INITIAL STATEMENT OF REASONS

CALIFORNIA CODE OF REGULATIONS
TITLE 8. INDUSTRIAL RELATIONS
DIVISION 1. DEPARTMENT OF INDUSTRIAL RELATIONS
CHAPTER 4. DIVISION OF INDUSTRIAL SAFETY
ARTICLE 1. GENERAL INDUSTRY SAFETY ORDERS
GROUP 16. CONTROL OF HAZARDOUS SUBSTANCE
ARTICLE 107 DUSTS, FUMES, MISTS, VAPORS AND GASES
SECTION 5155

Permissible Exposure Limit (PEL) for Trichloroethylene (TCE)

The California Occupational Safety and Health Standards Board's (Board) mission is to promote, adopt, and maintain reasonable and enforceable standards that will ensure a safe and healthful workplace for California workers. The Board's objective is to adopt reasonable and enforceable standards at least as effective as federal standards. The Standards Board also has the responsibility to grant or deny applications for variances from adopted standards and respond to petitions for new or revised standards. The part-time, independent board holds monthly meetings throughout California.

The Board proposes to amend section 5155, Airborne Contaminants, Table AC-1, permissible exposure limit (PEL) for trichloroethylene (TCE), Chemical Abstracts Registry #79016.

Under Labor Code section 144.6, the Board has established airborne exposure limits within California Code of Regulations (CCR) title 8, section 5155, Airborne Contaminants, known as PELs, for toxic substances and harmful physical agents encountered in the workplace. The PELs are set at levels that are intended to be sufficiently protective such that "nearly all workers may be exposed daily during a 40-hour workweek for a working lifetime without adverse effect."[1] Labor Code section 147.1(a) requires the Division of Occupational Safety and Health (Division) to maintain surveillance and propose new standards to the Board.

Under CCR title 8 section 5155, the existing 8-hour, time-weighted average (TWA) PEL for TCE, Chemical Abstracts Registry (CAS) #79016, is 25 parts per million (ppm), which is equivalent to 135 milligrams of TCE per cubic meter of air (mg/m^3) [2, 3] The existing TCE 15-

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[1] California Code of Regulations (CCR) title 8, section 5155, Airborne Contaminants (2025). Permissible Exposure Limits for Chemical Contaminants. Subsection (1), Note. https://www.dir.ca.gov/title8/5155.html. Accessed May 2026.

[2] California Code of Regulations (CCR) title 8, section 5155, Airborne Contaminants (2025). Permissible Exposure Limits for Chemical Contaminants. Trichloroethylene (Chemical Abstracts Registry #79016) https://govt.westlaw.com/calregs/Document/I7A387385F80C11EEAF93B42E135FCAF3. Accessed June 2025.

[3] PPM, or parts per million, is a unit of measurement that describes the concentration of a substance within a mixture. It represents the number of "parts" of a substance for every million parts of the whole mixture. For example, 1 ppm means one part of the substance for every one million parts of the mixture. The concentration of a substance in a mixture can also be described using mg/m^3, or milligrams per cubic meter, which represents the mass of a substance in milligrams in one cubic meter of air. PPM is converted to mg/ m^3 as follows: mg/m3 = (PPM * molecular weight) / 24.45. Conversely, mg/m^3 is converted to ppm as follows: PPM = (mg/ m^3 * 24.45) / molecular weight. These equations are based on 25°C and 1 atmosphere.

minute short-term exposure limit (STEL) is 100 ppm and the ceiling limit is 300 ppm.

Based on the Division's analysis and conclusions described herein, the Board proposes to reduce the TCE PEL from 25 ppm to 0.24 ppm and withdraw the existing STEL and ceiling limit.

The TWA is the employee's average airborne exposure to a substance in any 8-hour work shift of a 40-hour work week which shall not be exceeded.[4] The 8-hour TWA PEL is the level of exposure established as the highest level of exposure an employee may be exposed to without incurring the risk of adverse health effects. PPM is a unit of measurement that describes the concentration of a substance within a mixture. It represents the number of "parts" of a substance for every million parts of the whole mixture. For example, 1 ppm means one part of the substance for every one million parts of the mixture. The concentration of a substance in a mixture can also be described using mg/m^3, which represents the mass of a substance in milligrams in one cubic meter of air.

As described below, in the Division's analysis, the existing TCE PEL of 25 ppm could result in 380 cases of cancer among 3,582 workers employed by the 367 businesses that reported using TCE in 2024, and which are affected by the proposal.[5]

The Division estimates the cost of these cases at approximately $68,700,000 over ten years. The proposed PEL reduction potentially avoids 376 of these cases, which avoids approximately $68,000,000 in direct medical costs over this time period. These estimates do not include indirect costs, such as lost wages and benefits, lost productivity and opportunity, private purchases of medical supplies, in-home support services, care provided by family members, insurance co-pays and other costs associated with caring for an individual with a serious disease.

To reach this conclusion, the Division applied the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) cancer risk assessment methodology to derive the proposed 8-hour PEL for TCE of 0.24 ppm (1.3 mg/m^3).[6] Under this methodology, the Division applied OEHHA's most recent 2012 cancer unit risk level (URL) for TCE of 4.0×10^{-3} $(mg/m^3)^{-1}$ using the risk assessment parameters for occupational exposures prescribed under CCR title 27, section 25721.[7] This section states,

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[4] U.S. Department of Labor, Occupational Safety and Health Administration (Oct 6, 1995). Letters of Interpretation. From Joe Dear, Assistant Secretary of Labor, to Mark Nicas, American Industrial Hygiene Association. https://www.osha.gov/laws-regs/standardinterpretations/1995-10-06-3. Accessed July 23, 2025.

[5] 106 cases/1,000 workers = x cases/3,578 workers. x = 106/1,000 * 3,578 = 379 cancer cases.

[6] California EPA, Office of Environmental Health Hazard Assessment (OEHAA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California. Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/riskreport.pdf.

[7] California Code of Regulations, title 27, Environmental Protection. §25721. Level of Exposure to Chemicals Causing Cancer. Updated through 3/11/22. Noting at (d)(3) that "For workplace exposures, the exposed worker inhales ten cubic meters of workplace air per eight-hour day, forty hours per week, fifty weeks per year over a forty-year period." https://govt.westlaw.com/calregs/Document/IBBC153FD512211EC828B000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default). Accessed June 2025.

"for workplace exposures, the exposed worker inhales ten cubic meters of workplace air per eight-hour day, forty hours per week, fifty weeks per year over a forty-year period."

Based on this analysis, the Division estimates that occupational exposure to TCE at the existing PEL of 25 ppm is expected to result in 106 additional cases of cancer for every 1,000 workers who are exposed under the conditions prescribed in section CCR title 27 section 25721. This is more than 100 times over the Division's 1:1000 health risk threshold for PELs. This comes to 380 expected cancer cases for the 3,582 workers in the 367 affected businesses.[8]

Reducing the TCE PEL to 0.24 ppm would be expected to result in one case of cancer for every 1,000 workers who are exposed at this level under the conditions prescribed in CCR title 27 section 25721.[9] This comes to four workers among the population of 3,582 workers in the 367 affected businesses, along with $700,000 in direct medical costs over a ten-year period, as described below.[10] The proposal avoids 105 cases of cancer that would otherwise occur among every 1,000 workers exposed to TCE at the existing PEL, which comes to 380 cases in this worker population. The proposal therefore avoids 376 cases of cancer among these workers, along with $68,000,000 in direct medical costs over this 10-year period.

The revised PEL of 0.24 ppm meets the Division's 1:1000 cancer risk threshold and, as described below, is consistent with the following recommendations:

- 1997 Recommendation of the Division's Airborne Contaminants Advisory Committee;
- 2007 Analysis by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA);
- 2010 Recommendation by the Division's Health Effects Advisory Committee (HEAC);
- 2011 Toxicological Review of Trichloroethylene by the U.S. Environmental Protection Agency (EPA);
- 2012 Analysis by OEHHA;
- 2014 Analysis by the International Agency for Research on Cancer (IARC);
- 2015 Reassessment by the Hazard Evaluation System and Information Service (HESIS) of the California Department of Public Health (CDPH) for the HEAC;
- 2020 Risk Evaluation for Trichloroethylene by U.S. EPA;

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[8] 106 cancer cases / 1,000 workers = 380 cancer cases / 3,578 workers.

[9] California EPA, Office of Environmental Health Hazard Assessment (OEHAA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California. Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. Applying the revised URL using equation #3, p. 9, where C_{0cc} = the revised PEL in mg/m^3. C_{0cc} = Cancer risk/URL * [20m^3/10m^3 * 7 days/5 days * 52 weeks/50 weeks * 70 years/40 years]. That is: C_{0cc} = 0.001/4x10^{-3} (mg/m^3)$^{-1}$ * 5.09 = 1.27 mg/m^3, rounded to 1.3. To derive ppm: ppm = [1.3 mg/m3 * 24.45]/131.4 g/mol TCE = 0.24 ppm. In accordance with CCR title 27 §25721, OEHHA and HESIS use the inhalation volume of 10m^3 per day for workers (10m^3/20m^3 in equation #1), rather than using 8 out of 24 hours. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf) Accessed May 2025.

[10] 1 cancer case / 1,000 workers = 4 cancer cases / 3,582 workers.

- 2024 U.S. EPA Risk Management Rule under the Toxic Substances Control Act (TSCA).

The federal OSHA Sampling and Analytical Method 1001 for trichloroethylene shows that the proposed PEL of 0.24 ppm is reliably quantifiable in the laboratory with both 4-hour and 8-hour sample periods.[11] The federal OSHA quantitation limit for TCE is 0.013 ppm (0.068 mg/m^3) in workplace air, using personal sampling pumps to draw air at a rate of 50 mL/min through coconut shell adsorbent charcoal tubes.[12]

INFORMATIVE DIGEST

SUMMARY OF EXISTING LAWS AND REGULATIONS

This proposal affects CCR title 8, section 5155, Airborne Contaminants, Permissible Exposure Limit (PEL) for Trichloroethylene (TCE), Chemical Abstracts Registry #79016. Because occupational exposures fluctuate throughout the workday, section 5155 lists PELs as an 8-hour, time-weighted average (TWA) exposure concentration. The concentration is expressed as the amount of toxic material present in air as measured over an 8-hour period, using both parts per million (ppm) and milligrams per cubic meter (mg/m^3). In some cases, as with trichloroethylene, section 5155 also lists a short-term (15-minute) exposure limit (STEL) and maximum "ceiling limit" in addition to a PEL.

Section 5155 notes that "the Division recognizes the need for almost continuous review of these concentration limits and also anticipates the need for including new or additional substances." Accordingly, on an ongoing basis, the Division develops proposals to amend the PELs based on the following:

(1) New scientific evidence, including revised exposure limits, recommendations and analyses conducted by state and federal agencies and consensus bodies;

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[11] U.S. Department of Labor, OSHA, Industrial Hygiene Chemistry Division (May 1999). Sampling and Analytical Methods. Method 1001. Tetrachloroethylene, Trichloroethylene. https://www.osha.gov/sites/default/files/methods/osha-1001.pdf. Accessed June 2025.

[12] Applying the federal OSHA Sampling and Analytical Method 1001 (May 1999) for trichloroethylene shows that the proposed PEL of 0.24 ppm is reliably quantifiable in the laboratory with both 4-hour and 8-hour sample periods. The federal OSHA quantitation limit for TCE is 0.013 ppm (0.068 mg/m^3), using personal sampling pumps to draw workplace air at a rate of 50 mL/min through coconut shell adsorbent charcoal tubes.

