December 29, 2023

Dear Working Group Members:

The Connecticut Department of Energy and Environmental Protection (DEEP) is pleased to share a draft of the Release Based Cleanup Regulations (RBCRs). This draft is the result of many hundreds of hours spent by working group members on subcommittees, ad hoc teams, and drafting teams. Throughout this process, the working group asked important questions, challenged the status quo, provided comprehensive written advice and feedback, and brought to the discussion approaches successfully used in other states. The draft also represents thousands of hours of time spent by DEEP staff from across the agency, reviewing and adopting concepts developed by the working group, responding to questions, and incorporating feedback.

DEEP would like to take a moment to thank staff within the Remediation Division, the Water Planning and Management Division, the Emergency Response and Spill Prevention Division, the Office of Innovative Partnerships and Planning, and the Office of Legal Counsel for their work on these draft regulations. DEEP looks forward to continuing the transition to a release-based cleanup program that delivers better economic and environmental value for Connecticut.

Lastly, DEEP also extends a note of gratitude to our colleagues at the Connecticut Department of Public Health (DPH), who assisted in developing toxicity values used to calculate the managed multifamily residential and passive recreation direct exposure criteria. Criteria for and application of these new exposure scenarios can be found in sections 22a-134tt-app11 and 22a-134tt-app12 of the RBCRs. Without DPH's significant efforts and commitment, DEEP would not have been able to offer these valuable changes to the cleanup standards.

Today, we are sharing with you:

- Draft text of the entire RBCRs;
- A series of supplemental regulatory changes to the Release Reporting Regulations, Remediation Standards Regulations, and an administrative civil penalty schedule to be adopted in regulations adopted pursuant to Conn. Gen. Stat. § 22a-6b;
- A document offering technical descriptions of calculators DEEP intends to prepare and make available, including a calculator for LEP-implemented, risk-based direct exposure criteria needed to implement language found in section 22a-134tt-9 of the RBCRs; and

- A technical support document providing background on the derivation of criteria and equations for the proposed new exposure scenarios (managed multifamily residential and passive recreation found at sections 22a-134tt-App11 and 22a-134tt-App12 of the RBCRs, respectively.

For those who have regularly participated in the working group, you will find much of the RBCRs familiar. The RBCRs generally follow the process set out in the first year roadmap and tiers checklist (found at Appendix 1 of the draft RBCRs). The text of the RBCRs is based on the subcommittee concept papers. For example, in section 22a-134tt-2 of the RBCRs ("Discovery of Releases"), the concepts of actual and constructive knowledge are taken directly from the Subcommittee 1 concept paper, as is much of the language of those provisions for section 22a-134tt-2 of the RBCRs. This model of building the regulations upon the foundation set by the concept papers runs through most sections of the RBCRs.

A few other notes and points of emphasis:

- The current Remediation Standards Regulations (RSRs) are incorporated into the RCBRs. Section 22a-133k-1 of the RSRs is divided between sections 22a-134tt-1 and 22a-134tt-7 of the RCBRs. Certain provisions applicable to the entire body of new regulation are found in section 22a-134tt-1, certain provisions applicable only to the "cleanup standards sections" – sections 22a-134tt-7 to 22a-134tt-10, inclusive of the RBCRs – are found in section 22a-134tt-7. There are some tweaks to the RSRs language, including additional definitions and adjustments to public notice provisions.
- Section 22a-133k-2 of the RSRs (standards for soil remediation) and 22a-133k-3 of the RSRs (standards for groundwater remediation) are found at sections 22a-134tt-9 and 22a-134tt-10 of the RBCRs, respectively. These sections are shown in track changes to make comparison to the existing RSRs easy. You will note that no RSR provisions have been deleted, but significant additions have been made to section 22a-134tt-9 of the RBCRs to incorporate the new, more flexible approaches requested by and previously discussed with the working group.
- Section 22a-134tt-3(d) of the RBCRs allows for certain existing releases discovered on Transfer Act sites after the RBCRs are adopted to be remediated as a part of the site's Transfer Act cleanup, provided an enforceable commitment to do so is made at the time of reporting. This approach is not mandatory and is being offered as a flexible option for certifying parties or parcel owners that would prefer to close all releases under one administrative framework.

We also want to address the timing of our process moving forward. As you know, Conn. Gen. Stat. § 22a-134tt requires DEEP to provide this draft to the working group not less than 60 days before posting a notice of intent to adopt the RBCRs, to accept written advice and feedback on

this draft for 30 days, to hold a monthly working group not less than 15 days before posting a notice of intent, and to provide a revised draft prior to posting a notice of intent. To ensure that everyone has sufficient time to read, consider, and react to the proposed RBCRs, DEEP intends to:

- Accept written comments until **February 6, 2024**;
- Discuss these comments at two monthly working group meetings held on **February 13** and **March 12, 2024;** and
- Post a notice of intent to adopt the RBCRs no earlier than **April 1, 2024**.

At the January 9, 2024, monthly working group meeting, DEEP looks forward to more fully discussing the process to be used for accepting, discussing, and considering written advice and feedback on the proposed RBCRs. We will also use that meeting to discuss the other work that lies in front of us; in particular, the process for drafting and revising forms and guidance to support the new program.

As you know, DEEP will continue to meet monthly until these regulations are adopted. DEEP will also be looking for opportunities to ensure that our shared work is clearly articulated to various stakeholders that may not have been engaged during the working group process, as has been suggested by the working group. Please share with others DEEP's desire to speak at meetings on this regulatory proposal. In addition to individual meetings, DEEP will also be hosting informational sessions on this regulatory proposal in early 2024. Information and dates for presentations held by DEEP, or at which DEEP will discuss this regulatory proposal, will be listed soon on our release-based cleanup program regulation development webpage here.

We are proud of the work all of us – DEEP staff, working group members, those who volunteered for subcommittees, and others who have provided feedback along the way – have done on the RBCRs. We believe that these proposed regulations provide a workable path forward for both environmental and economic objectives, and we are excited to share them with you. We look forward to launching this next phase of our work together.

Best regards,

Graham J. Stevens & Brendan Schain

2a-134tt-1 Definitions and Miscellaneous Provisions

(a) Definitions

For the purposes of the RBCRS, the following terms have the following meanings:

(1) "Accessory uses of land" means any use of a parcel of land that is not the primary use of that parcel of land;

(2) "Active recreation" means any activity that is not "passive recreation" as it is defined in these regulations;

(3) "Active remediation" means remediation other than monitored natural attenuation;

(4) "Actual knowledge" means the type of knowledge described at section 22a-134tt-2(a)(2) of the RBCRs;

(5) "Application of pesticides" means the spraying, spreading, injection, placement, or other use of pesticides at a parcel for the pesticide's intended purpose, but does not include other releases of pesticides such as those from the handling, mixing, storing, spilling, leaking or disposing of pesticides, or releases of pesticides from equipment cleaning or repair;

(6) "Aquifer protection area" has the same meaning as provided in section 22a-354h of the Connecticut General Statutes;

(7) "Area of influence" has the same meaning as provided in section 22a-354b-1(a) of the Regulations of Connecticut State Agencies;

(8) "Areal extent of a groundwater plume" means the surface area beneath which groundwater is polluted by a release and in which one or more substances from such release or mobilized by such release is present at a concentration above the laboratory reporting limit;

(9) "Assessment of the secondary containment system" means an inspection or examination of a secondary containment system to ensure it is free of cracks, gaps, or voids and is functioning as designed and intended;

(10) "Association or professional property management company" means a condominium association, homeowners association, or company authorized to monitor compliance with declarations, bylaws or lease agreements and to maintain a parcel of land;

(11) "Audit" means the commissioner's review of an LEP verification or PEP certification pursuant to section 22a-134tt-13 of the RBCRs;

(12) "Automotive exhaust" means the substances which are byproducts of the reaction within an internal combustion engine and are expelled by those automobiles which rely on internal combustion engines for propulsion;

(13) "Background concentration" means the concentration of a substance in soil or groundwater that, based on a validated conceptual site model, is:

(A) In the general geographic vicinity of a release; and

(B) Either:

(i) Naturally occurring; or

(ii) Minimally affected by human influences at concentrations equal to or less than criteria specified in the RBCRs;

(14) "Base annual fee" means the fee calculated and paid the first time a release is assigned to a tier pursuant to section 22a-134tt-6(f)(2)(A) of the RBCRs;

(15) "Carcinogenic substance" means a substance defined as a "carcinogen" by federal or state agencies and for which a quantitative health risk extrapolation is available;

(16) "Certification" means the written opinion of a permitted environmental professional on a form prescribed by the commissioner that the remediation of a release satisfies the standards established in regulations adopted pursuant to section 22a-134tt;

(17) "CFR" means the Code of Federal Regulations;

(18) "Change in tier assignment" means the assignment of a release to a different tier following the process specified in section 22a-134tt-6(c)(2) of the RBCRs;

(19) "Characterization" means determining the nature and extent of a release in accordance with prevailing standards and guidelines;

(20) "Solid, liquid or gaseous products" shall have the same meaning as section 22a-450-1(39) of the Regulations of Connecticut State Agencies;

(21) "Cleanup standards sections" means sections 22a-134tt-7 to 22a-134tt-10, inclusive, of the RBCRs;

(22) "Commissioner" means the Commissioner of Energy and Environmental Protection or the designated agent of the commissioner;

(23) "Conceptual site model" means a representation in three dimensions of environmental conditions at a release area that is developed through a multi-phased investigative approach which validates such representation with information about, including, but not limited to, a substance's release, fate and transport, and pathway to human and environmental receptors;

(24) "Constructive knowledge" means the type of knowledge described at section 22a-134tt-2(a)(3) of the Regulations of Connecticut State Agencies;

(25) "Date of tier assignment" means the date specified by section 22a-134tt-6(c)(4)(D) of the Regulations of Connecticut State Agencies;

(26) "Demarcation layer" means a brightly-colored, tear-resistant, environmentally-stable marker layer installed at an appropriate depth, suitable to indicate the presence of polluted soil beneath such layer;

(27) "Department" means the Department of Energy and Environmental Protection;

(28) "Dilution factor" means the ratio by which the concentration of a substance dissolving into soil water is reduced by dilution with groundwater or surface water, as applicable;

(29) "Dilution and attenuation factor" or "Dilution attenuation factor" means the ratio by which the concentration of a substance dissolving into soil water is reduced by dilution with groundwater and by sorption to unsaturated or saturated soil, or by degradation, transformation or stabilization of the substance;

(30) "Diminishing state groundwater plume" means a groundwater plume that has been characterized seasonally and in three dimensions, provided that the characterization of such plume:

(A) Is consistent with a validated conceptual site model; and

(B) Demonstrates that such plume:

(i) Is not migrating, or has very limited potential to migrate, in any direction; and

(ii) Is comprised only of substances whose concentrations have decreased and will continue to decrease over time, except for the concentrations of related breakdown components, provided it is demonstrated that concentrations of such breakdown components are not a known risk to human health and the environment. For purposes of this clause, "breakdown components" means constituent compounds that result from the alteration of an original compound in the environment;

(31) "Direct exposure criteria" or "DEC" means the criteria identified in section 22a-134tt-App2 of the RBCRs, alternative direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs, or direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(b)(7) of the RBCRs;

(32) "Downgradient" means in the direction of the maximum rate of decrease of hydraulic head;

(33) "Downgradient area" with respect to a release of a substance means the area bounded by:

(A) The width of the release area of such substance perpendicular to the direction of groundwater flow;

(B) Two side boundary lines parallel to the downgradient direction of groundwater flow extending from the two endpoints of said width to the downgradient parcel boundary; and

(C) The downgradient parcel boundary extending between the two side boundary lines, excluding any portion of such downgradient area that is either affected by any other release of such substance or beneath an existing permanent structure;

