitting authority that is reviewing a notice of construction application for a new or modified TAP source must ensure that:

(a) The new or modified emission units use tBACT for emissions control for the ((~~TAPs~~)) TAPs with emission increases that trigger the need to submit a notice of construction application; and

WAC 173-460-080 First tier review.

(1) …

(2) The acceptable source impact analysis requirement of WAC 173-460-070 can be satisfied for any TAP using either dispersion modeling or the small quantity emission rate.

(a) Dispersion modeling. … The notice of construction application must demonstrate that the modeled ambient impact (rounded to two significant digits) of the aggregate emissions increase of each TAP does not exceed the ASIL for that TAP as listed in WAC 173-460-150. …

(b) Small quantity emission rates. An applicant may show for any TAP that the increase in emissions of that TAP (rounded to two significant digits), after application of tBACT, is less than the small quantity emission rate listed for that TAP in WAC 173-460-150.