- With a 240-minute sample, this equates to a detectable laboratory analytical mass of 8.3x10^{-4} mg of TCE. [C = M/(Q * t), where C = mg/m^3 air concentration; M = the analytical mass obtained in the lab; Q = the flow rate in 50 ml/min = 0.050 Lit/min = 5.0x10^{-5} m^3/min; t = time in mins.
- That is: M = C * (Q * t) = 0.068 mg/m^3 * (5.0x10^{-5} m^3/min * 240 min) = 0.00083 mg = 8.3x10^{-4} mg analytical mass obtainable in the laboratory]. With a 480-minute sample obtained with pumps operating at 50 mL/min, this analytical mass can be achieved at a TCE air concentration of 0.0064 ppm, or 6.4 ppb (3.5x10^{-3} mg/m^3).
- That is: [C = M/(Q * t), where C = mg/m^3 air concentration; M = the analytical mass obtained in the lab; Q = the flow rate in 50 ml/min = 0.050 Lit/min = 5.0x10^{-5} m3/min; t = time in mins).
- Therefore, the air concentration over 8 hours that can be detected in the laboratory is C = 0.00083 mg/(5.0x10^{-5} m^3/min * 480 mins) = 0.0064 ppm = 3.5x10^{-2} mg/m^3]. The proposed PEL of 0.24 ppm, or 1.3 mg/m^3, is therefore reliably quantifiable in the laboratory with both 4-hour and 8-hour sample periods.

(2) Consultation with California state agencies, including the Office of Environmental Health Hazard Assessment (OEHHA) and the Hazard Evaluation System and Information Service (HESIS) of the California Department of Public Health (CDPH), and;

(3) Input from an advisory committee, known as the Health Effects Advisory Committee (HEAC).

In setting PELs, including for carcinogens, the Division relies on the recommendations of HESIS and the HEAC. The Division does not conduct quantitative risk assessments. In recommending PELs for TCE, HESIS applies a cancer risk threshold of 1:1000; that is, where the PEL is set at a level that would cause one additional case of cancer to occur for every 1,000 workers who are exposed to the chemical substance at the PEL over a working lifetime under the conditions prescribed by CCR title 27 section 25721. For purposes of calculating "lifetime exposure" among workers to chemicals that cause cancer, section 25721(d) requires that specific assumptions "be used to calculate the reasonably anticipated rate of exposure to a chemical listed as causing cancer, unless more specific and scientifically appropriate data are available." Under subsection (d)(3), workers are assumed to inhale $10m^3$ of workplace air per 8-hour day, 40-hours per week, 50 weeks per year, over 40 years.[13]

Cal//EPA and the National Institute for Occupational Safety and Health (NIOSH) establish more protective exposure limits. Under Cal/EPA's Safe Drinking Water and Toxic Enforcement Act of 1986, also known as Proposition 65, the "no significant cancer risk" for carcinogens and reproductive toxicants is set at 1:100,000, or 10^{-5}.[14] Beginning in 2017, NIOSH began applying an initial exposure control point of 1:10,000 in setting Risk Management Levels (RML-CA) for occupational carcinogens, previously known as Recommended Exposure Limits (REL); that is, where one excess cancer case in 10,000 workers would be expected over a 45-year working lifetime.[15] When measurement of the carcinogen at the RML-CA is not analytically feasible at the 1 in 10,000 risk estimate, NIOSH sets the RML-CA at the limit of quantification (LOQ) or reliable quantitation limit (RQL) of the analytical method.

SUMMARY OF SECTIONS AFFECTED

Amend: 5155

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[13] California Code of Regulations, Title 27, Environmental Protection. §25721. Level of Exposure to Chemicals Causing Cancer. Updated through 3/11/22. Noting at (d)(3) that "For workplace exposures, the exposed worker inhales ten cubic meters of workplace air per eight-hour day, forty hours per week, fifty weeks per year over a forty-year period." https://www.law.cornell.edu/regulations/california/27-CCR-25721. Accessed June 2025

[14] California Code of Regulations (CCR), Title 27, Section 25703(b). "For chemicals assessed in accordance with this section, the risk level which represents no significant risk shall be one which is calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure at the level in question…"https://govt.westlaw.com/calregs/Document/IBB79EABB512211EC828B000D3A7C4BC3. . Accessed June 2025.

[15] U.S. Centers for Disease Control, National Institute for Occupational Safety and Health (July 2017). Current Intelligence Bulletin 68. NIOSH Chemical Carcinogen Policy. https://www.cdc.gov/niosh/docs/2017-100/pdf/2017-100.pdf. Accessed June 2025.

AUTHORITY AND REFERENCE

The authority and reference for this action occur through both implied and expressauthority as described below:

Authority: Labor Code 142.3

Reference: Labor Code Sections 142.3 and 144.6

COMPARABLE FEDERAL STATUTES OR REGULATIONS

Federal OSHA requires that regulations developed by state OSHA programs be "at least as effective" as the counterpart federal OSHA regulation.[16] The proposed rulemaking establishes an amended TCE PEL of 0.24 ppm, which is 5,000 times lower and therefore more protective than the federal OSHA PEL of 100 ppm. The rulemaking withdraws the existing California STEL of 100 ppm and ceiling limit of 300, which are 200 ppm and 300 ppm, respectively, under federal OSHA.[17] This action is also "at least as effective" as federal OSHA because it prohibits these very high, short-term exposures that are allowed under federal OSHA.

Federal OSHA acknowledges that "many of its PELs are outdated and inadequate for ensuring protection of worker health."[18] This includes the PEL for TCE. OSHA updated its Air Contaminants Standard in 1989 by lowering the PELs for 212 substances to more protective levels, while also setting new PELs for 164 substances that were not previously regulated. During this process, OSHA reduced the PEL for TCE from 100 ppm to 50 ppm.[19]

In 1992, however, the U.S. Court of Appeals, Eleventh Circuit, vacated OSHA's 1989 PELs, including the TCE PEL of 50 ppm; as a consequence, the OSHA PEL for TCE remains at 100 ppm today.[20]

In 2013, in an effort to better protect workers, OSHA began publicizing updated PELs.[21] For TCE, OSHA listed the California PEL of 25 ppm, the NIOSH Recommended Exposure Limit (REL) of 25 ppm (as a 10-hour TWA) and the threshold limit value (TLV®) of the American

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[16] U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) (2025). State Plans. Frequently Asked Questions. https://www.osha.gov/stateplans/faqs. Accessed June 2025.
[17] U.S. Department of Labor, OSHA (August 5, 1993). Permissible Exposure Limits: Annotated Tables. https://www.osha.gov/annotated-pels. Accessed June 2025.
[18] U.S. Department of Labor, OSHA (August 5, 1993). Memorandum on Compliance and Enforcement Activities Affected by the PELs Decision. https://www.osha.gov/laws-regs/standardinterpretations/1993-08-05. Accessed May 2025.
[19] U.S. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) (Sept 2007). Pocket Guide to Chemical Hazards. p. 316, showing the existing OSHA PEL for TCE, and p. 371, showing the vacated PEL for TCE in Appendix G of Vacated 1989 OSHA PELs. https://www.cdc.gov/niosh/npg/default.html. Accessed May 2025.
[20] U.S. Centers for Disease Control and Prevention, NIOSH (October 18, 2018). Appendix G: 1989 Air Contaminants Update Project – Exposure Limits NOT in Effect. https://www.cdc.gov/niosh/npg/nengapdxg.html#:~:text=*In%20July%201992%2C%20the%2011th,the%20PELs%20that%20were%20vacated. Accessed June 2025.
[21] U.S. Department of Labor, OSHA (August 5, 1993). Permissible Exposure Limits: Annotated Tables. https://www.osha.gov/annotated-pels. Accessed June 2025.

Conference of Governmental Industrial Hygienists (ACGIH®) of 10 ppm.[22,23] However, as described below, all of these limits were established based on endpoints other than cancer, and before U.S. EPA classified TCE as a known human carcinogen in 2011; these limits are therefore no longer protective.

POLICY STATEMENT OVERVIEW

The purpose of this rulemaking is to meet the Division's 1:1000 cancer risk threshold by reducing the 8-hour TWA PEL for TCE from 25 ppm to 0.24 ppm, while also withdrawing the STEL and ceiling limit. The revised PEL thereby provides greater protection for workers from health effects associated with exposures to TCE.

SUMMARY OF EFFECT OF PROPOSED REGULATORY ACTION

1. Amend Section 5155.

Section 5155 is amended to change the TCE PEL from 25 ppm and 135 mg/m^3 to 0.24 ppm and 1.3 mg/m^3. This is necessary to protect employees at places of employment from exposure to a known human carcinogen, as established by scientific consensus. In accordance with Labor Code section 144.6, the amended PEL will assure, "to the extent feasible, that no employee will suffer material impairment of health or functional capacity" from exposure to TCE over a working lifetime. The proposed PEL is also necessary to meet the Division's 1:1000 cancer risk threshold for occupational carcinogens.

The PEL for TCE was established before TCE was confirmed to be a human carcinogen; the PEL is therefore not protective. The Board established the PEL, STEL and ceiling limit for TCE in 1988 based on evidence of "central nervous system impairment, cognitive decrements and renal toxicity."[24] Since then, as detailed below, multiple organizations have classified TCE as a human carcinogen. U.S. EPA classified TCE as a known human carcinogen in 2011;[25] IARC classified TCE as a Group 1 carcinogen in 2014, based on "convincing evidence that the agent

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[22] U.S. Department of Labor, OSHA, Occupational Chemical Database (2025). Trichloroethylene. https://www.osha.gov/chemicaldata/684. Accessed June 2025.
[23] U.S. Centers for Disease Control and Prevention, NIOSH (2025). Appendix C - Supplementary Exposure Limits. Trichloroethylene. https://www.cdc.gov/niosh/npg/nengapdxc.html. Accessed May 2025.
[24] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. (Table A-2, p. A-25, Trichloroethylene, TLV Basis). Accessed May 2025.
[25] U.S. EPA (Sept 2011) Toxicological Review of Trichloroethylene (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS). (p. 6-43). https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0199tr/0199tr.pdf. Referenced in the OEHHA Initial Statement of Reasons, "Proposed Amendment To Section 25705(B), Specific Regulatory Levels Posing No Significant Risk: Trichloroethylene Safe Drinking Water And Toxic Enforcement Act Of 1986 Proposition 65." https://oehha.ca.gov/proposition-65/chemicals/trichloroethylene. Accessed May 2025.

causes cancer in humans;"[26, 27] the National Institute for Occupational Safety and Health (NIOSH) lists TCE as a "known carcinogen;"[28] the U.S. CDC's Agency for Toxic Substances and Disease Registry (ATSDR) 2019 Toxicological Profile for TCE describes it as "known to be a human carcinogen based on sufficient evidence of carcinogenicity from humans;"[29] U.S. EPA reaffirmed the conclusions of its 2011 toxicological review of TCE in 2020; [30] and, based on these assessments, U.S. EPA established a timeline in 2024 for prohibiting nearly all commercial and consumer uses of TCE within one year, with certain exceptions.[31] This action has since been delayed by the Trump Administration and the Third Circuit Court of Appeals.

In addition to cancer, U.S. EPA describes TCE as posing "a human health hazard to the central nervous system, kidney, liver, immune system, reproductive system, and to the developing fetus."[32]

Because the TCE PEL has not been updated to reflect these findings, it is no longer consistent with the scientific evidence and is therefore not sufficiently protective of workers. It is therefore no longer consistent with Labor Code sections 144.6 and 147.1 or with CCR title 8 section 5155.

Because it was established without awareness of TCE's carcinogenic properties, the TCE PEL far exceeds the Division's 1:1000 cancer risk threshold for occupational exposures. Based on the most recent 2011 risk assessment of U.S. EPA, which was confirmed by OEHHA in 2012 and by HESIS in 2015, the Division calculated that exposure over a working lifetime to TCE at the PEL of 25 ppm results in a lifetime cancer risk of 106 cases per 1,000 workers, more than 100 times over the Division's 1:1000 cancer risk threshold. The proposal reduces the lifetime cancer risk to one in 1,000 workers.