(34) "Dwelling unit" means a single family home or a section of a larger structure where a person or family eats, lives, and sleeps, such as a house, apartment, mobile home, or set of rooms;

(35) "Drinking water supply well" means an artificial excavation constructed by any method for the purpose of obtaining or providing water for drinking or other domestic, industrial, commercial, agricultural, recreational or irrigation use, or other outdoor water use;

(36) "Emergent reportable release" means a release to the land and waters of the state discovered by an observed change in conditions that is required to be reported by regulations adopted pursuant to section 22a-450 of the Connecticut General Statutes;

(37) "Engineered control" means any physical barrier, system, technology or method that prevents exposure to polluted soil, or minimizes migration of liquids or vapor through such soil, and complies with the other requirements specified in section 22a-134tt-9(f)(2) of the RBCRs;

(38) "Environmental land use restriction" or "ELUR" has the same meaning as provided in section 22a-133q-1 of the Regulations of Connecticut State Agencies;

(39) "Environmental use restriction" or "EUR" has the same meaning as provided in section 22a- 133q-1 of the Regulations of Connecticut State Agencies;

(40) "Environmentally isolated soil" means polluted soil which is above the seasonal high water table and is not subject to infiltration in accordance with section 22a-134tt-9(c)(5)(A) of the RBCRs, thereby preventing the leaching of pollutants from such soil into groundwater;

(41) "EPA" means the United States Environmental Protection Agency;

(42) "ETPH" means extractable total petroleum hydrocarbons;

(43) "EUR regulations" has the same meaning as provided in section 22a-133q-1 of the Regulations of Connecticut State Agencies;

(44) "Excess lifetime cancer risk" means the estimated probability that an individual's exposure to a substance could result in cancer;

(45) "Exigent condition" means a condition which exists or occurs as a result of a release that the commissioner determines, in the commissioner's sole discretion, requires the department to respond to such release to abate such a condition;

(46) "Existing release" means a release discovered through the laboratory analysis of samples taken from the land and waters of the state;

(47) "Fertilizer" means the substances identified as fertilizers in section 22-111b of the Connecticut General Statutes;

(48) "Full characterization" means characterization of a release such that the horizontal and vertical extent of such release is delineated to the points at which it is no longer detected;

(49) "GA area" means an area where the groundwater classification is GA, GAA, or GAAs;

(50) "GB area" means an area where the groundwater classification is GB;

(51) "Ground surface" means any horizontal surface at or near ground level, including, but not limited to, soil, grass, sidewalks, and driveways;

(52) "Groundwater" means that portion of "waters" as defined in section 22a-423 of the Connecticut General Statutes at or below the water table;

(53) "Groundwater classification" means the groundwater classification established in the Water Quality Standards;

(54) "Groundwater criteria" means surface water protection criteria, water quality criteria, volatilization criteria, groundwater protection criteria, and background concentration, as applicable;

(55) “Groundwater divide” means a line on the water table from which the water table slopes downward in both directions away from such line;
(56) “Groundwater monitoring well” means a well constructed for the purpose of aquifer testing, obtaining samples of ground water quality and/or measurement of ground water level;

(57) “Groundwater plume” means groundwater that has been impacted by a release and is emanating from a release area and in which one or more substances from such release is present at a concentration above the laboratory reporting limit;

(58) “Groundwater protection criteria” or “GWPC” means the criteria identified in section 22a-134tt-App4 of the RBCRs, alternative groundwater protection criteria calculated by an LEP or approved by the commissioner pursuant to section 22a-133k-10(d)(2) of the RBCRs, or groundwater protection criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(1) of the RBCRs;

(59) “Hardscape” means man-made features that are incorporated into landscaped areas, including walkways constructed with asphalt, concrete, or pavers; gravel parking areas and driveways; paved or gravel storm water features; placement of natural rock; rip-rap; and non-vegetated retaining walls;

(60) “Hazard index” means the calculation of the potential for non-cancer health effects as a result of exposure to one or more substances with the same or similar modes of toxic action or toxic endpoints;

(61) “Historically impacted material” means polluted material that will be managed in accordance with the conditional exemption for historically impacted material pursuant to section 22a-134tt-9(j) of the RBCRs;

(62) “Home heating fuel” means any petroleum-based fuel, including any petroleum product regulated pursuant to chapter 250, used as the primary source of residential heating or domestic hot water;

(63) “Hydraulic gradient” means the change in hydraulic head per unit distance;

(64) “Hydraulic head” means the elevation to which water rises in a piezometer or a well;
(65) “Immediate action" means the remediation necessary to comply with the requirements established by section 22a-134tt-5 of the RBCRs;

(66) “Immobilization” or “Immobilize” means the act of binding a substance to create a solid that is resistant to leaching and eliminates or virtually eliminates the mobility of a substance from such solid, including, but not limited to, solidification to physically bind or enclose a substance within a stabilized mass, stabilization through chemical reactions between a stabilizing agent and a substance, or encapsulation by coating a substance;

(67) “Impervious surface” means a surface composed of any material that prevents infiltration of water into the soil which shall include, but is not limited to, concrete or bituminous concrete;

(68) “Inaccessible soil” means soil that meets at least one of the following conditions:

(A) Is more than four feet below the ground surface;

(B) Is more than two feet below a paved ground surface comprised of bituminous concrete that, at a minimum, is three inches thick or reinforced concrete that, at a minimum, is four inches thick;

(C) Is beneath a building or other permanent structure;

(D) Is polluted fill:

(i) Beneath a paved ground surface comprised of bituminous concrete that, at a minimum, is three inches thick or reinforced concrete that, at a minimum, is four inches thick; and

(ii) That exceeds the applicable direct exposure criteria solely due to:

(I) Semi-volatile organic substances or petroleum hydrocarbons that are normal constituents of bituminous concrete; or

(II) Metals at concentrations that are equal to or less than two times the applicable direct exposure criteria; or

(E) Is located beneath concrete or bituminous concrete and complies with the applicable requirements of subparagraphs (B) and (C) of subdivision (3) of subsection (b) of section 22a-134tt-9 of the RBCRs.

(69) "Indoor air" means the portion of the atmosphere interior to buildings;

(70) "Immediate action plan" means a plan prepared pursuant to section 22a-134tt-5(j) of the RBCRs;

(71) "Immediate action report" means a report prepared pursuant to section 22a-134tt-5(k) of the RBCRs;

(72) "Industrial/commercial activity" means any activity related to the commercial production, distribution, manufacture or sale of goods, services, or any other activity which is not a residential activity;

(73) "Industrial/commercial direct exposure criteria" means the criteria identified as industrial/commercial direct exposure criteria in section 22a-134tt-App2 of the RBCRs, alternative direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs, or direct exposure criteria approved by the commissioner pursuant to section 22a-133k-9(b)(7) of the RBCRs;

(74) "Industrial/commercial volatilization criteria" means the criteria identified as industrial/commercial volatilization criteria in sections 22a-134tt-App6 and 22a-134tt-App7 of the RBCRs, alternative volatilization criteria approved by the commissioner pursuant to section 22a- 134tt-10(c)(4) of the RBCRs, or volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(3) of the RBCRs;

(75) "Intermittent watercourse" means a type of watercourse, as the term is defined in section 22a-38 of the Connecticut General Statutes, delineated in accordance with section 22a-38 of the Connecticut General Statutes;

(76) “Laboratory reporting limit” means the lowest concentration at which an analyte can be detected in a sample of environmental media by a laboratory certified by the Department of Public Health pursuant to section 19a-29a of the Connecticut General Statutes and which concentration can be reported with a reasonable degree of accuracy and precision pursuant to section 22a-134tt-1(e) of the RBCRs;

(77) “Licensed environmental professional” or “LEP” means an environmental professional who has a current valid license issued by the commissioner pursuant to section 22a-133v of the Connecticut General Statutes;

(78) “Managed multifamily residential activity" means activity at any parcel with four or more dwelling units, provided such dwelling units are managed by an association or a professional property management company;

(79) “Managed multifamily residential direct exposure criteria” means the criteria identified as managed multifamily residential direct exposure criteria in section 22a-134tt-App11 of the RBCRs or an alternative direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs;

(80) “Matrix interference” means either a positive or negative effect when measuring the concentration of a substance in a sample that creates erroneous results for an analyte;
(81) “Maximum extent practicable” means the greatest degree of remediation that can be achieved using sound engineering and hydrogeologic practices without taking cost into consideration;

(82) “Maximum extent prudent” means the greatest degree of remediation that can be achieved using sound engineering and hydrogeologic practices that the commissioner deems reasonable, taking into consideration cost in proportion to social and environmental benefits, provided that a mere showing of expense will not necessarily render an alternative unreasonable;

(83) “Monitored natural attenuation” means representative groundwater monitoring of the natural attenuation of each substance in a groundwater plume to a concentration equal to or less than groundwater criteria, provided such monitoring demonstrates that:

(A) Such attenuation is occurring, and will continue to occur, as evidenced by changes in chemical concentrations, alterations of chemical components, and hydrogeologic conditions within the aquifer after completing the remediation of a release area in a manner that will achieve compliance with the RBCRs; and

(B) The only remaining groundwater plume from a release is a diminishing state groundwater plume;

(84) “Land and waters of the state" has the same meaning as provided in section 22a-134pp(3) of the Connecticut General Statutes;

(85) “Multiple lines of evidence” means two or more sets of observable facts which tend to demonstrate the truth of a matter asserted;

(86) “Natural attenuation” means a decrease in concentration of a substance in groundwater through operation of natural physical or chemical processes, including, but not limited to, adsorption,

absorption, dilution, phase transfer, oxidation, organic complexation, biodegradation, dispersion, and diffusion;

(87) "Naturally occurring" means present in the environment in forms that have not been influenced by human activity;

(88) "Ninety-five (95) percent upper confidence level of the arithmetic mean" means a value that, when repeatedly calculated for randomly drawn subsets of size n from a population, equals or exceeds the population arithmetic mean ninety-five (95) percent of the time;

(89) "Non-aqueous phase liquid" or "NAPL" means a liquid that is not dissolved in water;

(90) "Notice of Activity and Use Limitation" or "NAUL" has the same meaning provided in section 22a-133q-1 of the Regulations of Connecticut State Agencies;

(91) "Numeric cleanup standards" means those cleanup standards identified in sections 22a-134tt-APP1 to 22a-134tt-APP12, inclusive, of the RBCRs;

(92) "Oil or petroleum" means oil or petroleum of any kind or in any form, including, but not limited to, crude oil or fractions thereof, refined petroleum or fractions thereof, biofuels, waste oils, mineral oils, dielectric fluids and distillation products such as heating oils, diesel fuels, fuel oil, kerosene, naphtha, gasoline, and lubricating and hydraulic oils;

(93) "Organoleptic" means the capability to produce a detectable sensory stimulus such as odor or taste;

(94) "Parcel" means a piece, tract, or lot of land, together with the buildings and other improvements situated thereon, a legal description of which piece, tract, or lot is contained in a deed or other instrument of conveyance;

(95) "Parcel-wide investigation" means an investigation of an entire parcel of land conducted pursuant to the site characterization guidance document published by the commissioner on the department's internet website, or by another method consistent with prevailing standards and guidelines approved in writing by the commissioner;

(96) "Passive recreation activity " means recreational activities that do not require development of prepared facilities like sports fields or courts or buildings, but does allow for the establishment of paved or unpaved walking trails;

(97) "Passive recreation direct exposure criteria" means the criteria identified as passive recreation direct exposure criteria in section 22a-134tt-App12 of the RBCRs, or an alternative direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs;
(98) "PCBs" means polychlorinated biphenyls;

(99) "Permitted Environmental Professional" or "PEP" means a person authorized by a permit issued pursuant to section 22a-454 of the Connecticut General Statutes to certify release records.