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[26] International Agency for Research on Cancer (IARC) (2014). Trichloroethylene, Tetrachloroethylene, and Some Other Chlorinated Agents. Volume 106 (p. 35). https://www.ncbi.nlm.nih.gov/books/NBK294281/. Accessed May 2025.
[27] International Agency for Research on Cancer (IARC) (2019). IARC Monographs on the Identification of Carcinogenic Hazards to Humans: Questions and Answers. https://monographs.iarc.who.int/wp-content/uploads/2018/07/QA_ENG.pdf. Accessed June 2025.
[28] U.S. Centers for Disease Control and Prevention, NIOSH (June 21, 2019). Trichloroethylene. Also listing domestic and international resources on the toxicity of TCE. https://www.cdc.gov/niosh/topics/trichloroethylene/default.html#Value. Accessed June 2025.
[29] U.S. Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry (ATSDR) (June 2019). Toxicological Profile for Trichloroethylene (p. 11). https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf. Accessed May 2025.
[30] U.S. EPA (November 2020). Risk Evaluation for Trichloroethylene (p. 33, line 1379). https://www.epa.gov/sites/default/files/2020-11/documents/1._risk_evaluation_for_trichloroethylene_tce_casrn_79-01-6.pdf. Accessed May 2025.
[31] Federal Register/Vol. 89, No. 242 (Tuesday, December 17, 2024). Rules and Regulations. Environmental Protection Agency 40 CFR Part 751 [EPA–HQ–OPPT–2020–0642; FRL–8317–02– OCSPP] RIN 2070–AK83; Trichloroethylene (TCE); Regulation Under the Toxic Substances Control Act (TSCA). Final Rule. www.govinfo.gov/content/pkg/FR-2024-12-17/pdf/2024-29274.pdf. Accessed June 2025.
[32] U.S. Environmental Protection Agency (Sept 16, 2024). Case Studies on Safer Alternatives for Solvent Degreasing Applications. Trichloroethylene. https://www.epa.gov/p2/case-studies-safer-alternatives-solvent-degreasing-applications. Accessed May 2025.

The Division derived the revised TCE PEL by applying the following OEHHA calculations:[33]

(1)	Molecular weight (MW):	131.4 g/mol
(2)	Existing PEL:	25 ppm (135 mg/m^3)[34]
(3)	Proposed PEL:	0.24 ppm
(4)	ppm to mg/m^3 (Proposed)	mg/m^3 = (ppm * MW) / 24.45 = (0.24 ppm * 131.4 g/mol) / 24.45 = 1.3 mg/m^3
	(Existing 25 ppm)[35]	mg/m^3 = (ppm * MW) / 24.45 = (25 * 131.4 g/mol) / 24.45 = 134.4
(5)	mg/m^3 to ppm (Proposed)	ppm = (24.45 * mg/m^3) / MW = (24.45 * 1.3 mg/m^3) / 131.4 = 0.24 ppm
	(Existing 135 mg/m^3)	ppm = (24.45 * mg/m^3) / MW = (24.45 * 134.4 mg/m^3) / 131.4 = 25 ppm.
(6)	URL:	Unit Risk Level in $(mg/m^3)^{-1}$ = 4.0 x 10^{-3} $(mg/m^3)^{-1}$ The excess cancer risk associated with working lifetime inhalation exposure to a unit air concentration (e.g., 1 $\mu g/m^3$) of a given chemical.[36]
(7)	CoCC:	Occupational Air Concentration (PEL) in mg/m^3 needed to achieve a specific cancer risk level, such as one cancer among every 1,000 similarly exposed workers.
(8)	Cancer risk level:	Target cancer risk level; e.g. 1 in 1,000, or 0.001, or (1 x 10^{-3}).
(9)	CCR title 27 §25721:	Workers inhale $10m^3$ of workplace air per 8h day, or per $20m^3$, 40h per week, 50 wks per year over 40 yrs.

Equation 1:

To calculate the TCE Occupational Air Concentration necessary to achieve a risk level of one cancer case for every 1,000 workers (0.001), based on OEHHA's cancer URL of 4.0 x 10^{-3} $(mg/m^3)^{-1}$:

$$\text{CoCC} = \frac{\text{Cancer risk}}{\text{URL}} * \frac{20m^3 \text{ Inhalation volume}}{10m^3 \text{ inhalation volume}} * \frac{7 \text{ days}}{5 \text{ days}} * \frac{52 \text{ weeks}}{50 \text{ weeks}} * \frac{70 \text{ years}}{40 \text{ years}}$$

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[33] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. Equations 1 and 3, p. 9. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed June 2025.

[34] California Code of Regulations (CCR) title 8, section 5155, Airborne Contaminants (2025). Permissible Exposure Limits for Chemical Contaminants. Trichloroethylene (Chemical Abstracts Registry #79016) https://www.dir.ca.gov/title8/5155.html. Using the conversion equation with 25 ppm results in 134.4 mg/m^3; however, CCR title 8, section 5144 rounds this to 135 mg/m^3. (25 ppm * 131.4 g/mol) / 24.45 = 134.4 ≈ 135 mg/m^3). Accessed May 2025.

[35] California Code of Regulations (CCR) title 8, section 5155, Airborne Contaminants (2025). Permissible Exposure Limits for Chemical Contaminants. Trichloroethylene (Chemical Abstracts Registry #79016) https://www.dir.ca.gov/title8/5155.html. Using the conversion equation with 25 ppm results in 134.4 mg/m^3; however, CCR title 8, section 5144 uses 135 mg/m^3 (25 ppm * 131.4 g/mol) / 24.45 = 134.4 ≈ 135 mg/m^3). Accessed May 2025.

[36] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. p. 8. For example, four cases of cancer would be expected to occur among 1,000 people for every 1 $\mu g/m^3$ of exposure to a chemical with URL of 4.0 x 10-3 $(mg/m3)^{-1}$; that is (1,000 * 0.004) = 4 cases. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed June 2025.

$$= \frac{0.001}{4.0 \times 10^{-3}\ (mg/m^3)^{-1}} * \frac{20m^3}{10m^3} * \frac{7\ days}{5\ days} * \frac{52\ weeks}{50\ weeks} * \frac{70\ years}{40\ years}$$

= (0.25 mg/m^3 * 5.09) = **1.27 mg/m^3** = **rounded to 1.3 mg/m^3**

Converting to ppm:

$$ppm = \frac{(24.45 * mg/m^3)}{MW\ g/mol} = \frac{(24.45 * 1.3\ mg/m^3)}{131.4\ g/mol} = \mathbf{0.24\ ppm}$$

Equation 2:

Excess lifetime cancer risk at the proposed PEL of 1.3 mg/m^3:

$$\text{Excess lifetime cancer risk} = PEL * URL * \frac{10m^3\ inh\ volume}{20m^3\ Inh\ volume} * \frac{5\ days}{7\ days} * \frac{50\ weeks}{52\ weeks} * \frac{40\ years}{70\ years}$$

$$= 1.3\ mg/m^3 * 4.0 \times 10^{-3}\ (mg/m^3)^{-1} * 0.196$$

$$= 0.0010$$

Excess lifetime cancer risk for 1,000 workers at the proposed PEL 1.30 mg/m^3 = 0.0010 * 1,000 = 1.0 = **1.0 cancer per 1,000 workers.**

Excess lifetime cancer risk at the existing PEL of 135 mg/m^3:

$$\text{Excess lifetime cancer risk} = PEL * URL * \frac{10m^3\ inh\ volume}{20m^3\ Inh\ volume} * \frac{5\ days}{7\ days} * \frac{50\ weeks}{52\ weeks} * \frac{40\ years}{70\ years}$$

$$= 135\ mg/m^3 * 4.0 \times 10^{-3}\ (mg/m^3)^{-1} * 0.196$$

$$= 0.106$$

Excess lifetime cancer risk for 1,000 workers existing PEL of 135 mg/m^3 = 0.106 * 1,000 = **106 cancers per 1,000 workers.**

Under the proposed TCE PEL reduction, the existing STEL and ceiling limit for TCE are no longer appropriate or necessary. An STEL is used to supplement the 8-hour TWA PEL "where there are recognized acute effects from a substance whose toxic effects are primarily of a chronic nature."[37] These effects include, for example, "narcosis of sufficient degree to increase the likelihood of accidental injury, impaired self-rescue, or materially reduced work efficiency."[38] Under section 5155, the STEL is defined as "a 15-minute time-weighted average exposure which is not to be exceeded at any time during a workday even if the 8-hour time-weighted average is below the PEL."[39]

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[37] American Conference of Governmental Industrial Hygienists (ACGIH) (2025). TLV Chemical Substances Introduction. See "Threshold Limit Value-Short Term Exposure Limit (TLV-STEL"). https://www.acgih.org/science/tlv-bei-guidelines/tlv-chemical-substances-introduction/. Accessed May 2025.
[38] American Conference of Governmental Industrial Hygienists (ACGIH) (2025). TLV Chemical Substances Introduction. See "Threshold Limit Value-Short Term Exposure Limit (TLV-STEL"). https://www.acgih.org/science/tlv-bei-guidelines/tlv-chemical-substances-introduction/. Accessed May 2025.
[39] California Code of Regulations title 8, section 5155 Airborne Contaminants (2025). https://www.dir.ca.gov/title8/5155.html. Accessed May 2025.

The threshold for mild central nervous system (CNS) depression for TCE is in the range 81-110 ppm.[40] However, a single, 15-minute (short-term) exposure to TCE at 81 ppm during an 8-hour workday results in an 8-hour TWA of 2.5 ppm, assuming no other TCE exposures occur during the remaining 7.75 hours. This is more than 12 times greater than the proposed 8-hour TWA PEL of 0.24 ppm in this rulemaking.[41] The STEL is therefore not relevant. This same finding applies in the case of the TCE ceiling limit.

Because air concentrations of TCE cannot approach the 15-minute STEL or ceiling limit without exceeding the proposed 8-hour PEL, this rulemaking withdraws the existing STEL and ceiling limit.[42] In this way, the proposed 8-hour TWA PEL also protects against the short-term neurological effects of TCE more effectively than the existing STEL and ceiling limit.

This rulemaking is based on the Division's analysis of the following documents:

- 1997 Recommendation of the Division's Airborne Contaminants Advisory Committee;
- 2007 Analysis by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA);
- 2010 Recommendation by the Division's HEAC;
- 2011 Toxicological Review of Trichloroethylene by the U.S. EPA;
- 2012 Analysis by OEHHA;
- 2014 Analysis by IARC;
- 2015 Reassessment by HESIS of the CDPH for the HEAC;
- 2020 Risk Evaluation for Trichloroethylene by U.S. EPA;
- 2024 U.S. EPA Risk Management Rule under the TSCA.

Each of these is described below.

1997 recommendation of the Division's Airborne Contaminants Advisory Committee

In 1997, the Division's Airborne Contaminants Advisory Committee identified 16 chemicals in title 8, section 5155, including TCE, which were recognized carcinogens but for which the PEL had been established based on a health effect *other than cancer*. Rather than amend these PELs to be protective against cancer risks, the committee issued the following "Cancer Position Statement," which called on the Division to reconsider these PELs by applying a

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[40] Agency for Toxic Substances and Disease Registry. *Case Studies in Environmental Medicine: Trichloroethylene Toxicity* (WB1112). P. 25. Atlanta: U.S. Department of Health and Human Services; November 8, 2007, p. 25. https://archive.cdc.gov/www_atsdr_cdc_gov/csem/tce/docs/tce.pdf (Accessed May 2026).

[41] The 8-hour TWA in the case described here is derived using the formula in the appendix to §5155: 8-hour TWA = $[(C_1*T_1)+(C_2*T_2)+\ldots./8hrs]$ = [(81 ppm * 0.205 hrs.) + (0 ppm * 7.75 hrs.)]/8hrs = (81 ppm * 0.205 hrs.)/8hrs = 2.5 ppm.

[42] Applying the formula in the appendix to section 5155 shows that a TCE exposure at the 15-minute STEL of 100 ppm would exceed the proposed 8-hour PEL of 0.24 ppm after only one minute, and an exposure at the ceiling limit of 300 ppm would exceed the proposed 8-hour PEL of 0.24 ppm after only 20 seconds. In both cases, the proposed 8-hour PEL would be reached well before the acute neurologic effects occur that the STEL and ceiling limit are intended to protect against.

quantitative risk assessment approach:

> *"This substance has been identified by the International Agency for Research on Cancer as a carcinogen (Group 2B or higher). The exposure limits recommended have been primarily set on the basis of other types of toxic results, damage or interference with organ systems, irritation, respiratory problems, etc. Quantitative risk assessments can be used to estimate risks of cancer at various exposure levels in order to set a Permissible Exposure Limit. No such risks assessments have been conducted by this committee. Currently, neither the Division of Occupational Safety and Health, nor the Occupational Safety and Health Standards Board have standard methods for performing these assessments or a useful criterion against which limits might be set. Cal/OSHA should reconsider the Permissible Exposure Limit proposed here if such a carcinogen guideline policy is adopted and appropriate resources can be allocated for an occupational risk assessment for this substance."* [43]

As recommended by the committee in this statement, the current rulemaking applies the occupational cancer risk assessment approach recommended by OEHHA and HESIS in amending the PEL for TCE.

2007 analysis by OEHHA

OEHHA is the lead agency for quantitative health risk assessment among California state agencies. At the request of HESIS, which provides technical support to the Division on toxic substances, OEHHA conducted quantitative risk assessments in 2007 for various occupational carcinogens, including TCE.

OEHHA's 2007 report identified 44 workplace chemicals that are listed as carcinogens under California Proposition 65 but *do not* have a PEL, and 62 additional workplace chemicals that are listed as carcinogens under Proposition 65 but have PELs based on a health endpoint *other* than cancer. OEHHA identified TCE among this latter group of 62 chemicals because the 1988 TCE PEL was based not on cancer but on central nervous systems impairment, cognitive decrements and renal toxicity, as noted above.

In its 2007 report, OEHHA applied a cancer unit risk level (URL) of 2.0 x 10^{-3} $(mg/m^3)^{-1}$ to the PEL of 25 ppm and found that exposure at the PEL over a working lifetime would produce 35 excess cancer cases per 1,000 workers, well over the Division's 1:1000 risk target.[44] According to OEHHA, the URL is best defined as the excess cancer risk associated with inhalation exposure over a working lifetime to an air concentration (e.g., 1 mg/m^3) of a particular

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[43] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. (Table A-2, p. A-25, Trichloroethylene, TLV Basis). (See footnote b, p. 37, and footnote a, p. A-26). Accessed May 2025.

[44] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed June 2025. (Table A-2, p. A-25, Trichloroethylene, TLV Basis, p. 55, table 6, row 37). Estimated Excess Cancer Cases per 1,000 Workers.) Table 6 lists the OEHHA Unit Risk Value as 2.0x10^{-3} $(mg/m^3)^{-1}$. To derive 35 excess cancer cases at the PEL of 25 ppm, or 135 mg/m^3, OEHHA applies equation #1, p. 9: "Excess lifetime cancer risk" = PEL * [8/24 * 5/7 * 50/52 * 40/70] * Unit Risk Level $(mg/m^3)^{-1}$. That is: [135 mg/m^3 * 0.131. * 2x10^{-3} $(mg/m^3)^{-1}$]= 0.035. Applying this risk level to 1,000 = [0.035 * 1,000] = 35.

chemical.[45] Based on the URL of 2.0 x 10^{-3} $(mg/m^3)^{-1}$ OEHHA calculated a revised PEL for TCE of 0.70 ppm, which at the time met the Division's 1:1000 risk threshold.[46,47] OEHHA recommended that, more generally, PELs be developed using this same approach:

> *"By using lists and risk assessments already developed by OEHHA, priorities for developing protective occupational standards can be efficiently identified by HESIS, and scarce state resources can be leveraged to the maximum benefit. Drawing on OEHHA's analyses will also provide a stronger scientific basis for developing protective occupational standards."*[48]

OEHHA's recommendation to apply quantitative risk assessment methods to the development of PELs is consistent with Labor Code sections 144.6 and 147.1 and is aligned with the 1997 "Carcinogen Position Statement" of the Division's Airborne Contaminants Advisory Committee, noted above, as well as with the recommendations of HESIS in 2010 and 2015.

The proposed rulemaking for TCE is consistent with OEHHA's recommendations in its 2007 report, but it applies a revised, more protective, URL of 4.0 x 10^{-3} $(mg/m^3)^{-1}$ that U.S. EPA established in 2011 and OEHHA confirmed in 2012, as noted below.

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[45] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. (p. 8). The 2007 URL for TCE of 2.0 x 10^{-3} $(mg/m^3)^{-1}$ is interpreted by OEHHA to mean that if 10,000 people inhaled 1 mg/m^3 of TCE every day over a lifetime, approximately 20 excess cases of cancer would be expected in that population; that is, [2.0 x 10^{-3} $(mg/m^3)^{-1}$ * 10,000] = 20. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed May 2025.

[46] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. (p. 66, Table 10. Trichloroethylene) https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed May 2025.
To derive a PEL of 0.7 ppm (3.7 mg/m^3), OEHHA uses the unit risk level (URL) of 2x10^{-3} $(mg/m^3)^{-1}$ and applies equation #3, p. 9, where C_{0cc} = the revised PEL in mg/m^3. That is: C_{0cc} = Cancer risk/URL * [24/8 * 7/5 * 52/50 * 70/40] = 0.001/2x10^{-3} $(mg/m^3)^{-1}$ * 7.64 = 3.82 mg/m^3. To derive ppm: ppm = [3.82 mg/m^3 * 24.45]/131.4 g/mol TCE = 0.71 ppm. In accordance with CCR title 27, Environmental Protection, §25721(d)(3) OEHHA now applies the inhalation volume of 10m^3 per day for workers (10m^3/20m^3) for equations #1 (and 20m^3/10m^3 for equation #3), rather than using 8 out of 24 hours, or 8/24, as shown in equation #1, p. 9.

[47] California Code of Regulations, title 27, Environmental Protection. §25721. Level of Exposure to Chemicals Causing Cancer. Updated through 3/11/22. Noting at (d)(3) that "For workplace exposures, the exposed worker inhales ten cubic meters of workplace air per eight-hour day, forty hours per week, fifty weeks per year over a forty-year period.." https://www.law.cornell.edu/regulations/california/27-CCR-25721. Accessed May 2025.

[48] California EPA, Office of Environmental Health Hazard Assessment (OEHHA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California: Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations (p. 111) (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf). Accessed May 2025.

2010 recommendation by HESIS to HEAC

At its March 24, 2010 meeting, HEAC noted that IARC, the National Toxicology Program and U.S. EPA all classified TCE as a "probable human carcinogen."[49] In response, HEAC recommended that the PEL for TCE be reduced from 25 ppm to 0.4 ppm.[50] HEAC reached this decision based on the recommendation of Will Forrest of the CDPH HESIS, which advises the Division on matters pertaining to toxic substances. At the time, OEHHA's unit risk level (URL) for TCE was 2.0×10^{-3} $(mg/m^3)^{-1}$. OEHHA had not yet updated their URL to 4.0×10^{-3} $(mg/m^3)^{-1}$ in response to U.S. EPA's 2011 Toxicological Review of TCE. HESIS applied OEHHA's cancer risk assessment methods using the Division's 1:1000 risk threshold.[51] The HEAC noted that at 0.4 ppm, there would be no need for a STEL.

2011 Toxicological Review of Trichloroethylene by U.S. EPA

In its 2011 review, U.S. EPA doubled the TCE inhalation unit risk level (URL) from 2.0×10^{-3} $(mg/m^3)^{-1}$ to 4.0×10^{-3} $(mg/m^3)^{-1}$, "based on human kidney cancer risks reported in 2006 by Charbotel et al. and adjusted, using human epidemiological data, for potential risk for non-Hodgkin Lymphoma (NHL) and liver cancer."[52, 53] This means that in 2011, U.S. EPA concluded that TCE was essentially two-times more potent as a carcinogen than previously thought.

In taking this action, U.S. EPA characterized TCE as "carcinogenic to humans" by all routes of exposure, based on "convincing evidence of a causal association between TCE exposure in humans and kidney cancer," and noting that "there is high confidence in these unit risks for cancer, as they are based on good-quality human data, as well as being similar to unit risk estimates based on multiple rodent bioassays."[54]

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[49] Health Effects Advisory Committee (HEAC) (March 24, 2010). Meeting of the Health Expert Advisory Committee (HEAC) for Permissible Exposure Limits for Airborne Contaminants in the Workplace. See links to "Trichloroethylene" and to "Minutes." https://www.dir.ca.gov/dosh/doshreg/5155Meetings_2009.htm. Accessed May 2025.

[50] Health Effects Advisory Committee (HEAC) (March 24, 2010). Meeting of the Health Expert Advisory Committee (HEAC) for Permissible Exposure Limits for Airborne Contaminants in the Workplace. See link to "Minutes" p. 5. https://www.dir.ca.gov/dosh/doshreg/5155Meetings_2009.htm. Accessed May 2025.

[51] California Department of Public Health, Hazard Evaluation System and Information Service (HESIS) (Oct 6, 2010) Will Forest. Trichloroethylene. Briefing for the DOSH Health Effects Advisory Committee. (https://www.dir.ca.gov/dosh/doshreg/5155Meetings_2009.htm). HEAC meeting, link for "Trichloroethylene."

[52] U.S. Environmental Protection Agency (Sept 2011) Toxicological Review of Trichloroethylene (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS). (p. 6-43). https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0199tr/0199tr.pdf. Accessed May 2025. Cited in the OEHHA Initial Statement of Reasons, "Proposed Amendment to Section 25705(B), Specific Regulatory Levels Posing No Significant Risk: Trichloroethylene Safe Drinking Water And Toxic Enforcement Act Of 1986 Proposition 65."

[53] The revised URL for TCE of 4.0×10^{-3} $(mg/m^3)^{-1}$ can be interpreted to mean that if 10,000 people inhaled 1 mg/m^3 of TCE every day over a lifetime, approximately 40 excess cases of cancer would be expected in that population; that is: [4.0×10^{-3} $(mg/m^3)^{-1}$ * 10,000] = 40. U.S. EPA's revised URL for TCE doubles the cancer risk of TCE, which previously (at the URL of 2.0×10^{-3} $(mg/m^3)^{-1}$) was expected to produce 20 cases of excess cancer within a population of 10,000.

[54] U.S. Environmental Protection Agency (2011). Toxicological Review of Trichloroethylene (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS). (pp. 6-42 and 6-43). https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0199tr/0199tr.pdf. Accessed May 2025.

2012 analysis by OEHHA

In 2012, OEHHA reviewed the 2011 U.S. EPA Toxicological Review of Trichloroethylene for purposes of Proposition 65 and "found it to be a reliable scientific basis for updating the No Significant Risk Levels (NSRLs) that is consistent with Section 25703 guidance."[55] OEHHA thereby confirmed U.S. EPA's new URL or 4.0 x 10^{-3} $(mg/m^3)^{-1}$. OEHHA updated its TCE Safe Harbor level under Proposition 65 accordingly.[56]

The proposed rulemaking reduces the TCE PEL from 25 ppm to 0.24 ppm by applying the revised cancer URL of 4.0 x10^{-3} $(mg/m^3)^{-1}$ for TCE generated by U.S. EPA in 2011 and confirmed by OEHHA in 2012.