(100) "Person" has the same meaning as meaning as provided in section 22a-134pp(5) of the Connecticut General Statutes;

(101) “Persistent impact to groundwater” means the presence of a release in groundwater after more than 24 hours;

(102) “Pesticide” has the same meaning as provided in section 22a-47(w) of the Connecticut General Statutes;

(103) “Pollutant mobility criteria” or “PMC” means the criteria identified in section 22a-134tt-App3 of the RBCRs, alternative pollutant mobility criteria calculated by an LEP or approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs, or pollutant mobility criteria approved by the commissioner pursuant to section 22a-134tt-9(c)(6) of the RBCRs;

(104) “Polluted fill” means soil which contained polluting substances at the time such soil was deposited as fill material;

(105) “Polluted material” means soil that has been historically intermixed with coal ash, wood ash, coal fragments, coal slag, coal clinkers, asphalt paving fragments, or any combination thereof;

(106) “Polluted soil” means soil affected by a release of a substance at a concentration above the laboratory reporting limit for such substance;

(107) “Pollution” has the same meaning as provided in section 22a-423 of the Connecticut General Statutes;

(108) “Potential public water supply resource” means any “potential well fields” as defined in section 22a-354a of the Connecticut General Statutes, or any area mapped by the commissioner pursuant to section 22a-354c(b) of the Connecticut General Statutes;
(109) “PPB” means parts per billion;

(110) “PPM” means parts per million;

(111) “Practicable” means the greatest degree of remediation that can be achieved using sound engineering and hydrogeologic practices without taking cost into consideration;

(112) “Preferential pathway” means a high-permeability conduit that allows contamination to migrate through soils and groundwater at a faster rate than would be expected through naturally occurring undisturbed soils or unfractured bedrock such as a utility penetration; line; drain; building sump or drainage pit; elevator shaft; fractured bedrock; or gravel;

(113) “Private drinking water supply well” means a drinking water supply well that services a single dwelling unit;

(114) “Properly constructed and developed groundwater monitoring well” means a well that provides samples that are representative of groundwater in a release area that is installed in accordance with prevailing standards and guidelines;

(115) “Prudent” means reasonable, taking into consideration cost in proportion to social and environmental benefits;

(116) “Public roadway” means any portion of a federal, state, town, or other public highway, including, but not limited to, road, street, parkway, limited access highway, boulevard, or avenue paved with bituminous concrete or concrete, under the control of the federal government, the state or any political

subdivision of the state, any quasi-governmental entity or municipal economic development agency or entity created or operating under the Connecticut General Statutes, that is dedicated, appropriated, or open to the movement of vehicles or pedestrians, including appurtenant sidewalks, medians, and shoulders, but excluding landscaped or grassy areas beyond the outer edge of the travel way;

(117) “Public water supply distribution system” means any combination of pipes, tanks, pumps, etc. which deliver water from the source or treatment facility to the consumer from any water company, as defined in section 25-32a of the Connecticut General Statutes, supplying water to two (2) or more consumers, or twenty-five (25) or more persons daily, at least sixty (60) days of the year;

(118) “Public drinking water supply well” means a drinking water supply well that services multiple dwelling units;

(119) “Q99” means the daily stream flow that is predicted to be equaled or exceeded on ninety-nine (99) percent of days in a year, and is calculated using methods developed by the U.S. Geological Survey (StreamStats);

(120) “Reasonable confidence protocols” or “RCPs” means any reasonable confidence protocols, quality assurance requirements, or quality control requirements, posted by the commissioner on the department’s internet website, regarding the laboratory measurements of the concentration of a substance in a sample;

(121) “Release” has the same meaning as that provided in section 22a-134pp(6) of the Connecticut General Statutes;

(122) “Release-based cleanup regulations” or “RBCRs” refers to sections 22a-134tt-1 to 22a-134tt-APP12, inclusive, of the Regulations of Connecticut State Agencies;

(123) "Release area" means the land area at and beneath which polluted soil is located as a result of a release;

(124) “Release record” means a document certified by a PEP or verified by an LEP documenting compliance with a requirement or requirements of the RBCRs;
(125) “Remediation” means determining the nature and extent of a release, in accordance with prevailing standards and guidelines, and the containment, removal and mitigation of such release, and includes, but is not limited to, the reduction of pollution by monitored natural attenuation;

(126) “Report” means to notify the commissioner of a release in accordance with the RBCRs or the regulations adopted pursuant to section 22a-450 of the Connecticut General Statutes, and in the manner specified by the commissioner;

(127) “Residential activity” means any activity at:

(A) A place intended for people to live, including, but not limited to, a residence, dwelling, house, apartment, condominium, nursing home, or dormitory;

(B) A pre-school, primary school, secondary school, day care center, playground, or outdoor recreational area; or

(C) A hospital, solely for the purposes of compliance with volatilization criteria;

(128) “Residential direct exposure criteria” means the criteria identified as residential direct exposure criteria in 22a-134tt-App2 of the RBCRs, alternative direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(d) of the RBCRs, or direct exposure criteria approved by the commissioner pursuant to section 22a-134tt-9(b)(7) of the RBCRs;

(129) “Residential volatilization criteria” means the criteria identified as residential volatilization criteria in sections 22a-134tt-App6 and 22a-134tt-App7 of the RBCRs, alternative volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(c)(4) of the RBCRs, or volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(3) of the RBCRs;

(130) “Scoping level ecological risk assessment” means visual observation of potential pathways from a release to ecological receptors;

(131) “Screening level ecological risk assessment” means confirmed pathways from a release to ecological receptors through results of laboratory analysis of representative samples;

(132) “Seasonal high water table” means, on an annual basis, the highest plane in the ground at which all pore spaces are filled with water at atmospheric pressure;

(133) “Seasonal low water table” means, on an annual basis, the lowest plane in the ground at which all pore spaces are filled with water at atmospheric pressure;

(134) “Secondary containment system” means a system serving one (1) or more primary storage containers or tanks that is designed, installed and operated to collect and contain a release of a reportable material in the event of loss of the integrity or failure of the primary containment;

(135) “Sediment” means unconsolidated material occurring in a watercourse, as that term is defined in section 22a-38 of the Connecticut General Statutes, and in estuarine water or marine water;

(136) “Semi-volatile organic substance” means an organic substance that has a higher molecular weight and higher boiling point than a volatile organic substance;

(137) “Significant existing release” means a release to the land and waters of the state discovered pursuant to section 22a-134tt-2 of the RBCRs that is present in the location identified by, or creating one or more of the impacts to human health or the environment identified in section 22a-134tt-5(f) of the RBCRs;

(138) “Site-specific ecological risk analysis” means the full delineation and evaluation of pathways and impacts from a release to ecological receptors;

(139) “Soil” means unconsolidated geologic material overlying bedrock, including, but not limited to, sediment that has been removed from any surface water body and placed on dry land;

(140) “Soil water” means that portion of “waters” as defined in section 22a-423 of the Connecticut General Statutes, which is above the water table;

(141) “Soil vapor” means gaseous substances in the space between particles of soil;

(142) “SPLP” means Synthetic Precipitation Leaching Procedure EPA Method 1312 as set forth in “Test Methods for Evaluating Solid Waste: Physical/Chemical Methods”, SW-846, U.S. Environmental Protection Agency, Office of Solid Waste, Washington D.C. 20460;

(143) “Subject area” means an area where the RBCRs require an EUR to be placed and maintained as part of the selected remedial approach. “Subject area” includes the area subject to the restrictions and requirements of an EUR after such EUR has been recorded. There can be multiple subject areas on a parcel, or an entire parcel may comprise a single subject area;

(144) “Substance” means an element, compound or material which, when added to air, water, soil or sediment, may alter the physical, chemical, biological or other characteristic of such air, water, soil or sediment;

(145) “Surface water" has the same meaning as that provided in section 22a-426-1(60) of the Regulations of Connecticut State Agencies;

(146) “Surface water protection criteria” or “SWPC” means the criteria identified in section 22a-134tt-App5 of the RBCRs, alternative surface water protection criteria calculated by an LEP or approved by the commissioner pursuant to section 22a-134tt-10(b) of the RBCRs, or surface water protection criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(2) of the RBCRs;

(147) “Target indoor air concentrations” means a risk-based indoor air concentration developed in consultation with the Department of Public Health that are not expected to cause adverse health effects from chronic exposure;

(148) “TCLP” means Toxicity Characteristic Leaching Procedure EPA Method 1311 as set forth in “Test Methods for Evaluating Solid Waste: Physical/Chemical Methods”, SW-846, U.S. Environmental Protection Agency, Office of Solid Waste, Washington D.C. 20460;

(149) “Technically impracticable” means a determination by the commissioner that further reduction of the concentration of a substance in soil or groundwater cannot be achieved using sound engineering and hydrogeologic remediation practices;

(150) “TI Zone” means the areal extent of a substance that is technically impracticable to remediate to the applicable groundwater criteria;

(151) “Tier” means either:

(A) One of the categories established under 22a-134tt-6(b)(1) of the RBCRs; or

(B) The act of assigning a release to one of the categories identified in 22a-134tt-6(b)(1) of the RBCRs, pursuant to the process specified in 22a-134tt-6 of the RBCRs;

(152) “Tier Characterization” means the nature and extent of each substance present in the land and waters of the state at a concentration that exceeds fifty (50) percent of the applicable cleanup standard, or the applicable laboratory reporting limit, whichever is higher, has been delineated, or a demonstration that each substance is present in soil or groundwater at a level less than or equal to the background concentration has been made, using the standards identified in section 22a-134tt-4 of the RBCRs, except that:

(A) Pesticides shall be characterized to the extent needed to determine that pesticides discovered are present due to the application of pesticides. If such a determination is made, no further characterization of pesticides present due to the application of pesticides shall be required for tier characterization; and, pesticides present due to spraying, spreading, injecting, placing or other use of pesticides for the pesticide's intended purpose and consistent with its labeling shall not require further characterization for the purposes of tier characterization; and

(B) A release of polluted material that is discovered on a parcel currently used only for industrial/commercial activity may be characterized only to the extent needed to determine that it is prudent to remediate the polluted material using the conditional exemption for historically impacted material, pursuant to section 22a-134tt-9(j) of the RBCRs;

(153) "Underground storage tank system" or "UST system" means an underground storage tank and any associated ancillary equipment and containment system;

(154) "Underground storage tank system regulations" means regulations adopted pursuant to section 22a-449(d) of the Connecticut General Statutes;

(155) "Upgradient" means in the direction of maximum rate of increase of hydraulic head;

(156) "Upgradient area" with respect to a release area of a substance means the area bounded by:

(A) The width of the release area of such substance perpendicular to the direction of groundwater flow;

(B) Two side boundary lines parallel to the upgradient direction of groundwater flow extending from the two endpoints of said width to the upgradient parcel boundary; and

(C) The upgradient parcel boundary extending between the two side boundary lines, excluding any portion of such upgradient area that is affected by any other release of such substance, or beneath an existing permanent structure;

(157) "Vapor mitigation system" means technology employed to mitigate real or potential impacts from vapor intrusion;

(158) "Verification" shall have the same meaning as section 22a-134pp(9) of the Connecticut General Statutes;

(159) "Volatilization criteria" means the criteria identified in sections 22a-134tt-App6 and 22a-134tt-App7 of the RBCRs, alternative volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(c)(4) of the RBCRs, or volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(3) of the RBCRs;

(160) "Volatilization criteria for groundwater" means the criteria identified in section 22a-134tt-App6 of the RBCRs, alternative volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(c)(4) of the RBCRs, or volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(3) of the RBCRs;

(161) "Volatilization criteria for soil vapor" means the criteria identified in section 22a-134tt-App7 of the RBCRs, alternative volatilization criteria approved by the commissioner pursuant to section 22a-

134tt-10(c)(4) of the RBCRs, or volatilization criteria approved by the commissioner pursuant to section 22a-134tt-10(i)(3) of the RBCRs;

(162) "Volatile organic substance" means an organic substance that has a high vapor pressure and low boiling point at room temperature;

(163) "Volatile petroleum substance" means a volatile organic substance found in gasoline, diesel fuel, fuel oil, heating oil, kerosene, jet fuel, or similar fuels, along with volatile organic substances that may have been used as fuel additives;

(164) "Water table" means the plane in the ground at which all pore spaces are filled with water at atmospheric pressure;

(165) "Water quality criteria" means the lower of the human health or aquatic life criteria contained in Table 3 of the Water Quality Standards;

(166) "Water quality standards" means the Connecticut Water Quality Standards in sections 22a-426-1 to 22a-426-9, inclusive, of the Regulations of Connecticut State Agencies and the Classification Maps adopted pursuant to section 22a-426 of the Connecticut General Statues;

(167) "Wetland" has the same meaning as "wetlands" as provided in section 22a-38(15) of the Connecticut General Statutes or "wetland" as provided in section 22a-29(2) of the Connecticut General Statutes.