2014 Reclassification IARC

In 2014, IARC reclassified TCE as "carcinogenic to humans," designating it as a Group 1 carcinogen. Chemicals receive a Group 1 designation only when IARC finds "convincing evidence that the agent causes cancer in humans."[57]

In its previous review in 1995, IARC had retained TCE's classification as "probably carcinogenic to humans" (Group 2A) based on "sufficient evidence for carcinogenicity in experimental animals and limited evidence in humans."[58]

2015 Reassessment by HESIS for the HEAC

On July 15, 2015, HESIS updated its recommended TCE PEL from 0.40 ppm to 0.20 ppm, based on the following:

(1) The 2011 U.S. EPA report that TCE is "carcinogenic to humans by all routes of exposure based on convincing evidence of a causal association between trichloroethylene exposure of humans and kidney cancer";

(2) The 2014 designation by IARC of TCE as a Group 1 carcinogen "on the basis of sufficient evidence in humans for its carcinogenicity"; and:

(3) The 2015 conclusion of the U.S. National Toxicology Program of the National Institutes of Health that TCE is "known to be a human carcinogen" with "sufficient evidence of

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[55] Cal/EPA, Office of Environmental Health Hazard Assessment (OEHHA) (March 16, 2012). Date listed at https://oehha.ca.gov/proposition-65/chemicals/trichloroethylene. Initial Statement of Reasons title 27, California Code of Regulations Proposed Amendment to Section 25705(B), Specific Regulatory Levels Posing No Significant Risk: Trichloroethylene Safe Drinking Water And Toxic Enforcement Act Of 1986 Proposition 65. https://oehha.ca.gov/media/031612ISOR_TCE.pdf. Accessed May 2025.

[56] Cal/EPA, Office of Environmental Health Hazard Assessment (OEHHA) (2022). Chemicals Considered or Listed Under Proposition 65. Trichloroethylene. https://oehha.ca.gov/proposition-65/chemicals/trichloroethylene. Access June 2025.

[57] International Agency for Research on Cancer (IARC) (Dec 10, 2019). IARC Monographs on the Identification of Carcinogenic Hazards to Humans: Questions and Answers. https://monographs.iarc.who.int/wp-content/uploads/2018/07/QA_ENG.pdf. Accessed May 2025.

[58] IARC Working Group on the Evaluation of Carcinogenic Risks to Humans (2014). Trichloroethylene, Tetrachloroethylene, and Some Other Chlorinated Agents. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 106. See General Remarks, Trichloroethylene. General Remarks - Trichloroethylene, Tetrachloroethylene, and Some Other Chlorinated Agents - NCBI Bookshelf (nih.gov). Accessed May 2025.

carcinogenicity from studies in humans."[59]

HESIS applied U.S. EPA's revised URL of 4.0 x 10^{-3} $(mg/m^3)^{-1}$ using the Division's 1:1000 cancer risk threshold to derive a revised PEL of 0.20 ppm (rounded from 0.24 ppm), as follows:

Working lifetime exposure / lifetime exposure = 40/70 * 50/52 * 5/7 * 10/20 = 0.196

Working lifetime fraction * Unit Risk Factor = 0.196 * 0.004 $(mg/m3)^{-1}$ = 0.000784 $(mg/m3)^{-1}$

By the conversion factor, 0.000784 $(mg/m3)^{-1}$ = 0.004213 ppm^{-1}

The working lifetime exposure associated with a cancer risk level of 1/1000 is 0.001 / 0.004213 ppm^{-1} = 0.24 ppm, rounded to 0.20 ppm.

2020 Risk Evaluation for Trichloroethylene by U.S. EPA

In its 800-page reevaluation in 2020 on the risks of TCE, U.S. EPA concluded that there is a statistically significant association between TCE and increased incidence of kidney cancer, liver cancer, and non-Hodgkins lymphoma.[60] Based on its comprehensive review of the scientific literature, EPA "found unreasonable risks to workers from all occupational uses of TCE, except for distribution in commerce," as well as "unreasonable risks from most commercial uses of this chemical to workers nearby but not in direct contact with TCE (known as occupational non-users)." EPA found that "risks to workers and occupational non-users can come from both short- and long-term inhalation and dermal (through the skin) exposure."

In its 2020 reevaluation, EPA reaffirmed that TCE is "carcinogenic to humans," which was the same conclusion that EPA reached in its 2011 IRIS assessment; however, EPA (and OEHHA) did not change the TCE URL from its 2011 value of $(4x10^{-3}\ mg/m^3)^{-1}$.

In addition to cancer, EPA described TCE as posing "a human health hazard to the central nervous system, kidney, liver, immune system, reproductive system, and to the developing fetus."[61]

2024 U.S. EPA TSCA Risk Management Rule

On December 17, 2024 U.S. EPA issued a final rule to take effect on January 16, 2025 that would prohibit nearly all commercial and consumer uses of TCE within one year, based on the findings and conclusions of EPA's 2020 Risk Evaluation, which reaffirmed its 2011 toxicological review.[62] EPA allowed for a longer phase-out period for 13 industrial applications,

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[59] California Department of Public Health, Hazard Evaluation System and Information Service (HESIS) (July 15, 2015). Review of recent toxicological literature and authoritative body determinations for the six chemical PELs recommended by HEAC in 2010: Updated information on trichloroethylene. Not posted to the HEAC website for July 2015 but available in PDF as a Document Relied Upon.

[60] U.S. EPA (November 2020). Risk Evaluation for Trichloroethylene (p. 33, line 1379). (https://www.epa.gov/sites/default/files/2020-11/documents/1._risk_evaluation_for_trichloroethylene_tce_casrn_79-01-6.pdf). Accessed May 2025.

[61] U.S. Environmental Protection Agency (Sept 16, 2024). Case Studies on Safer Alternatives for Solvent Degreasing Applications. Trichloroethylene. (https://www.epa.gov/p2/case-studies-safer-alternatives-solvent-degreasing-applications). Accessed May 2025.

[62] Federal Register/Vol. 89, No. 242 (Tuesday, December 17, 2024). Rules and Regulations. Environmental Protection Agency 40 CFR Part 751 [EPA–HQ–OPPT–2020–0642; FRL–8317–02– OCSPP] RIN 2070–AK83; Trichloroethylene (TCE); Regulation Under the Toxic Substances Control Act (TSCA). Final Rule. www.govinfo.gov/content/pkg/FR-2024-12-17/pdf/2024-29274.pdf. Accessed June 2025.

and the agency established an Existing Chemical Exposure Limit (ECEL) of 0.2 ppm TCE as an 8-hour TWA for these purposes.[63]

EPA's action was delayed by the Trump Administration and was subject to a stay by the Third Circuit Court of Appeals in April 2025.[64] It was subsequently allowed to move forward and was implemented by EPA in September 2025, but it was derailed again with further legal action. It is now under judicial review.

DISCLOSURES REGARDING THE PROPOSED ACTION

- Mandate on local agencies and school districts: [NONE]
- Costs or savings to any state agencies: [NONE]
- Costs or savings to local agencies or school districts, which must be reimbursed in accordance with Part 7 (commencing with Section 17500) of Division 4 of the Government Code: [NONE]
- Other nondiscretionary costs or savings imposed on local agencies: [NONE]
- Costs or savings in federal funding to the state: [NONE]

BUSINESS IMPACT STATEMENT

The Division has determined that the proposed reduction in the TCE PEL will have no significant adverse economic impact on California businesses or individuals, nor will it affect the ability of businesses to create new business or expand business in California, or compete with businesses in other states. It will not affect the creation or elimination of jobs in California. The Division reached this conclusion based on the following findings:

The proposal affects 0.02% of California businesses, or 367 businesses statewide.

As of the second quarter of 2024, the California Employment Development Department (EDD) reported that 1,867,597 businesses operated in the state.[65] This is the latest quarter for which data are available. Under the California Environmental Reporting System (CERS), these businesses must submit annual reports to Cal/EPA if they store or handle hazardous materials, or manage underground or aboveground storage tanks, or generate hazardous waste.[66]

As of December 2024, Cal/EPA showed that 320,061 businesses in California (17%) reported

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[63] U.S. EPA. Fact Sheet. 2024 Final Risk Management Rule for Trichloroethylene under TSCA. www.epa.gov/system/files/documents/2024-12/tce-fact-sheet.pdf. Accessed June 2025.
[64] U.S. EPA (April 2025). Assessing and Managing Chemicals under TSCA. Risk Management for Trichloroethylene (TCE). https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-trichloroethylene-tce. Accessed June 2025.
[65] California Employment Development Department (EDD): Size of Business Data for California (Quarterly). Payroll and Number of Businesses by Size of Business – Classified by Industry (Table 2A) – 2024, Qtr. 2. Total businesses at line 10, column D (Total All Industries) in Table 2A are 1,867,597. https://labormarketinfo.edd.ca.gov/LMID/Size-Data-for-CA-Quarterly.html Accessed June 2025.
[66] California EPA, California Environmental Reporting System (CERS) (2024). https://cers.calepa.ca.gov/about-cers/. Accessed June 2025.

to CERS.[67] Of these, 142,639 (45%) are classified by Cal/EPA as "Chemical Storage Facilities," meaning that they use or handle a "hazardous material," which is defined under Health and Safety Code section 25501 as a chemical for which the "quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment."[68, 69] This definition applies to any chemical for which the producer reports health or environmental hazard data on the Safety Data Sheet (SDS). The minimum reporting threshold is 55 gallons for hazardous materials. TCE is considered a hazardous material. In addition, businesses are required to report the presence of *any* amount of "extremely hazard substances," as defined in Code of Federal Regulations (CFR) title 40, Part 355, Appendices A and B.[70]

Cal/EPA does not release CERS chemical inventory information to the public; however, through an interagency agreement, Cal/EPA releases this information to the California Department of Public Health, Occupational Health Branch, Hazard Evaluation System and Information Service (HESIS), on request. For the proposed revision to the TCE PEL, HESIS provided the Division with aggregated data on December 5, 2024 showing that 367 businesses in the CERS database reported using or handling TCE that year (Figure 1).[71]

Figure 1. Share of TCE usage among 367 affected businesses that reported using TCE, based on 2024 CERS reporting data.

Business or facility type	NAICS code	Number of businesses (Total = 367)	Average use (gal/day)	Percent of 367 total businesses
Automotive repair, dealership, body and paint	441110, 811111, 8111121	207	45 ± 39	56%
Manufacturing	31-35	31	141 ± 216	8%

[67] California EPA, California Environmental Reporting System (CERS) (2024). Cal/EPA Regulated Site Portal. Showing 320,061 entries from businesses into the CERS database. https://siteportal.calepa.ca.gov/nsite/map/results. Accessed June 2025.

[68] California Health and Safety Code, Section 25501 (January 1, 2023). Subsection (n)(1), Hazardous Material. https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=HSC&sectionNum=25501 Accessed June 2025.

[69] California EPA, California Environmental Reporting System (CERS) (2024). Cal/EPA Regulated Site Portal. Advanced Search Criteria. Filters. Regulatory Programs. Chemical Storage Facilities. Showing 142,639 entries for Chemical Storage Facilities in the CERS database. https://siteportal.calepa.ca.gov/nsite/map/results/filters. Accessed June 2025.

[70] California Health and Safety Code, Section 25507. Subsection (a)(3)(A). https://codes.findlaw.com/ca/health-and-safety-code/hsc-sect-25507/. See CFR title 40, Part 355, Appendix A and B. https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=HSC&sectionNum=25507.. Accessed June 2025.

[71] California EPA, California Environmental Reporting System (CERS) (December 5, 2024). Interagency communication with the California Department of Public Health (CDPH), Occupational Health Branch, Hazard Evaluation System and Information Service (HESIS). This dataset was provided under a confidentiality agreement between the agencies and is not accessible to the public.

Remediation	562910	16	1676 ± 2616	4%
Electric Power Distribution	221122	10	60 ± 94	3%
Warehouse/ Wholesalers	493110, 424690	7	1289 ± 1644	2%
Education/R&D	various	74	0.43 ± 0.41	20%
Other	various	22	52 ±8 5	6%

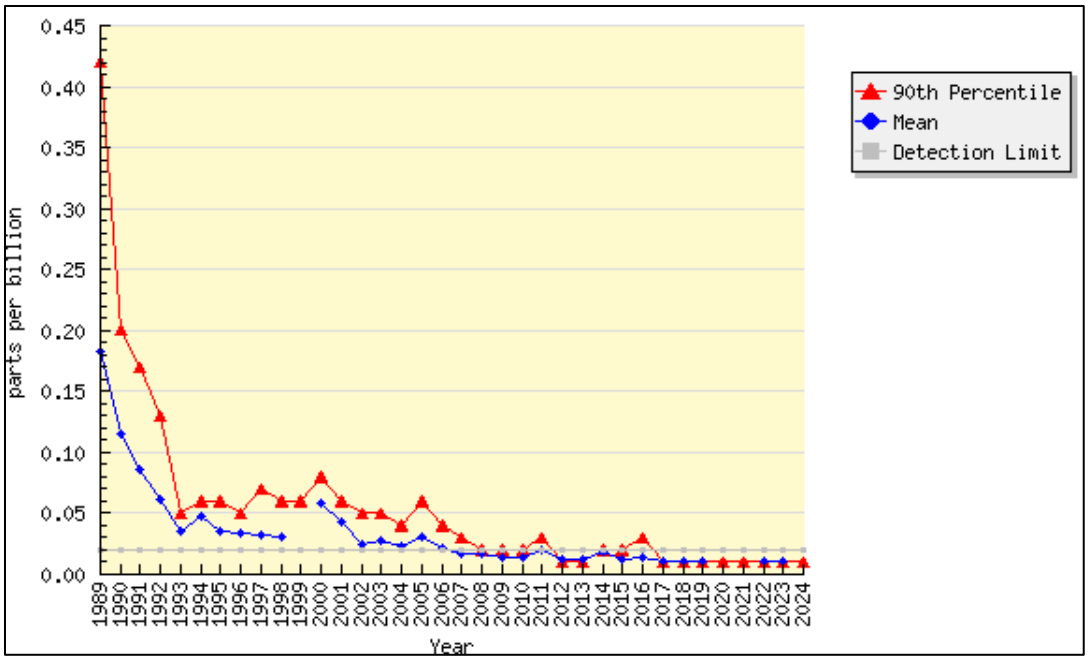
This represents 0.02% of California's 1,867,597 businesses, as of the second quarter of 2024.[72] Fifty-six percent (207) of these businesses are in automotive repair, auto dealerships and auto body and paint facilities (Figure 1). On account of its well-established toxicity, and in response to local and state government regulations and initiatives, 99.98% of California businesses no longer handle, store or otherwise work with TCE. The great majority of businesses are therefore unaffected by the proposed rulemaking.

Ambient levels of TCE measured in urban air confirm the limited use of TCE in California.

While the CERS data indicates that only 367 businesses reported using TCE in 2024, the limited use of TCE in California is also apparent in data reported by the California Air Resources Board (ARB) from ambient air monitoring stations located in urban areas of the state.[73] From 1989 to the most recent data reported in 2024, the mean statewide ambient TCE air concentration declined 95%, from 0.183 ppb to 0.010 ppb, below the detection limit of 0.020 ppb. Air concentrations of TCE have remained below the limit of detection since 2006. ARB's emissions data illustrates that since 1989, industrial and commercial uses of TCE have declined substantially, reflecting reduced usage statewide (Figure 2).

Figure 2. California TCE air measurements, 1989-2024, parts per billion (ppb).

[72] California Employment Development Department (EDD) (2024). Size of Business Data for California (Quarterly). Payroll and Number of Businesses by Size of Business – Classified by Industry (Table 2A) – 2024, Qtr. 2. Total businesses at line 10, column D (Total All Industries) in Table 2A are 1,867,597. https://labormarketinfo.edd.ca.gov/LMID/Size-Data-for-CA-Quarterly.html Accessed June 2025.
[73] California Air Resources Board (2025). Annual Statewide Toxics Summary: Trichloroethylene. (https://www.arb.ca.gov/adam/toxics/statepages/tcestate.html). Accessed June 2025.



The Division found declining use among a sample of businesses that reported using TCE.

In an earlier effort to gauge the use of TCE among California businesses potentially affected by the proposed PEL reduction, the Division sent inquiries by email in 2021 to a set of 52 car dealerships, automotive repair shops and manufacturing facilities that reported using TCE in 2020 under the CERS program. Thirty (30) businesses (58%) responded to the Division's inquiry. Fifteen (50%) of these businesses reported that they had discontinued use of TCE and in most cases had replaced it with safer, non-halogenated solvents. Nine manufacturers (30%) reported using TCE in closed-systems or vacuum degreasers that prevent worker exposures and environmental emissions. Three automotive repair facilities indicated that they used bulk TCE in hand-operated pump sprayers to clean parts, rather than using TCE in aerosol spray cans. Two businesses reported using adhesives containing TCE. One facility reported using TCE-based adhesives from open containers with brushes as part of an assembly process. These findings corroborate the CERS and ARB data, showing very little remaining use of TCE among California businesses.

SMALL BUSINESS IMPACT STATEMENT

The CERS data provided by Cal/EPA to CDPH in 2024 shows that 367 businesses are affected by the proposal. CERS does not distinguish between large and small establishments; however, statewide across all industry sectors, small businesses with 100 or fewer employees

make up 99% of businesses.[74, 75] As such, 1,848,921 (99%) of California's 1,867,597 businesses are small businesses, as of the second quarter of 2024, and 363 (99%) of the 367 businesses that reported using TCE in 2024 are small businesses. This constitutes 0.02% of the state's small businesses that will be affected by the proposal; 99.08% of small businesses do not use TCE and are unaffected by the proposed TCE PEL reduction.[76]

In addition, because safer alternatives to TCE are available for most applications, it will be relatively uncomplicated for most small businesses to comply with the proposed TCE PEL reduction by switching to safer chemical alternatives or processes. For example, 207 (56%) of the 367 businesses are in auto repair businesses, which represents about 2% of the nearly 20,000 auto repair facilities statewide.[77] These facilities previously relied heavily on TCE for cleaning and degreasing tasks.[78] Only 2% continue to use TCE; the remaining 98% of these facilities have identified and implemented functional (and ideally, safer) alternatives to TCE, as of December 2024.

If the remaining other small businesses must continue using TCE, they will likely need additional local exhaust controls to meet the reduced PEL; these can be relatively expensive but are not prohibitive, as described below. The Division has therefore concluded that the vast majority of small businesses in California will not be adversely affected by the proposed regulatory action.

COST IMPACT ON REPRESENTATIVE PRIVATE PERSON OR BUSINESS

The 367 affected businesses will take one of two possible approaches in complying with the proposal.

In response to the proposed reduction in the TCE PEL, the 367 affected businesses will take

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[74] California Employment Development Department (EDD) (2024). Size of Business Data for California (Quarterly). Payroll and Number of Businesses by Size of Business – Classified by Industry (Table 2A) – 2023, Qtr. 4. Total businesses at line 10 (Total All Industries) in Table 2A are 1,811,844. Total small businesses with 99 or fewer employees (1,786,021) is derived by adding columns E through I. Total large businesses with 100 or more employees (25,823) is derived by adding columns J through M. Percent small businesses is derived using 1,786,021 / 1811,844 = 99%. https://labormarketinfo.edd.ca.gov/LMID/Size-Data-for-CA-Quarterly.html. Accessed June 2025.

[75] California Government Code section 14837 (d)(1)(A). "Small business" means an independently owned and operated business that is not dominant in its field of operation, the principal office of which is located in California, the officers of which are domiciled in California, and which, together with affiliates, has 100 or fewer employees, and average annual gross receipts of ten million dollars ($10,000,000) or less over the previous three years, or is a manufacturer, as defined in subdivision (c), with 100 or fewer employees. Commencing January 1, 2019, the average annual gross receipts threshold shall be fifteen million dollars ($15,000,000).https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=14837. . Accessed June 2025.

[76] 363 small businesses / 1,848,921 small businesses statewide = 0.02%

[77] U.S. Bureau of Labor Statistics. Quarterly Census of Employment and Wages. Employment and Wages Data Viewer. Private, NAICS 8111 Automotive repair and maintenance, All States and U.S., 2024 First Quarter, All establishment sizes. California, Quarterly Establishments. https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm#type=0&year=2024&qtr=1&own=5&ind=8111&supp=0. Accessed June 2024.

[78] California EPA, Air Resources Board (ARB) Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for Emissions of Chlorinated Toxic Air Contaminants from Automotive Maintenance and Repair Activities (March 10, 2000). https://ww2.arb.ca.gov/sites/default/files/barcu/regact/amr/amr-isor.pdf. Accessed June 2025.

one of two approaches:

- Approach (1): Identify an alternative to TCE, which will likely require administrative costs to assess the efficacy of the alternative(s), or;
- Approach (2): Continue using TCE, which will likely require additional local exhaust ventilation systems to maintain TCE exposure level below the proposed PEL of 0.24 ppm.

As detailed below, Approach #1 would require about $10,000 in administrative costs per business in the first year of the proposed PEL reduction, and no additional costs each year over the subsequent nine years, for a total ten-year cost per business of $10,000 (Figure 3).

Approach #2 would cost up to $20,000 per business in the first year and $1,000 each year over the subsequent nine years for maintenance and cleaning, for a total ten-year cost per business of $29,000 (Figure 3). These estimates are based on the mid-point price for the installation and maintenance of local exhaust ventilation systems, as noted below.02%

Figure 3. Estimated First-year, Annual, and Total Ten-year Costs for 367 Businesses Affected by the Proposed TCE PEL Revision (2024 dollars).

	Business Response to the Proposed TCE PEL Reduction: Choose #1 or #2			
	Approach #1: Select an alternative to TCE: cost per business.	Approach #2: continue to use TCE and improve local exhaust ventilation: cost per business.	Mid-point estimated cost per business, assuming that choices 1 & 2 are selected in equal measure.	Estimated total cost of the proposal for 367 businesses, based on the mid-point cost estimate.
First-year Cost	$10,000	$20,000	$15,000	$5,505,000[79]
Year 2+ Annual Cost	$0	$1,000	$500	$183,500[80]
Total Annual Cost over 9 years	$0	$9,000	$4,500	$1,651,500[81]
Total Cost over 10 Years	$10,000	$29,000	$19,500	$7,156,500[82]

Approach #1 will require staff time

Under approach #1, businesses that choose an alternative to TCE will incur costs for staff time to evaluate and integrate the alternative chemical or process into their existing industrial system(s). Additional engineering controls would likely not be needed because any controls that are currently in place to protect workers from TCE exposure would likely also be effective in controlling exposures to an alternative (and ideally less toxic) chemical.

To evaluate the cost of staff time, the Division determined that, as of the first quarter of 2024, the average hourly salary for 37 different management occupations in California was $78.97.[83] In the Pacific Census, including California, the benefits scaling adjustment is 1.43 (or 43%), which accounts for the ratio of total benefits to average wages and salaries for private industry workers. Applying this 43% adjustment brings the total cost of compensation to $113.00 per

[79] ($15,000 * 367 businesses) = $5,505,000 in year one.
[80] ($500 * 367 businesses) = $183,500 per year in year 2+.
[81] ($4,500 * 367 Businesses) = $1,651,500 over subsequent nine years.
[82] ($5,505,000 + $1,651,500) = $7,156,500 total for 367 businesses over 10 years.
[83] California Department of Employment Development (EDD) (2024). Occupational Employment and Wage Statistics (OEWS) program. Scroll to "State of California, 2024, 1st Quarter. https://labormarketinfo.edd.ca.gov/data/oes-employment-and-wages.html. Accessed June 2025.

hour.[84] An initial investment of $10,000 in the first year of the proposal would therefore allow for approximately 88 hours of management staff time to identify and implement an alternative to TCE.[85]

This time estimate is reasonably sufficient, based on the Division's experience with management tasks involved in (1) identifying an alternative chemical or process that is compatible with the employer's existing industrial systems; (2) evaluating potential worker exposures for the alternative chemical or process; (3) evaluating the performance of the chemical or process after implementation; and (4) evaluating the effectiveness and costs of exposure controls.