(b) Construction of Regulations

In the construction of the RBCRs, terms or words in the singular may be construed and applied to more than one thing and terms or words in the plural may be construed and applied to the singular or just one thing.

(c) Use of Form Prescribed by the Commissioner

(1) Any submittal to the commissioner under the RBCRs, including, but not limited to, a request for a variance, approval, notice, financial assurance, or EUR shall be submitted in writing on a form prescribed by the commissioner. Such form may require the following information:

(A) A description of the subject release;

(B) A description of the distribution and concentration of substances in soil and groundwater resulting from the subject release;

(C) The general characteristics of soil in the vicinity of the subject release area;

(D) A map showing the extent of all release areas on a parcel and the subject release area, including all sample locations;

(E) A map showing the extent of the subject groundwater plume and the concentration of substances in such plume;

(F) The tabulated analytical results of all laboratory analyses of soil and groundwater at the subject release area;

(G) A detailed justification for any variance or approval requested;

(H) Any information specifically required by the RBCRs;

(I) A signed certification by the person submitting the form and, if provided on the form, certification by an LEP; and

(J) Any other information deemed necessary by the commissioner.

(2) If an electronic system is available for any submission identified in subdivision (1) of this subsection, such submittal shall be made pursuant to the instructions prescribed by the commissioner for the use of such electronic system.

(d) **General Requirements for Analytical Data**

(1) Analytical Data Quality and Usability

(A) With respect to analytical data, the following shall apply:

(i) All analytical data used to comply with the RBCRs shall be scientifically valid and defensible, with a level of precision, accuracy, and sensitivity commensurate with its intended use. All analytical data submitted shall include an analytical data quality assessment and data usability evaluation prepared by individuals qualified to make such assessment or evaluation; and

(ii) If the commissioner determines that analytical data is not scientifically valid and defensible, or not of a sufficient level of precision, accuracy, and sensitivity to support the intended use of the data, the commissioner shall identify in writing the reasons for such conclusions and such data shall not be relied upon to demonstrate compliance with the RBCRs.

(B) The commissioner may specify, by posting on the department's internet website, methods or protocols to ensure that analytical data is of known and documented quality, including, but not limited to:

(i) RCPs for laboratory quality assurance and quality control measures or analytical methods for the evaluation of soil, sediment, groundwater, air, or soil vapor;

(ii) RCPs to be followed when establishing laboratory reporting limits; and

(iii) Methods and protocols for assessing data quality and evaluating data usability which can be used to determine whether data is scientifically valid and defensible, with a level of precision, accuracy, and sensitivity commensurate with its intended use.

(C) If an analytical data quality assessment or usability evaluation is conducted using a method or protocol other than the methods and protocols prescribed by the commissioner pursuant to this subdivision, such methods and protocols shall be documented and submitted for the commissioner's review and evaluation. If the commissioner determines that such method or protocol is not scientifically valid and defensible, or not of a sufficient level of precision, accuracy, and sensitivity to support the intended use of the data, the commissioner shall identify in writing the reasons for such conclusions and such data shall not be relied upon to demonstrate compliance with the RBCRs.

(2) Laboratory Reporting Limit Requirements

The laboratory reporting limit for the analysis of all samples used to comply with the RBCRs shall:

(A) Be established at a concentration which is less than the applicable criteria, unless matrix interference or instrument limitations cannot be overcome by taking the additional actions listed in subdivisions (3) and (4) of this subsection;

(B) Not be artificially raised or lowered; and

(C) (i) Be equivalent to the concentration of the lowest standard used to calibrate the instrument actually analyzing a sample, provided such instrument has been calibrated in accordance with a method specified in an RCP or otherwise approved by the commissioner after consultation with the Commissioner of Public Health; or

(ii) Be equivalent to the concentration of a low-level reporting standard, as specified in an RCP or otherwise approved by the commissioner after consultation with the Commissioner of Public Health.

(3) Matrix Interference

(A) When analyzing a sample, if due to matrix interference the laboratory reporting limit for a substance is greater than the applicable RBCR criteria for such substance, additional procedures, including, but not limited to, sample preparation procedures or alternative analytical methods shall be evaluated to determine whether the use of such procedures or methods will enable a laboratory reporting limit equal to or less than the applicable RBCR criteria for such substance to be consistently and accurately achieved.

(B) In the circumstances described in subparagraph (A) of this subdivision, at a minimum, the following procedures or methods shall be evaluated in determining whether a laboratory reporting limit less than or equal to the applicable criteria can be achieved:

(i) "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods." SW-846, U.S. Environmental Protection Agency, Office of Solid Waste, Washington D.C. 20460; or

(ii) Other analytical methods or procedures either approved in writing by EPA or, after consultation with the Commissioner of Public Health, approved in writing by the commissioner.

(C) (i) If pursuant to subparagraph (B) of this subdivision, a procedure or method is identified that will consistently and accurately achieve a laboratory reporting limit equal to or less than the applicable criteria, the sample shall be re-analyzed for the subject substance using such procedure or method.

(ii) If after re-analysis the matrix interference is overcome and the lowest laboratory reporting limit for a substance that can be consistently and accurately achieved is now equal to or less than the applicable criteria, the analytical results from such re-analysis can be used for the purpose of determining compliance with the RBCRs.

(D) (i) If despite taking the actions to overcome matrix interference specified in subparagraphs (B) and (C) of this subdivision, a laboratory reporting limit less than or equal to the applicable criteria cannot be consistently and accurately achieved, a report detailing the measures taken to overcome such matrix interference shall be submitted in writing to the commissioner. This report shall include, at a minimum, a description of the measures taken under subparagraphs (B) and (C) of this subdivision as well as the lowest achievable laboratory reporting limit consistently and accurately achievable under subparagraph (C)(i) of this subdivision.

(ii) The commissioner shall use the report submitted pursuant to clause (i) of this subparagraph to determine the lowest laboratory reporting limit for such substance that can be consistently and accurately achieved. If the commissioner determines that such laboratory reporting limit is still greater than the applicable criteria, the commissioner may determine that compliance with the RBCRs will be achieved when such laboratory substance has been remediated to such reporting limit. Any such determination by the commissioner shall be in writing and shall include the reasons for such determination.

(4) Instrument Limitations

(A) When analyzing a sample, if due to instrument limitations the laboratory reporting limit for a substance is greater than the applicable RBCR criteria for such substance, alternative analytical methods or alternative instrumentation shall be evaluated to determine whether the use of such procedures or methods will enable a laboratory reporting limit equal to or less than the applicable criteria for such substance to be consistently and accurately achieved.

(B) In the circumstances described in subparagraph (A) of this subdivision, at a minimum, the following procedures or methods shall be evaluated in determining whether a laboratory reporting limit less than or equal to the applicable criteria can be achieved:

(i) "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods." SW-846, U.S. Environmental Protection Agency, Office of Solid Waste, Washington D.C. 20460; or

(ii) Other analytical methods or instruments either approved in writing by EPA or, after consultation with the Commissioner of Public Health, approved in writing by the commissioner.

(C) (i) If pursuant to subparagraph (B) of this subdivision, a method or instrument is identified that will consistently and accurately achieve a laboratory reporting limit equal to or less than the applicable criteria, the sample shall be re-analyzed for the subject substance using such method or instrument.

(ii) If after re-analysis the instrument limitation is overcome and the lowest laboratory reporting limit for a substance that can be consistently and accurately achieved is now equal to or less than the applicable criteria, the analytical results from such re-analysis can be used for the purpose of determining compliance with the RBCRs.

(D) (i) If despite taking the actions to overcome instrument limitations specified in subparagraphs (B) and (C) of this subdivision, a laboratory reporting limit less than or equal to the applicable criteria cannot be consistently and accurately achieved, a report detailing the measures taken

to overcome such instrument limitations shall be submitted in writing to the commissioner. This report shall include, at a minimum, a description of the measures taken under subparagraphs (B) and (C) of this subdivision as well as the lowest achievable laboratory reporting limit consistently and accurately achievable under subparagraph (C)(i) of this subdivision.

(ii) The commissioner shall use the report submitted pursuant to clause (i) of this subparagraph to determine the lowest laboratory reporting limit for such substance that can be consistently and accurately achieved. If the commissioner determines that such laboratory reporting limit is still greater than the applicable criteria, the commissioner may determine that compliance with the RBCRs will be achieved when such substance has been remediated to such laboratory reporting limit. Any such determination by the commissioner shall be in writing and shall include the reasons for such determination.

(e) Significant Existing Releases

For the purposes of the RBCRs, the following existing releases are determined to be significant existing releases:

(1) a release that has caused or is causing contamination of a public or private drinking water well;

(2) a release of a substance for which a groundwater protection criteria has been specified that has caused or is causing contamination of groundwater within 500 feet of a private or public drinking water well at a concentration equal to or greater than the groundwater protection criteria;

(3) a release discovered in soil within two feet of the ground surface that contains a substance at concentrations greater than or equal to 15 times the applicable direct exposure criteria for such substance;

(4) a release of volatile organic substances or volatile petroleum substances to groundwater that has caused or is causing either:

(A) a groundwater plume within 30 feet of the ground surface and within 30 feet or less of the lowest portion of a building contaminated at concentrations greater than or equal to 10 times the applicable volatilization criteria for any volatile organic substance, except volatile petroleum substances;

(B) a groundwater plume within 10 feet of the ground surface and within 10 feet or less of the lowest portion of a building contaminated at concentrations greater than or equal to 10 times the applicable volatilization criteria for any volatile petroleum substances;

(C) soil vapor beneath a building to be contaminated at concentrations greater than or equal to the applicable volatilization criteria for such substance; or

(D) the detection of toxic air contaminants in indoor air provided such toxic air contaminant is not present in indoor air solely as the result of a current process or use of materials in an industrial setting;

(5) a release of a substance at a concentration of greater than or equal to 10 times the surface water protection criteria for such substance, or of a non-aqueous phase liquid, to groundwater within 500 feet of surface water;

(f) Criteria and Land Uses

(1) When determining the current use of land, all current uses on the parcel impacted by a release, including accessory uses, shall be considered. If any use of a parcel, or any portion of the parcel, is for residential activity, the current use of the parcel shall be residential.

(2) When determining the applicable criteria for soil remediation, residential criteria shall be considered applicable unless use of a parcel is restricted by an EUR or the parcel is subject to a permit by rule.