Approach #2 will require local exhaust controls.

Under choice #2, businesses that choose to continue using TCE would likely need to install more effective local exhaust ventilation systems to protect workers from TCE exposure at the revised PEL of 0.24 ppm. Because these are local, not general, exhaust ventilation systems, the mid-point cost is about $20,000.[86] Annual maintenance costs are estimated at $1,000 for these systems.[87]

It is reasonable to assume that businesses will choose Approach #1 and Approach #2 in equal measure.

Assuming that businesses will select approach #1 or approach #2 in equal measure is reasonable because 56% (207) of the 367 affected businesses are in automotive repair, auto dealerships and auto body and paint, where alternatives to TCE have already been implemented by about 19,800 such facilities statewide, as of December 2024. The affected facilities represent about 2% of the nearly 20,000 auto repair facilities statewide, which previously relied heavily on TCE for cleaning and degreasing tasks.[88, 89] These facilities will therefore most likely choose approach #1 and simply select an alternative to TCE. The remaining 160 (44%) of affected facilities might be less able to take this approach; some would

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[84] U.S. Bureau of Labor Statistics, Employer Cost for Employee Compensation, Historical Datasets for Private Industry Workers. Scroll to Historical Datasets for Private Industry Workers to access data https://www.bls.gov/ecec/tables.htm. Accessed June 2025.
[85] $10,000 / $113.00 per hour = 88.49 hours of staff time.
[86] Isaac Smith, Healthcare Data Central (Oct 2025). Ductwork Cost Estimator: Comprehensive Guide to Installation and Replacement Costs: Average Costs for Ductwork Installation and Replacement. https://www.researchgate.net/publication/396737971_Ductwork_Cost_Estimator_Comprehensive_Guide_to_Installation_and_Replacement_Costs_Average_Costs_for_Ductwork_Installation_and_Replacement Accessed June 2026.
[87] Excedr (May 30, 2025).How Much Does a Fume Hood Cost? Pricing Breakdown. https://www.excedr.com/blog/how-much-does-a-fume-hood-cost-pricing-breakdown#installation-maintenance-operating-costs. "Preventive maintenance contracts can range from $500 to $1,500 per year, depending on hood type, usage intensity, and compliance requirements." Accessed June 2026.
[88] U.S. Bureau of Labor Statistics. Quarterly Census of Employment and Wages. Employment and Wages Data Viewer. Private, NAICS 8111 Automotive repair and maintenance, All States and U.S., 2024 First Quarter, All establishment sizes. California, Quarterly Establishments. https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm#type=0&year=2024&qtr=1&own=5&ind=8111&supp=0. Accessed June 2024.
[89] California EPA, Air Resources Board (ARB) Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for Emissions of Chlorinated Toxic Air Contaminants from Automotive Maintenance and Repair Activities (March 10, 2000). https://ww2.arb.ca.gov/sites/default/files/barcu/regact/amr/amr-isor.pdf. Accessed June 2025.

need to take the more costly approach #2.

However, even if all 367 businesses selected the more costly approach #2 (incurring an initial expense of $20,000 in the first year and $1,000 each year over the following nine years) the total cost over ten years of the proposal, per business, would be $29,000, and the total ten year cost for all 367 businesses would be $10,643,000.

Assuming the 367 affected businesses choose approach #1 or approach #2 in equal measure, the mid-point cost estimates per business are $15,000 in the first year of the proposal and $500 per year in each of the subsequent nine years, for a total ten-year cost of $19,500 per business. For all 367 businesses, this comes to a 10-year total cost of $7,156,500 (Figure 3).

Upstream businesses are unlikely to be affected.

Upstream businesses that produce or import TCE, and manufacturers of products that contain TCE, are unlikely to be affected by the proposal. EPA national databases show there are 16 U.S. businesses that manufacture or import TCE[90] and eight U.S. businesses that use TCE in commercial formulations.[91] While these databases are not necessarily a complete inventory of businesses, of those listed, only one product manufacturer that uses TCE is shown as operating in California.

As noted above, the use of TCE has declined substantially in California in the wake of numerous regulatory actions; it will continue to do so if U.S. EPA is successful in defending its proposed prohibition on the use of TCE under the Toxic Substances Control Act (TSCA), which went into effect in September 2025 but is now under judicial review. Since many manufacturers already produce TCE-free alternatives, the proposed TCE PEL reduction to 0.24 ppm and the transition away from TCE into alternatives by California employers are aligned with this upstream effort occurring on a national level.

ECONOMIC IMPACT ANALYSIS / ASSESSMENT OF JOB/BUSINESS CREATION OR ELIMINATION

As noted above, the Division has determined that, because the proposal affects only 367 businesses, or 0.02% of businesses operating in the state, it will not have a significant impact on the creation or elimination of jobs, nor will it affect the ability of businesses to create or expand business in California or compete with businesses in other states.

In addition, because safer alternatives to TCE are available for most applications, it will be relatively uncomplicated for small businesses to comply with the proposed TCE PEL reduction by switching to safer chemical alternatives or processes. Those small businesses that must continue using TCE will likely need additional local exhaust controls to meet the reduced PEL; these can be relatively expensive but are not prohibitive, as described above. The Division has therefore determined that the vast majority of small businesses in California will not be adversely affected by the proposed regulatory action.

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[90] U.S. EPA. Chemical Data Reporting (CDR). https://www.epa.gov/chemical-data-reporting/access-cdr-data#2024. Accessed September 14, 2026.

[91] U.S. EPA. ChemExpo. Get Data. https://comptox.epa.gov/chemexpo/get_data/. Accessed September 14, 2026.

HEALTH AND WELFARE BENEFITS FOR CALIFORNIA RESIDENTS, WORKERSAFETY, AND THE STATE'S ENVIRONMENT

The proposal could avoid $68,000,000 for treatment of cancers attributable to TCE exposure.

In the Division's analysis, the existing TCE PEL could result in 380 cases of cancer among the 3,582 workers employed by the 367 businesses affected by the proposal.[92] The proposed PEL reduction avoids 376 of these cases, which avoids $68,000,000 in direct medical costs (Figure 5). This estimate does not include indirect costs, such as lost wages and benefits, lost productivity and opportunity, private purchases of medical supplies, in-home support services, care provided by family members, insurance co-pays and other costs associated with caring for an individual with a serious illness.

To reach this conclusion, the Division applied the OEHHA cancer risk assessment methodology to derive the proposed 8-hour PEL for TCE of 0.24 ppm (1.3 mg/m^3). Under this methodology, the Division applied OEHHA's most recent 2012 cancer unit risk level (URL) for TCE of 4.0 x 10^{-3} (mg/m^3)$^{-1}$ using the risk assessment parameters for occupational exposures prescribed under CCR title 27, section 25721.[93]

Based on this analysis, the Division estimated that occupational exposure to TCE at the existing PEL of 25 ppm would be expected to result in 106 additional cases of cancer for every 1,000 workers who are exposed under the conditions prescribed in section CCR title 27 section 25721.[94] This is more than 100 times over the Division's 1:1000 health risk threshold for PELs. This comes to 380 cancer cases for the 3,582 workers in the 367 businesses affected by the proposal (Figure 6).[95]

Reducing the TCE PEL to 0.24 ppm would be expected to result in one case of cancer for every 1,000 workers who are exposed at 0.24 ppm under the conditions prescribed in section CCR title 27 section 25721.[96] This comes to four cancer cases among the population of 3,582

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[92] 106 cases / 1,000 workers = x cases / 3,578 workers. x = 106/1,000 * 3,578 = 379 cancer cases.
[93] California Code of Regulations, title 27, Environmental Protection. §25721. Level of Exposure to Chemicals Causing Cancer. Updated through 3/11/22. Noting at (d)(3) that "For workplace exposures, the exposed worker inhales ten cubic meters of workplace air per eight-hour day, forty hours per week, fifty weeks per year over a forty-year period." https://govt.westlaw.com/calregs/Document/IBBC153FD512211EC828B000D3A7C4BC3. Accessed June 2025.
[94] California EPA, Office of Environmental Health Hazard Assessment (OEHAA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California. Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. Applying the revised URL using equation #3, p. 9. In accordance with CCR title 27 §25721, OEHHA and HESIS use the inhalation volume of 10m^3 per day for workers (10m^3/20m^3 in equation #1), rather than using 8 out of 24 hours. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/riskreport.pdf. Accessed June 2025.
[95] 106 cancer cases / 1,000 workers = 379 cancer cases / 3,578 workers.
[96] California EPA, Office of Environmental Health Hazard Assessment (OEHAA) (Dec 2007). Occupational Health Hazard Risk Assessment Project for California. Identification of Chemicals of Concern, Possible Risk Assessment Methods, and Examples of Health Protective Occupational Air Concentrations. Applying the revised URL using equation #3, p. 9. In accordance with CCR title 27 §25721, OEHHA and HESIS use the inhalation volume of 10m^3 per day for workers (10m^3/20m^3 in equation #1), rather than using 8 out of 24 hours. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/risksummary.pdf. Accessed June 2025.

workers in the 367 affected businesses.[97] The proposal therefore has the potential to avoid 376 cases of cancer among this group of workers (Figure 5).

TCE exposure can cause non-Hodgkin lymphoma and cancers of the liver and kidney.

The National Cancer Institute (NCI) of the National Institutes of Health (NIH), reported in 2021 that nationwide, the aggregate costs for cancer care increased 10% between 2015 and 2020, from $190 billion to $209 billion (based on 2020 U.S. dollars), due to aging and the expansion of the U.S. population.[98] The NCI included direct costs for medical services and oral prescription drugs in its estimates but did not account for the indirect costs noted above. This is the latest information published by NCI, as of May 2025.

The Division adjusted these disease cost estimates 20.9% to account for California employment changes and price growth that occurred during the period June 2020 to December 2024.[99]

The NCI estimated that the national, per-patient annualized average direct medical costs in 2020 U.S. dollars for cancer care were highest in the last year of life, at about $110,000, followed by the initial and continuing phases of treatment, at $44,000 and $5,500 per year, respectively.[100] NCI disaggregated these figures into specific cancers, including those relevant to TCE exposure (Figure 4).[101]

Figure 4. Cost of cancer relevant to TCE exposure, by cancer site, with five-year survival rates and costs, 2011-2017 (2020 dollars).

Cancer Site	Initial care, per year, per person	Continuing care, per year, per person	Last year-of-life care	5-year survival rate, 2011-17	5-year death rate, 2011-17	5-year cost with survival[a]	5-year cost with death[b]
Kidney	$41,122	$8,537	$95,985	75.6%	24.4%	$75,270	$162,700
Liver	$62,776	$18,219	$92,134	20.3%	79.7%	$135,650	$209,570

[97] 1 cancer case / 1,000 workers = 4 cancer cases / 3,578 workers.
[98] National Institutes of Health, National Cancer Institute (July 2021). Financial Burden of Cancer Care. https://progressreport.cancer.gov/after/economic_burden. Accessed June 2025.
[99] California Department of Industrial Relations (2025). Consumer Price Index Calculator. https://www.dir.ca.gov/oprl/CPI/CPICalculator/CpiCalculator.aspx. Accessed May 27, 2025. At this website, select: (1) California, (2) All Urban Consumers, (3) Beginning Month of June, (4) Beginning Year of 2020, (5) Ending Month of December, (6) Ending Year of 2024. For the period June 2020 to December 2024, the percent change in the Consumer Price Index (CPI) was 20.9%. Accessed May 2025.
[100] National Institutes of Health, National Cancer Institute (July 2021). Financial Burden of Cancer Care. Average per patient annualized 2007-2013 cancer-attributable costs in 2020 U.S. dollars for medical series related to cancer care by cancer site and phase of care. https://progressreport.cancer.gov/after/economic_burden. Accessed June 2025.
[101] National Institutes of Health, National Cancer Institute (2022). Cancer State Facts: Kidney and Renal Pelvis Cancers, Non-Hodgkin Lymphoma, and Liver Cancer. https://seer.cancer.gov/statfacts/html/kidrp.html. Accessed June 2025.