(g) Licensing of Permitted Environmental Professionals

(1) In determining whether the commissioner is satisfied that issuing a license pursuant to section 22a-454 of the Connecticut General Statutes to a person to act as a permitted environmental professional will not result in pollution, contamination, emergency or the violation of the RBCRs or a violation of any regulation adopted under sections 22a-30, 22a-39, 22a-116, 22a-347, 22a-377, 22a-430, 22a-449, 22a-451 and 22a-462 of the Connecticut General Statutes, the commissioner shall consider:

(A) Such person's training and education;

(B) The duration and nature of such person's professional experience; and

(C) Any credentials or licenses held by such person.

(2) As part of an application submitted pursuant to section 22a-454 of the Connecticut General Statutes, the commissioner may request any information necessary to comply with the requirements of this subsection.

(3) No license authorizing a person to act as a PEP shall be renewed if the commissioner determines that the activities of the permittee have resulted or will result in pollution, contamination, or emergency. If the activities of a PEP result in pollution, contamination, or emergency, the commissioner may take any applicable enforcement action authorized by section 22a-134ss of the Connecticut General Statutes.

Section 22a-134tt-2 Discovery of Releases

(a) Discovery of an Existing Release

(1) Except as provided in subsection (b) of this section, discovery of a release to the land and waters of the state occurs when a person who created or is maintaining a release has actual knowledge or constructive knowledge of such release, except that a release shall not be deemed discovered if the only evidence of such release is data available or generated before the date when regulations are first adopted pursuant to section 22a-134tt.

(2) A person who created or is maintaining a release has actual knowledge of a release if they know of the presence of substances in or on the land and waters of the state. Actual knowledge of a release shall include, but shall not be limited to, knowledge of a release on the basis of either:

(A) The results of laboratory analysis of soil, groundwater, sediment, or soil vapor, obtained by or at the direction of the person who created or is maintaining the release or the commissioner, indicating concentrations of such substances above the laboratory reporting limit; or

(B) The observed presence of non-aqueous phase liquid;

provided such substance is not present because it has been authorized under Title 22a of the Connecticut General Statutes, is naturally occurring, or is a result of automotive exhaust or the application of fertilizer or pesticides consistent with their labeling.

(3) A person who shall be presumed to have discovered a release if such person, when taking into account any specialized knowledge or training, has actual or constructive knowledge of a release and, if such release exists, would be considered to have created or be maintaining such release.

(A) Such a person shall be considered to have constructive knowledge when:

(i) a reasonable person, with similar knowledge, experience or training, exercising a reasonable degree of care a person would exercise in the same or similar circumstances, would have discovered a release; or

(ii) multiple lines of evidence indicate the presence of oil or petroleum or chemical liquids or solids, liquids, or gaseous products or hazardous waste, as defined in section 22a-448 of the Connecticut General Statutes, in or on the land and waters of the state. Such evidence may include, but shall not be limited to:

(I) information about the use of a particular geographic area, including anecdotal reports of historical disposal or releases, aerial photographs, and maps;

(II) the results of field screening indicating the presence of volatile organic compounds, petroleum hydrocarbons, or metals;

(III) observed staining of soil, concrete floors, or pits;

(IV) organoleptic evidence, including odors;

(V) indoor air samples indicating the intrusion of soil vapors;

(VI) the observed presence of asphalt, coal slag, solid waste, ash, or other non-native materials in or on the land and waters of the state; or

(iii) such person has been notified, pursuant to subsection (b)(2) of this section, that characterization of a release has identified the source of such release, and such source is under the control of a person who created or is maintaining such release.

(B) A person with constructive knowledge of a release, and who would be considered to have created or be maintaining such release, shall bear the burden of rebutting the presumption that a release has been discovered.

(i) The presumption that a release has been discovered shall only be rebutted when a person with constructive knowledge obtains laboratory analytical data, based on the collection of samples from representative locations, which demonstrates that any substance reasonably likely to have been released in the geographic area identified is not present in or on the land and waters of the state in the identified geographic area. Such data shall be collected and analyzed pursuant to sections 22a-134tt-1(d) and 22a-134tt-4 of the RBCRs.

(ii) If the presumption that a release has been discovered is not rebutted, the release shall be considered discovered on the day the person who created or is maintaining such release first had constructive knowledge of the release and shall be subject to the requirements of the Release-Based Cleanup Regulations.

(b) Existing Releases Discovered by the Commissioner or Other Persons

(1) If the commissioner determines a release exists in a certain geographic area on the basis of the results of laboratory analysis of soil, groundwater, sediment, or soil vapor indicating concentrations of substances above the laboratory reporting limit, and provides such data to the person who created or is maintaining the release, such person will be considered to have actual knowledge of the release, pursuant to subsection (a)(2) of this section.

(2) If characterization of a release performed pursuant to the requirements of section 22a-134tt-4 of the RBCRs has identified the source of such release, and information regarding such characterization, including the results of laboratory analysis of soil, groundwater, sediment, or soil vapor, indicating concentrations of such substances above the laboratory reporting limit, is provided to any person who would be considered to have created or be maintaining a release by the person performing such characterization, the person who would be considered to have created or be maintaining a release shall have constructive knowledge of such release pursuant to subsection (a)(3) of this section.

(c) Discovery of a Significant Existing Release

In addition to the provisions of subsection (a) of this section, a significant existing release is discovered when any person, taking into account any specialized knowledge or training possessed by such person, authorized or otherwise permitted by the person who created or is maintaining a release to access a specific area for any purpose, obtains actual knowledge, pursuant to the standards identified in

subsection (a)(2) of this section, or constructive knowledge, pursuant to the standards identified in subsection (a)(3) of this section, of a release requiring immediate action.

(d) Existing Releases from Regulated Underground Storage Tank Systems

If the source of a release is or was an underground storage tank system regulated by the underground storage tank system regulations adopted pursuant to section 22a-449(d) of the Connecticut General Statutes, such release shall not be considered to have been discovered for the purposes of the RBCRs.

(e) Discovery of Emergent Reportable Releases

Any release to the land and waters of the state required to be reported by regulations adopted pursuant to section 22a-450 of the Connecticut General Statutes shall be considered to be discovered and shall be subject to the requirements of the RBCRs, unless otherwise exempted from discovery by subsection (d) of this section.

(f) Naturally Occurring Metals at the Time of Discovery

(1) If the laboratory analytical results of soil samples identify the presence of one or more metals listed in the following table, each metal shall be considered naturally occurring if:

(A) the concentration of such metal in each sample analyzed is less than or equal to the low value listed in the following table that corresponds to such metal;

(B) Not less than 3 samples of soil have been analyzed and the concentration in any 1 or more samples analyzed is greater than the low value listed in the following table that corresponds to such metal but the concentration in each sample analyzed is less than or equal to the high value in the following table that corresponds to such metal;

(C) Not less than 5 samples of soil have been analyzed and the concentration in any 1 or more samples analyzed is greater than the high value listed in the following table that corresponds to such metal but the concentration in each sample analyzed is less than or equal to the residential direct exposure criteria for such metal, provided an outlier analysis has been performed and any sample determined to be an outlier is evaluated to determine whether such sample has resulted in the discovery of a release;

(D) Not less than 7 samples of soil have been analyzed and the concentration in any 1 or more samples analyzed is greater than the residential direct exposure criteria for such metal, provided an outlier analysis has been performed and the results of the laboratory analysis of all soil samples analyzed is provided to the commissioner, and the commissioner determines in writing that, in the commissioner's sole discretion, the identified metal is naturally occurring; or

(E) The identified metal is determined to be background using a method other than the methods specified in this subsection, provided such method is submitted to the commissioner in writing and the commissioner, in the commissioner's sole discretion, approves of the use of such method.

(2) Soil samples shall be collected and analyzed as follows:

(A) If 1 or more samples identify concentrations of metals greater than the low value listed in the table following subdivision (1) of this subsection, the minimum number of samples of soil specified by subparagraphs (B), (C), and (D) this subsection shall be collected from another area reasonably believed not to be impacted by site activity, and shall be from the same geologic unit and of similar texture and composition;

(B) If one or more samples identifying concentrations of metals greater than the low value listed in the table following subdivision (1) of this subsection have been collected from a known or suspected release area, the minimum required number of samples of soil specified by subdivisions (B), (C), or (D) of subsection (e) of this section shall be collected from outside such known or suspected release area; and

(C) All analytical data shall comply with the requirements of section 22a-134tt-1(d) of the RBCRs. If an outlier analysis is required, such analysis shall be performed pursuant to any method specified by the commissioner pursuant to section 22a-134tt-1(d) of the RBCRs or another method approved by the commissioner pursuant to such section.

Naturally Occurring Background Metals Values for Connecticut

Inorganic Substance	Option 1 Default Values in mg/kg (ppm)	Option 2 Upper Limit in mg/kg (ppm)
Aluminum	58,800	85,040
Antimony	0.1	0.3
Arsenic	3	6
Barium	385	756
Beryllium	2	2
Bismuth	0.2	0.5
Cadmium	ND < 0.1	0.3
Calcium	5,610	20,870
Cerium	73	138
Cesium	ND < 5	8
Chromium	31	60
Cobalt	9	20
Copper	17	45
Gallium	15	24
Indium	0.05	0.1

Inorganic Substance	Option 1 Default Values in mg/kg (ppm)	Option 2 Upper Limit in mg/kg (ppm)
Iron	26,080	51,940
Lanthanum	32	66
Lead	18	27
Lithium	20	60
Magnesium	5,840	15,320
Manganese	544	1,195
Mercury	0.03	0.1
Molybdenum	0.7	4
Nickel	13	36
Niobium	10	17
Phosphorus	339	817
Potassium	16,930	29,620
Rubidium	80	117
Scandium	12	18
Selenium	ND < 0.2	0.8
Silver	ND < 1	ND < 1
Sodium	9,930	18,500
Strontium	125	283
Sulfur	ND < 100	304
Thallium	0.4	0.8
Thorium	11	15
Tin	2	3
Titanium	2,880	4,660
Tungsten	0.9	2
Uranium	3	7
Vanadium	69	102
Yttrium	19	31

Inorganic Substance	Option 1 Default Values in mg/kg (ppm)	Option 2 Upper Limit in mg/kg (ppm)
Zinc	44	104

Notes:

ND = non-detect at the specified reporting limit

mg/kg = milligrams per kilogram

22a-134tt-3 – Reporting Newly Discovered Existing Releases

(a) Report Required; Discovery By a Creator or Maintainer

Upon discovery of an existing release, a report of such release shall be provided to the commissioner by a person who created or is maintaining such release within the applicable time period specified in subdivision (1) or (2) of this subsection. Any report required by this subsection shall contain the information and be made in the manner specified by subsection (b) of this section. A person who discovers a significant existing release, but who did not create and is not maintaining such release, shall take the steps required by subsection (c) of this section to ensure that such release is reported as required.

(1) Significant Existing Releases

(A) A significant existing release shall be reported not more than 72 hours after the discovery of such release.

(B) Notwithstanding the requirements of subparagraph (A) of this subdivision, a significant existing release shall be reported not more than 2 hours after the discovery of such a release if such release is an imminent hazard which creates a significant risk of harm to human health, safety, public welfare, or the environment, including, but not limited to:

(i) an imminent risk of impacting a public or private drinking water supply by NAPL or by a substance for which a groundwater protection criteria is identified in the cleanup standards sections;

(ii) an imminent risk of explosion;

(iii) a significant existing release which is discovered or is present within 500 feet of residential activity, playground, recreation area, or park; and

(iv) an imminent risk to sensitive ecological receptors, such as aquatic life.

(2) Other Reportable Existing Releases

(A) An existing release shall be reported, pursuant to the requirements of subsection (b) of this section, not more than 120 days after discovery if:

(i) there is one or more numeric cleanup criteria for each substance released in the cleanup standards sections, and the results of laboratory analysis indicate that a substance is present in soil or groundwater at a concentration greater than or equal to two times the applicable numeric cleanup standard; provided that, if oil or petroleum, or constituent components of oil or petroleum, are detected at concentrations that exceed the reportable concentrations in soil, such release shall only be reported if the contiguous volume of soil containing such release is characterized pursuant to 22a-134tt-4 and determined to be equal to or greater than 2 cubic yards;

(ii) such release is identified by the presence of subsurface NAPL in a groundwater monitoring well, excavation, or subsurface structure, and the measured thickness of such NAPL is equal to or greater than one-eight inch; or

(iii) the release is of a substance for which no numeric cleanup standard is specified, but the concentration is greater than two times an additional polluting substances criteria for such substance calculated pursuant to the cleanup standards sections, or no additional polluting substances criteria can be calculated.

(B) Notwithstanding the requirements of subparagraph (A) of this subdivision, a release shall not be reported if, not more than 120 days after discovery, it has been remediated to the standards in the cleanup standards sections and a release remediation closure report has been verified by an LEP pursuant to section 22a-134tt-12 of the RBCRs.

(C) An existing release shall be reported, pursuant to the requirements of subsection (b) of this section, not more than 365 days after discovery if there is one or more numeric cleanup standard or an additional polluting substances criteria can be calculated for each substance released and the results of laboratory analysis indicate that a substance is present in soil or groundwater at a concentration less than twice the applicable numeric cleanup standard or calculated additional polluting substances criteria, except that a release shall not be reported if, not more than 365 days after discovery, such release has been remediated to the standards in the cleanup standards sections and a release remediation closure report has been verified by an LEP pursuant to section 22a-134tt-12 of the RBCRs.

(D) Notwithstanding the requirements of subparagraph (A) of this subdivision, the following releases are exempt from the requirement to report:

(i) Any release required to be reported by regulations adopted pursuant to section 22a-450 of the Connecticut General Statutes;

(ii) Releases resulting or emanating from a consolidated bituminous concrete surface provided such release is from an incidental source, as such term is used at section 22a-134tt-9(b)(5)(B);

(iii) Releases resulting or emanating from piers, pilings, and other building foundation structures and other building materials, provided such structures or materials are still in good repair and serving their original intended use;

(iv) Releases resulting or emanating from utility poles or landscaping timbers still in use; and

(v) Releases of trihalomethanes discovered in groundwater caused by naturally occurring geological process or discharges from a public water supply system;

(b) Report contents and process

(1) Contents of Report

(A) Any report required by this section shall contain the following information regarding a discovered release:

(i) The time and date that, pursuant to section 22a-134tt-2 of the Regulations of Connecticut State Agencies, the release was discovered;

(ii) The precise longitude and latitude, in degrees, minutes, and seconds, where the release is located such that it can be found using a global positioning system device;

(iii) The street address of the parcel on or under which the release is located, the town and zip code in which such parcel is located, the map, block and lot number of such parcel, and any significant landmarks on such parcel to help more closely identify the precise location of the release. If the parcel on or under which the release is located does not have an address, or the address is unknown, the address of a nearby parcel may be provided along with sufficient directions or landmarks to locate the release;

(iv) The name, mailing address, telephone number, and electronic mail address of the person providing the report and the person who created or is maintaining the release at whose direction the report has been provided;

(v) A statement identifying whether the person providing the report is the creator or maintainer of the release or, if the person is not the creator or maintainer of the release a description of such person's relationship to the creator or maintainer;

(vi) The name, business address, telephone number, and electronic mail address of any LEP or PEP who has knowledge of the discovered release;

(vii) If the person providing the report is not the owner of the parcel on or under which the release is located, the name of the owner of the parcel on or under which the release is located, and the telephone number and mailing address for such owner, if such information is known;

(vii) A brief description of the current use of the parcel on which the release was discovered;

(ix) Known or suspected sensitive receptors within 500 feet of the release, including, but not limited to, residential drinking water wells, public water supply wells or reservoirs, surface water bodies, schools and day care centers;

(x) The substance or substances released, and if known, the quantity or concentration of such substances;

(xi) A description of the nature and extent of the release, including whether such release has impacted soils, groundwater or surface water;

(xii) A description of any imminent hazard posed by such a release, including but not limited to those hazards listed in subsection (a)(1)(B) of this section; and

(xiii) The results of laboratory analysis identifying each substance present at greater than applicable numeric cleanup standard or a cleanup standard calculated pursuant to section 22a-134tt-APP8 of the Regulations of Connecticut State Agencies at the time such report is submitted.

(B) If the release required to be reported is a significant existing release, and not all information required by subdivision (1) of this subsection is available at the time a report must be provided:

(i) any person required to report such a release shall report all known information about such release in the timeframe specified by subsection (a)(1) of this section; and

(ii) Not later than 7 days after an incomplete report is provided pursuant to clause (i) of this subparagraph, a complete report, containing all the information specified in subdivision (1) of this subsection, shall be provided.

(C) Form and Process for Providing a Report

(i) The commissioner shall specify, by posting on the department's internet website, the form and process by which each type of report required by subparagraph (B) of this subsection and containing the information specified in such subparagraph, shall be provided. The form and process specified may include, but shall not be limited to, one or more of the following:

(I) a telephone call to the department's emergency dispatch center;

(II) a written report provided by mail;

(III) a written report provided by electronic mail to a designed electronic mail address; or

(IV) a written report provided using to a file transfer site or electronic filing system maintained by the department.

(ii) If the process for submitting a report specified by the commissioner pursuant to this subparagraph requires the report be provided in writing, such report shall be provided on a form prescribed by the commissioner.

(c) Reports of Significant Existing Releases When the Person Who Discovers Such Release Did Not Create And Is Not Maintaining The Release

(1) The timeframe for providing a report specified in subsection (a)(1) of this section shall begin upon discovery of significant existing release by a person who did not create and is not maintaining such release, pursuant to section 22a-134tt-2(b) of the RBCRs.

(2) If the person who discovers a significant existing release has access to the geographic area of the release because:

(A) such person is an employee, contractor, agent, representative, or otherwise has access to the geographic area of the release at the specific direction or with the direct consent of a person who created or is maintaining a release, the person who discovers such a release shall, not later than one hour after discovering the release, notify the person who created or is maintaining the release of its discovery and provide all available relevant information regarding the release to such person; or

(B) such person is hired, retained, designated or authorized, or otherwise has access to the geographic area of the release at the direction of a person other than a person who created or is maintaining such a release, the person who discovered the release shall, not later than one hour after discovering the release, notify the person on whose behalf the geographic area of the release was accessed of the discovery and provide all available relevant information regarding the release to such person. Any person receiving such a notification shall contact a person who created or is maintaining the release and provide all available relevant information regarding the release to such person not later than one hour after receiving the notification.

(3) A person who created or is maintaining significant existing release, upon receipt of notification made pursuant to this subsection shall report such release to the commissioner within the time specified by subsection (a)(1) of this section that contains the information required by, and is in the form and uses the process specified by, subsection (b) of this section. The person reporting such a release shall confirm to the person who notified them and the person who discovered such a release, that a timely report of the release has been provided to the commissioner.

(4) If the person who discovered a significant existing release and the person who notified the person who created or is maintaining such a release have not received confirmation that such a timely report of such release has been provided to the commissioner pursuant to subparagraph (2)(B) of this subsection, and the time period for reporting such release has expired, such persons shall notify the commissioner that:

(A) a significant existing release was discovered;

(B) the time, date and location of discovery;

(C) the nature of the discovered release;

(D) that a person who created or is maintaining such a release was notified within the time specified by this subsection; and

(E) the name and contact information for such person.

The commissioner shall specify, by posting on the department's internet website, the form and process by which such notification shall be made, which shall include, but may not be limited to notification by telephone call to the department's emergency dispatch center.

(d) Reports of Existing Releases Discovered on Transfer Act Site

(1) If an existing release is discovered on any parcel required to be investigated and remediated pursuant to sections 22a-134 to 22a-134e, inclusive, and sections 22a-134h and 22a-134i of the Connecticut General Statutes and, pursuant to section 22a-134rr of the Connecticut General Statutes, such release is subject to the requirements of sections 22a-134qq to 22a-134xx, inclusive, of the Connecticut General Statutes, a report of such release shall be provided to the commissioner pursuant to the requirements of this section.

(2) If remediation of the parcel pursuant to the requirements of sections 22a-134 to 22a-134e, inclusive, and sections 22a-134h and 22a-134i of the Connecticut General Statutes, is ongoing and a Form I, Form II, Form III verification or Form IV verification has not yet been submitted, and the discovered release is not a release requiring immediate action, in addition to complying with the requirements of subsection (b) of this section, any report filed pursuant to subdivision (1) of this subparagraph shall specify whether:

(A) the release will be remediated pursuant to the process and to the standards specified in the RBCRs; or

(B) the release will be remediated pursuant to the requirements of, and to the standards specified by sections 22a-134 to 22a-134e, inclusive, and sections 22a-134h and 22a-134i of the Connecticut General Statutes, and a Form III verification or From IV verification for the parcel which includes such release will be provided pursuant to the requirements of sections 22a-134 to 22a-134e, inclusive, and sections 22a-134h and 22a-134i of the Connecticut General Statutes not later than the deadline for verification of the parcel specified in section 22a-134a(g)(c) of the Connecticut General Statutes, without extension of such deadline.

22a-134tt-4 Characterization of Discovered Releases

(a) Requirement to Characterize Nature and Extent of a Release

(1) Upon discovery, the nature and extent of a release shall be determined, pursuant to the requirements of this section. This characterization is necessary prior to determining the appropriate remedial action for an existing release. Remediation of any release shall not be determined to have satisfied the requirements of the RBCRs unless and until the nature and extent of such release has been determined, as required herein.

(2) Required Information

(A) Characterization of a release shall require the development of a conceptual site model, which may include, but shall not be limited to, evaluation of:

(i) The physical setting of the release, such as topography, soil type, geology, and hydrogeology;

(ii) Chemical properties of each substance discovered;

(iii) The historical, current, and anticipated land uses of the release area and surrounding real property;

(iii) Receptor pathways and Potential receptors, such as existing uses of groundwater and proximity to water supply wells, nearby occupied buildings and nearby surface water;

(iv) Historical information and records;

(v) Observations of the release area and surrounding real property; and

(vi) The results of soil, groundwater, or other environmental media testing, including the results of any field screening and all laboratory analytical data concerning such release.

(B) (i) When specifying prevailing standards and guidelines pursuant to subsection (b) of this section, the commissioner shall identify those releases for which a full characterization is not required and shall specify the extent of information necessary to develop a conceptual site model of such a release; and

(ii) A determination that the release remediation closure report for a release may be certified by a PEP shall be considered to satisfy the requirements of this section.

(3) Tier characterization of a release shall be completed as soon as practicable, but not later than 1 year after discovery of such release.

(4) No release remediation closure report shall be verified by an LEP or certified by a PEP until full characterization of a release is complete.

(5) If an immediate action is required by section 22a-134tt-5 of the Regulations of Connecticut State Agencies, then any characterization necessary to perform such actions, or verify the effects of such actions, shall be completed as required by such section.

(b) Identification of Prevailing Standards and Guidelines

(1) The commissioner may specify, by posting on the department's internet website, methods or protocols for the characterization of a release through the development of a conceptual site model which shall include, but shall not be limited to, methods or protocols for identifying and evaluating the information specified by subsection (a)(2) of this section. Methods or protocols posted on the department's internet website pursuant to this subdivision shall be considered prevailing standards and guidelines.

(2) If characterization is conducted pursuant to the prevailing standards and guidelines specified by the commissioner pursuant to subdivision (1) of this subsection, such characterization shall be sufficient for all purposes required by the RBCRs .