Non-Hodgkin Lymphoma (NHL)	$75,164	$12,805	$144,707	73.2%	26.8%	$126,380	$258,286

a. The Division assumed one year of initial care and four years of continuing care. For example, ($41,122) + ($8,537 * 4) = $75,270.

b. The Division assumed one year of initial care, three years of continuing care, and one last-year-of-life care. For example, ($41,122) + ($8,537 * 3) + $95,985 = $162,700.

While NCI generated medical costs for a period of five years of cancer treatments, those costs could occur at any time over the 10-year projected timespan of the proposed PEL reduction. The Division therefore estimated yearly costs using a ten-year time period. Over this ten-year period, and assuming cancer cases are distributed evenly among the three types of cancer relevant to TCE exposure, the costs of 106 cancer cases are:[102]

- $3,381,000 for 35 cases of kidney cancer;
- $6,810,000 for 35 cases of liver cancer;
- $5,661,000 for 35 cases of NHL;
- Total for 106 cancer cases: $15,852,000; and[103]
- Adjusted for 20.9% inflation for the period June 2020 to Dec 2024: $19,165,000.[104]

To derive potential cancer costs among the 367 businesses, the Division approximated the number of employees in these businesses by dividing the total number of employees (18,225,617) in the state by the total number of businesses (1,867,597), as of the second quarter of 2024, the latest period for which data are available.[105,106] This imperfect approach resulted in an average of 9.76 employees at each of the 367 businesses, for a total of 3,582

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[102] U.S. EPA (Sept 2011) Toxicological Review of Trichloroethylene (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS) (p. 6-43). https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0199tr/0199tr.pdf. Accessed June 2025.

[103] Five year total costs for 106 individuals, based on the Division's assumptions noted in Table 3 and applying the percentages of patients who survive and who die, per cancer type:
Kidney = (35 cases * 0.756 * $75,270) + (35 cases * 0.244 * $162,700) = $3,381,000.
Liver = (35 cases * 0.203 * $135,650) + (35 * 0.797 * $209,570) = $6,810,000.
NHL = (35 cases * 0.732 * $126,380) + (35 * 0.268 * $258,286) = $5,661,000.
Total = $15,852,000 over 10 years in direct medical costs, not including indirect costs, for 106 cancer cases. Adjusted for 20.9% inflation is $19,165,000.

[104] California Department of Industrial Relations (May 2025) Consumer Price Index Calculator. https://www.dir.ca.gov/oprl/CPI/CPICalculator/CpiCalculator.aspx. At this website, select: (1) California, (2) All Urban Consumers, (3) Beginning Month of June, (4) Beginning Year of 2020, (5) Ending Month of December, (6) Ending Year of 2024. For the period June 2020 to December 2024, the percent change in the Consumer Price Index (CPI) was 20.9%. Accessed June 2025.

[105] California Employment Development Department (EDD) (2024). Size of Business Data for California (Quarterly). Payroll and Number of Businesses by Size of Business – Classified by Industry (Table 2A) – 2024, Qtr. 2. Total businesses at line 10, column D (Total All Industries) in Table 2A are 1,867,597. https://labormarketinfo.edd.ca.gov/LMID/Size-Data-for-CA-Quarterly.html. Accessed June 2025.

[106] California Employment Development Department (EDD) (2024). Size of Business Data for California (Quarterly). Number of Employees by Size Category – Classified by Industry (Table 2B) – 2024, Qtr. 2. Total employees at line 11 (Total All Industries) in Table 2B is 18,225,617. https://labormarketinfo.edd.ca.gov/LMID/Size-Data-for-CA-Quarterly.html. Accessed June 2025.

employees.[107]

At the current PEL, TCE exposure could result in cancer for 380 workers employed in the 367 businesses affected by the proposal.

Assuming that all 3,582 workers employed by these 367 businesses are exposed to TCE at (or above) the existing PEL, under the conditions prescribed by section 25721, these workers would be expected to experience 380 cancer cases attributable to TCE.[108] Treating these 380 cases comes to $68,700,000 in direct medical costs (Figure 5).[109] Because TCE is capable of causing various cancers within ten years or less, and the timeline of the proposed regulation is projected at 10 years, this comes to about $6.87 million per year over ten years.[110, 111, 112]

The proposed TCE PEL reduction could avoid 376 of these cancer cases, saving $68 million per year over ten years.

Alternatively, if the proposed TCE PEL of 0.24 ppm produces one cancer per 1,000 workers, as expected, these 3,582 workers would experience four cancer cases over this ten-year time period.[113] This avoids 376 cancer cases that would otherwise occur at the current TCE PEL. The cost of treating these four cases is about $700,000.[114] This comes to $70,000 per year over 10 years (Figure 5).

The costs avoided from 376 cases of cancer avoided is therefore $68,000,000 over ten years, or $6.8 million per year.[115] These estimates do not include the indirect costs noted above.

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[107] 9.76 employees per business * 367 businesses = 3,578 employees.
[108] 3,578 workers * (106 cancer cases / 1,000 workers) = 379 cancer cases.
[109] Cancer rate of 106 cases per 1000 workers. Total cost of these 106 cases = $19,163,000, adjusted for 20.9% inflation for the period June 2020 to December 2024. ($19,163,000 / 106 cases) * (379 cases) ≈ $68,700,000 in direct medical costs for 379 cancer cases occurring among 3,578 workers.
[110] Lipworth L, Sonderman JS, Mumma MT, et al (2011).Cancer mortality among aircraft manufacturing workers: an extended follow-up. *J Occup Environ Med*. 2011;53:992–1007. https://pubmed.ncbi.nlm.nih.gov/21866047. Accessed June 2025.
[111] Raaschou-Nielsen O, Hansen J, McLaughlin JK, et al (2003). Cancer risk among workers at Danish companies using trichloroethylene: a cohort study. *Am J Epidemiol*. 2003;158:1182–92. https://pubmed.ncbi.nlm.nih.gov/14652303/. Accessed June 2025.
[112] Karami S, Lan Q, Rothman N, et al (2012). Occupational trichloroethylene exposure and kidney cancer risk: a meta-analysis. Occup Environ Med. 2012;69:858–867. https://pubmed.ncbi.nlm.nih.gov/23000822/. Accessed June 2025.
[113] 3,578 workers * (1 cancer case / 1,000 workers) = 3.58 cancer cases ≈ 4 cases
[114] X = ($19,165,000 / 106 cases) * (4 cases) ≈ $700,000 in medical costs
[115] $68,700,000 – $700,000 = $67,000,000 in medical costs avoided.

Figure 5. Expected cancer cases and treatment costs at the existing and proposed TCE PEL, adjusted by 20.9% to account for inflation for the period June 2020 to Dec 2024.

	Expected new cancer cases per 1,000 workers, per OEHHA unit risk level	Expected new cancer cases for 3,582 workers at 367 affected businesses	Total direct cost of cancer treatment over ten years, not including indirect costs	Annual direct cost of cancer treatment over ten years
Existing PEL of 25 ppm	106	380	$68,700,000	$6.8 million
Proposed PEL of 0.24 ppm	1	4	$700,000	$70,000
Cancer cases or costs avoided at the proposed TCE PEL	105 cancer cases avoided per 1,000 workers	376 cancer cases avoided per 3,582 workers	$68,000,000 in medical costs avoided over ten years	$6.8 million in medical costs avoided per year

TCE is also a well-recognized environmental and public health hazard.

In addition to its effects on the health of workers, TCE is a well-recognized environmental and public health hazard. The ARB has designated TCE as a toxic air contaminant (TAC); OEHHA lists it as a known carcinogen and reproductive toxicant for purposes of the public warning provisions of Proposition 65; and U.S. EPA has found TCE in at least 1,051 (57%) of 1,854 current or former superfund sites on the National Priorities List, which are the nation's most serious hazardous waste sites.[116] TCE persists in groundwater and diffuses into air spaces beneath buildings and enters indoor air (a process known as vapor intrusion) such that occupants—including children and other vulnerable members of the population—can be exposed.[117] In light of the many health hazards associated with TCE, any reduction in its use in industrial processes or in consumer and commercial products will benefit public and environmental health, in addition to benefitting the health and safety of workers.

CONSIDERATION OF ALTERNATIVES

The alternative to reducing the PEL for TCE from 25 ppm to 0.24 ppm would be to reduce the PEL to a level somewhere between 0.24 ppm and 25 ppm, such as one-half the existing PEL, or 12.5 ppm. Assuming a linear association between exposure and disease, this would result

[116] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR) (June 2019). Toxicological Profile for Trichloroethylene, p. 1 https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf. Accessed June 2025.
[117] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR) (June 2019). Toxicological Profile for Trichloroethylene. p. 2 (https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf). Accessed June 2025.

in half the number of expected cancers (190 cases) among the 3,582 affected workers, compared to the cancer rate at the existing PEL (380 cases), along with half of the $68,000,000 in direct medical costs avoided, or $34,000,000. It is likely, however, that this alternative would still require employers to identify an alternative to TCE (Approach 31) or implement engineering controls to protect workers from TCE exposure under a revised PEL of 12.5 ppm (Approach #2), so the 367 businesses would still need to invest the estimated cost of $7,156,500 over the 10 year time period.

Alternative 1 is therefore equally costly for employers compared to the proposed regulation, but it results in only a 50% reduction in cancer cases and costs. As a result, this alternative does not sufficiently protect workers from a known carcinogen and is inconsistent with Labor Code sections 144.6 and 147.1. For these reasons, the Division rejected this alternative.

There have been no alternatives presented that would be less burdensome and equally effective at achieving the purposes of this proposal.

ANTICIPATED BENEFITS OF THE PROPOSAL

As detailed above, the existing TCE PEL could result in 380 cases of cancer among 3,582 workers employed by the 367 businesses affected by the proposal, whereas the proposed PEL reduction could result in four cases. The proposed TCE PEL reduction therefore prevents up to 376 excess cancer cases, which avoids $68,000,000 in direct medical costs (Figure 5). This estimate does not include indirect costs, such as lost wages and benefits, lost productivity and opportunity, private purchases of medical supplies, in-home support services, care provided by family members, insurance co-pays and other costs associated with caring for an individual with a serious illness.

In addition to its effects on the health of workers, TCE is a well-recognized environmental and public health hazard. The ARB has designated TCE as a toxic air contaminants (TAC); OEHHA lists it as a known carcinogen and reproductive toxicant for purposes of the public warning provisions of Proposition 65; U.S. EPA has found TCE in at least 1,051 (57%) of 1,854 current or former superfund sites on the National Priorities List, which are the nation's most serious hazardous waste sites.[118] TCE persists in groundwater and diffuses into air spaces beneath buildings and enters indoor air (a process known as vapor intrusion) such that occupants—including children and other vulnerable members of the population—can be exposed.[119] In light of the many health hazards associated with TCE, any reduction in its use in industrial processes or in consumer and commercial products will benefit public and environmental health, in addition to benefitting the health of workers.

[118] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR) (June 2019). Toxicological Profile for Trichloroethylene, p. 1 (https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf). Accessed May 2025.
[119] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR) (June 2019). Toxicological Profile for Trichloroethylene, p. 2 (https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf). Accessed May 2025.

DOCUMENTS RELIED UPON - STUDIES, REPORTS, AND SIMILAR DOCUMENTS

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SPECIFIC TECHNOLOGIES AND EQUIPMENT

The proposal does not mandate the use of specific technologies or equipment.

PETITION

This proposal was not the result of a petition.

ADVISORY COMMITTEE

This proposal was developed with the assistance of an advisory committee. Minutes and attendance sheets are included as Documents Relied Upon.

FIRE PREVENTION STATEMENT

This proposal does not include fire prevention or protection standards. Therefore, approval of the State Fire Marshal pursuant to Government Code Section 11359 or Health and Safety Code Section 18930(a)(9) is not required.