(3) (A) If characterization is performed using standards and guidelines other than those prevailing standards and guidelines specified by the commissioner pursuant to subdivision (1) of this subsection, such standards and guidelines, and any methods or protocols used pursuant thereto, shall be documented and submitted for the commissioner's review;

(B) The documentation required by subparagraph (A) of this subdivision shall be submitted to the commissioner once, at the earliest of the following:

(i) upon completion of an immediate action completed pursuant to section 22a-134tt-5 of the Regulations of Connecticut State Agencies, if an immediate action is required for such release;

(ii) upon submission of a release remediation closure report, if remediation is completed not more than one year after discovery of such release; or

(iii) upon assignment of the release to a cleanup tier, if such release is required to be assigned to a cleanup tier.

(C) If the commissioner determines that such standard or guideline, or any method or protocol used pursuant thereto, is not scientifically valid and defensible, or not of a level of precision, accuracy, and sensitivity to sufficiently determine the nature and extent of a release, the commissioner shall identify in writing the reasons for such conclusions and such characterization shall not be relied upon to demonstrate compliance with the RBCRs. Along with such written statement, the commissioner shall specify a deadline for the completion of characterization pursuant to the requirements of this section.

(4) Notwithstanding the requirements of this section, a release remediation closure report certified by a PEP shall contain only such characterization necessary to demonstrate compliance with the applicable provisions of section 22a-134tt-8 of the RBCRs.

22a-134tt-5 – Immediate Actions

(a) **Immediate Action Required**

(1) An immediate action, performed pursuant to the requirements of this section, shall be required upon discovery of a release to the land and waters of the state if such release is:

(A) An emergent reportable release; or

(B) A significant existing release.

(2) An immediate action shall continue until it has achieved either an immediate action transition-point identified in subsection (h) of this section or the standards identified in the cleanup standards sections.

(3) If an immediate action is required by this section but such action has not been undertaken or an immediate action has not been performed pursuant to the requirements of this section, including but not limited to, the failure to comply with a deadline specified herein, the failure to satisfy a cleanup standard or transition-point identified by subdivision (2) of this subsection, or the failure to submit an immediate action report identified in subsection (k) of this section, the commissioner may take any action authorized by section 22a-134rr or 22a-134ss of the Connecticut General Statutes, including issuing a cease and desist order pursuant to section 22a-134ss(g) of the Connecticut General Statutes. Nothing herein shall affect the commissioner's ability to enforce under any other provision of statute or regulation.

(b) **Emergencies and Exigent Conditions**

(1) Upon receiving a report of an emergent reportable release or a significant existing release, the commissioner may, in the commissioner's sole discretion, determine such release to be an emergency or exigent condition and may direct the response to such release.

(2) If the commissioner responds to such an emergency or exigent condition, on-site or otherwise, the commissioner may direct any person who created or is maintaining such release to perform any action necessary to investigate, stabilize, contain, mitigate, remediate, remove, or monitor such release or to protect human health or the environment, which shall include, but not be limited to, any remediation or other action necessary to achieve an immediate action transition-point specified in subsection (h) of this section or a standard specified in the cleanup standards sections.

(3) If an action directed by the commissioner pursuant to this subsection is not performed as directed by the commissioner or is not able to be performed by the person who created or maintained the release in the timeframe necessary to protect human health or the environment, the commissioner may perform such action, or may retain an appropriately licensed contractor to perform such action, and may seek to recover eligible costs pursuant to section 22a-451 of the Connecticut General Statutes and may take any authorized enforcement action including, but not limited to, actions authorized by sections 22a-134rr to 22a-134ss, inclusive, of the Connecticut General Statutes including issuing a cease and desist order pursuant to section 22a-134ss(g) of the Connecticut General Statutes, or an administrative civil penalty pursuant to sections 22a-134ss(f) and 22a-6b of the Connecticut General Statutes, including a schedule of penalties adopted pursuant thereto.

(4) The commissioner shall determine, in the commissioner's sole discretion, when an emergency or exigent condition caused by a release has been abated. The commissioner may determine that an emergency or exigent condition has been abated without achieving either an immediate action transition-point specified by subsection (h) of this section or a standard specified in the cleanup standards sections. Upon determining that the emergency or exigent condition has been abated, the commissioner may end any response to such release. At the conclusion of any response directed by the commissioner, provided the response directed has not achieved an immediate action transition-point, each person who created or is maintaining such release shall continue the actions required to achieve an immediate action transition-point or a cleanup standard within the time specified by subsection (h) of this section.

(c) **Time to Begin Required Immediate Actions**

(1) The actions required by subsections (d) and (e) of this section shall begin immediately upon discovery of an emergent reportable release, if practicable, and under no circumstances later than 2 hours after discovery of such release. No time period or deadline specified by this section shall delay any action necessary to investigate, stabilize, contain, mitigate, remediate, remove, or monitor such release.

(2) The actions required by subsections (d) and (f) of this section shall begin immediately upon discovery of a significant existing release or as soon as is practicable, and under no circumstances later than any deadline for action specified in this section after such release is reported as required by section 22a-134tt-3 of the Regulations of Connecticut State Agencies. No time period or deadline specified by this section shall delay any action necessary to investigate, stabilize, contain, mitigate, remediate, remove, or monitor such release.

(3) If the immediate actions specified by subsection (d) of this section, and subsection (e) or (f), as applicable, are not underway and the time frame specified by this subsection has passed, the commissioner may perform such action, or may retain an appropriately licensed contractor to perform such action, and may seek to recover eligible costs pursuant to section 22a-451 of the Connecticut General Statutes and may take any authorized enforcement action including, but not limited to, actions authorized by sections 22a-134rr to 22a-134ss, inclusive, of the Connecticut General Statutes including issuing a cease and desist order pursuant to section 22a-134ss(g) of the Connecticut General Statutes, or an administrative civil penalty pursuant to section 22a-134ss(f) and section 22a-6b of the Connecticut General Statutes, including a schedule of penalties adopted pursuant thereto.

(d) **Required Immediate Actions**

(1) Upon discovery of an emergent reportable release or a significant existing release, each person who created or is maintaining such release shall take immediate action to investigate, stabilize, contain, mitigate, remediate, remove, or monitor such release, as required to meet an immediate action transition-point specified by subsection (h) of this section or a cleanup standard specified in the cleanup standards sections. Such actions shall include, but shall not be limited to:

> (A) Removing from the land and waters of the state, to the maximum extent practicable, an emergent reportable release, or, to the extent necessary to comply with this section, a significant existing release, using means appropriate for the specific substance released and the land and waters impacted by such release;

(B) Implementing measures to prevent migration of a release which may include, but shall not be limited to, active remediation techniques or the use of physical barriers or appropriate treatment systems; and

(C) Identifying the source of a release and eliminating the source of an emergent reportable release or, if practicable in the time provided to complete immediate actions, eliminating the source of a significant existing release.

(2) Full characterization of the nature and extent of a release shall not be required before commencing an immediate action. Characterization of the nature and extent of the release shall be performed at the same time as the required immediate actions to ensure that such required actions are sufficient and successful. At a minimum, characterization sufficient to demonstrate that an immediate action transition-point specified by subsection (h) of this section has been achieved shall be developed during the timeframe specified for achieving an immediate action transition-point, except that should the actions performed include remediation to a standard specified in the cleanup standards sections, a complete characterization of such release pursuant to section 22a-134tt-4 of the RBCRs shall be required.

(e) **Required Immediate Actions for an Emergent Reportable Release**

In addition to the actions specified by subsection (d) of this section, the following actions shall be required if a release is an emergent reportable release that is:

(1) Present in a public or private drinking water well:

(A) Install, as soon as is practicable, physical barriers to prevent the further migration of such release, which may include, but shall not be limited to, interceptor trenches, sheet piles or slurry walls, and implement, as soon as is practicable, hydraulic control and recovery measures, which may include but shall not be limited to, recovery wells, absorbent socks, bailing, or vacuuming;

(B) Identify each public or private drinking water well located on a parcel adjacent to the parcel on which the impacted well is located, collect samples of water from such wells, and send for laboratory analysis as soon as is practicable but not more than 36 hours after discovery that a public or private drinking water well has been impacted by such release;

(C) Identify each public or private drinking water well located within 200 feet of an impacted well, or within 500 feet downgradient of an impacted well, collect samples of water from such wells, and send for laboratory analysis as soon as is practicable but not more than 36 hours after discovery that a public or private drinking water well has been impacted by such release;

(D) Ensure that an alternative source of potable water is provided to the users of each public or private drinking water well impacted by such release;

(E) Seven days after the collection of samples from a public or private drinking water well pursuant to subparagraph (B) and (C) of this subdivision, collect a second sample of water from each well tested and send for laboratory analysis;

(F) For each drinking water well impacted by the release of a substance at a concentration greater than the groundwater protection criterion, install an appropriate treatment system for such substance or connect to an unimpacted public drinking water supply system. Each treatment system shall be installed not more than 15 days following discovery that such well has been impacted by the release, unless such drinking water well will be replaced with a connection to an unimpacted public water supply system. Each connection to an unimpacted public drinking water supply system shall be made not more than 30 days following discovery of such impacted well; and

(G) As soon as practicable, but not more than 45 days following discovery that such release has impacted a public or private drinking water well, prepare and submit to the commissioner an immediate action report, pursuant to subsection (k) of this section that:

(i) Lists each drinking water well identified pursuant to subparagraph (B) and (C) of this subdivision, specifies whether each drinking water well has been impacted by such release, and includes the results of laboratory analysis of all samples collected from such wells;

(ii) Identifies each treatment system installed and each connection to an unimpacted public drinking water supply system made. For each treatment system installed, a schedule for the maintenance and monitoring of such system shall be specified;

(iii) For each drinking water well impacted by a substance at a concentration less than the groundwater protection criterion, and for each drinking water well within 200 feet of a drinking water well impacted by such release, provides a schedule for the quarterly monitoring of such well for substances associated with such release; and

(iv) Includes a description of those measures undertaken to prevent further migration of the release, pursuant to subparagraph (A) of this subdivision, and a schedule for the maintenance, and monitoring of such measures;

(H) The commissioner may request a follow up report be submitted pursuant to section 22a-450(4)(b) of the Regulations of Connecticut State Agencies, and may specify a deadline for the submission of such a report;

(2) Impacting groundwater, and is present in a groundwater monitoring well within 500 feet in any direction of a public or private drinking water well:

(A) Install, as soon as is practicable, physical barriers to prevent the further migration of such release, which may include, but shall not be limited to, interceptor trenches, sheet piles or slurry walls, and implement, as soon as is practicable, hydraulic control and recovery measures, which may include but shall not be limited to, recovery wells, absorbent socks, bailing, or vacuuming;

(B) Identify each public or private drinking water well located on a parcel adjacent to the parcel on which the impacted monitoring well is located , collect samples of water from such wells, and send for laboratory analysis as soon as is practicable but not more than 36 hours after discovery of such release;

(C) Seven days after the collection of samples from a public or private drinking water well pursuant to subparagraph (B) of this subdivision, collect a second sample of water from each well tested and send for laboratory analysis;

(D) Not more than 45 days after discovery of such release, prepare and submit to the commissioner an immediate action report, pursuant to subsection (k) of this section that:

(i) lists each drinking water well identified pursuant to subparagraph (B) of this subdivision, specifies whether each listed drinking water well has been impacted by such release, and includes the results of laboratory analysis of all samples collected from such wells;

(ii) provides a schedule for the quarterly monitoring of groundwater at monitoring wells determined to impacted by such release; and

(iii) includes a description of those measures undertaken to prevent further migration of such release pursuant to subparagraph (A), including a schedule for the periodic testing of wells identified pursuant to subparagraphs (B) of this subdivision, and a schedule for the implementation, maintenance, and monitoring of any such measures; and

(E) Notwithstanding the requirements of this subdivision, any public or private drinking water well impacted by a release shall be subject to the requirements of subdivision (1) of this subsection.

(3) Discovered in soil:

(A) Not more than 2 hours after discovery of such release, initiate remediation of such impacted soil to the applicable direct exposure criteria or to the standards found in section 22a-134tt-8(a) of the RBCRs, and continue until compliance with such criteria or standards have been met; and

(B) Notwithstanding the requirements of subparagraph (A) of this subsection, if such release contains PCBs, remediate or dispose of such soil in the manner required by 40 CFR 761 or as directed by the commissioner, not more than 48 hours after discovery.

(4) A release of volatile organic substances, except volatile petroleum substances, that is discovered in groundwater within 30 feet or less of the ground surface and within 30 feet or less of the lowest portion of a building under which groundwater is impacted, or that consists of volatile petroleum substances within 10 feet or less of the ground surface and within 10 feet or less of the lowest portion of a building under which groundwater is impacted with such substances:

(A) If the building is occupied or in use, immediately ventilate the building to the maximum extent practicable, which may include, but shall not be limited to, the opening of doors and windows, the use of fans, or the adjustment of the building's air handling turnover rate;

(B) All measures necessary to ensure that further migration of such release into indoor air is mitigated or prevented, which may include, but shall not be limited to:

(i) installation of a soil vapor extraction system;

(ii) installation of a sub-slab depressurization system; or

(iii) the sealing of cracks in the buildings floor and foundation or other preferential pathways; and

(C) Not more than 7 days after discovery of the release, prepare and submit an immediate action plan, pursuant to subsection (j) of this section that:

(i) Describes the nature and extent of the volatile organic substances from soil or groundwater in indoor air, and includes the results of laboratory analysis of soil, soil vapor, and groundwater samples collected;

(ii) Specifies a vapor mitigation system or approach to be used or installed, and a schedule for the installation of such system or approach;

(iii) Includes a schedule for the maintenance and monitoring of such system or approach; and

(iv) Includes a description of those measures already undertaken, or to be undertaken, to prevent further migration of such release, and a schedule for the implementation, maintenance, and monitoring of any such measures.

(5) Causing a visible impact to surface water:

(A) As soon as practicable, but not more than 2 hours after the discovery of such release, undertake all measures necessary to remove all impacts that are recoverable and ensure that further migration of such release is mitigated or prevented, which may include, but shall not be limited to, physical barriers such as booms, interceptor trenches, slurry walls, other physical barriers, or vacuum extraction;

(B) If the release occurred in or migrated to a surface water body, each substance released is soluble or has a specific gravity greater than or equal to 1, and such release has been present in surface water for a period-of-time such that accumulation or adsorption on sediments is possible, sample sediments to determine if such sediments were impacted by the release in a reasonable time, provided such sampling shall occur not more than 48 hours following discovery of the release;

(C) Not more than 45 days after discovery of such release, prepare and submit an immediate action report, pursuant to subsection (k) of this section that includes:

(i) A description of measures installed to prevent migration of such release and any necessary maintenance or monitoring of such measures;

(ii) The results of laboratory analysis of sediment samples if required to be collected pursuant to subparagraph (B) of this subdivision;

(iii) A schedule for any necessary additional mitigation, abatement, and monitoring of the impacted surface water body; and

(iv) A schedule for the quarterly monitoring of groundwater, if any groundwater is impacted by such release resulting in impacts to groundwater at a concentration greater than or equal to the surface water protection criteria or by a nonaqueous phase liquid.

(f) **Required Immediate Actions for a Significant Existing Release**

In addition to the actions specified by subsection (d) of this section, the following actions shall be required if the release is a significant existing release that:

(1) Has caused or is impacting a public or private drinking water well:

(A) Install, as soon as is practicable, physical barriers to prevent the further migration of the release, which may include, but shall not be limited to, interceptor trenches, sheet piles or slurry walls, and implement, as soon as is practicable, hydraulic control and recovery measures, which may include but shall not be limited to, recovery wells, absorbent socks, bailing, or vacuuming;

(B) Identify each public and private drinking water well located on a parcel adjacent to the parcel on which the impacted well is located, provided that such well is within 500 feet of the impacted well, and collect samples of water from such wells not more than 2 days after such release;

(C) Ensure that an alternative source of potable water is provided to the users of each public or private drinking water well impacted by the release;

(D) Not more than 15 days after discovery that a public or private drinking water well has been impacted by such release, identify each public and private drinking water well located within 200 feet of an impacted well, or within 500 feet downgradient of an impacted well; and

(E) Not more than 15 days after discovery that a public or private drinking water well has been impacted by such release, prepare and submit an immediate action plan, pursuant to subsection (j) of this section, that:

(i) Lists each drinking water well identified pursuant to subparagraphs (B) and (D) of this subdivision, specifying whether each listed drinking water well has been impacted by such release and including the results of laboratory analysis of all samples collected pursuant to subparagraphs (B) and (D) of this subdivision;

(ii) Specifies a schedule for the sampling and analysis of drinking water wells on parcels adjacent to the parcel on which each impacted drinking water well is located, provided each impacted drinking water well shall be sampled not less than once per quarter, and a schedule for the continued identification and sampling of potentially impacted wells in an iterative manner until all drinking water wells impacted by the release have been identified and sampled;

(iii) For each drinking water well impacted by such release by a substance at a concentration greater than the groundwater protection criterion, either identifies and describes an appropriate treatment system for such substance or indicates that a connection to an unimpacted public drinking water supply system will be provided. For each treatment system identified, the plan shall specify a schedule for its installation, provided such system

shall be installed not more than 15 days following discovery that such well has been impacted by such release, and any required maintenance and quarterly monitoring. For each identified connection to an unimpacted public drinking water supply system, the plan shall specify a schedule for the connection to such system, provided such connection shall be made not more than 30 days following discovery that such well has been impacted by the release;

(iv) For each drinking water well impacted by such release by a substance at concentrations less than or equal to the groundwater protection criteria, and for each drinking water well within 200 feet of a drinking water well impacted by such release, provides a schedule for quarterly monitoring of such drinking water well for the substances associated with such release; and

(v) Includes a description of those measures already undertaken, or to be undertaken, to prevent further migration of such release, pursuant to subparagraph (A) of this subdivision, and a schedule for the implementation, maintenance, and monitoring of any such measures.

(2) Is of a substance for which a groundwater protection criterion has been adopted that has caused or is impacting groundwater within 500 feet of a private or public drinking water well at a concentration equal to or greater than the groundwater protection criterion:

(A) Identify each drinking water well located on a parcel adjacent to the parcel on which the impacted monitoring well is located, provided that such drinking water well is within 500 feet of the impacted monitoring well, and collect samples of water from such wells not more than 2 days after the discovery of such release;

(B) Not more than 15 days after discovery of such release, identify each public and private drinking water well located within 200 feet of an impacted monitoring well, or within 500 feet downgradient of an impacted monitoring well;

(C) As soon as practicable, implement all measures necessary to ensure that further migration of such release is mitigated or prevented;

(D) Not more than 15 days after discovery of such release, prepare and submit an immediate action plan, pursuant to subsection (j) of this section, that:

(i) Lists each drinking water well identified pursuant to subparagraphs (A) and (B) of this subsection

(ii) Specifies whether each identified well has been sampled, lists each drinking water well known to have been impacted by the release, and includes the results of laboratory analysis of all samples collected from such wells;

(ii) Lists each drinking water well within 200 feet of an impacted public or private drinking water well, or within 500 feet downgradient of a groundwater monitoring well and groundwater plume exceeding groundwater protection criteria for substances associated with the release, and specifies a schedule for the sampling of such wells;

(iii) Provides a schedule for the quarterly monitoring of groundwater determined to be impacted at a concentration greater than a groundwater protection criterion; and

(iv) Includes a description of those measures already undertaken, or to be undertaken, to prevent further migration of the release, including a schedule for the periodic testing of wells identified pursuant to subparagraphs (A) and (B) of this subdivision, and a schedule for the implementation, maintenance, and monitoring of any such measures; and

(E) Notwithstanding the requirements of this subdivision, any public or private drinking water well impacted by the release shall be subject to the requirements of subdivision (1) of this subsection.

(3) Is discovered in soil within 2 feet of the ground surface that contains a substance at concentrations greater than or equal to 15 times the applicable direct exposure criterion for such substance:

(A) Determine the location and extent of soil impacted by such release, not more than 45 days after discovery of such release;

(B) Not more than 90 days after discovery of such release:

(i) Remove or mitigate soil within 2 feet of the ground surface impacted at concentrations greater than 15 times the applicable direct exposure criteria by measures to prevent exposure to such soil, which may include, but shall not be limited to, installation of a fence, pavement, or other temporary physical barrier;

(ii) Render inaccessible, by satisfying all relevant provisions of the cleanup standards sections, all soil impacted by such release at concentrations greater than the applicable direct exposure criteria;

(iii) Remediate all soil impacted by such release to the applicable direct exposure criteria; or

(iv) If the soil is impacted by PCBs, remediate or dispose of such soil as required by 40 CFR 761 or in a manner authorized by the commissioner or the Environmental Protection Agency;

(C) Not more than 90 days after discovery of such release, if measures to prevent exposure to such soil have been implemented pursuant to subparagraph (B)(i) or (B)(ii) of this subdivision, prepare and submit an immediate action plan, pursuant to subsection (j) of this section that:

(i) Describes the location and extent of such release, including the results of the laboratory analysis of samples;

(ii) Includes a description and photographs of the installed measures, and a schedule for the monitoring and maintenance of such measures, at a minimum annually, and sufficient to ensure that such measures remain effective; and

(iii) Provides a schedule for the monitoring and maintenance of such measures, at a minimum annually, and sufficient to ensure that such measures remain effective; and

(D) Notwithstanding the requirements of subsection (j) of this section, an immediate action plan shall not be required for a release requiring immediate action subject to the requirements of this subdivision, except as specified by subparagraph (C) of this subdivision.

(4) Is of volatile organic substances or volatile petroleum substances to groundwater that has caused or is causing a groundwater plume within 30 feet of the ground surface and within 30 feet or less of the lowest portion of a building impacted at concentrations greater than or equal to 10 times the applicable volatilization criteria for any volatile organic substance, except volatile petroleum substances; a groundwater plume within 10 feet of the ground surface and within 10 feet or less of the lowest portion of a building impacted at concentrations greater than or equal to 10 times the applicable volatilization criteria for any volatile petroleum substances; soil vapor beneath a building to be impacted at concentrations greater than or equal to the applicable volatilization criteria for such substance; or the detection of toxic air contaminants in indoor air provided such toxic air contaminant is not present in indoor air solely as the result of a current process or use of materials in an industrial setting:

(A) If the building is occupied or in use, immediately ventilate the building to the maximum extent practicable; and

(B) Not more than 30 days after discovery of such release, prepare and submit an immediate action plan, pursuant to subsection (j) of this section that:

(i) Describes the nature and extent of such release, and includes the results of laboratory analysis of samples collected;

(ii) Specifies a sufficiently protective vapor mitigation system or approach to be used or installed, which may include, but shall not be limited to, the sealing of cracks and other preferential pathways, a sub-slab depressurization system or soil vapor extraction system or an adjustment of air handling turnover rate, and a schedule for the use or installation of such system or approach;

(iii) Includes a schedule for the maintenance and monitoring of such system or approach to be used or installed; and

(iv) Includes a description of those measures already undertaken, or to be undertaken, to prevent further migration of such release, and a schedule for the implementation, maintenance, and monitoring of any such measures.

(5) Is a release of a substance at a concentration greater than or equal to 10 times the surface water protection criteria for such substance, or is a nonaqueous phase liquid, to groundwater within 500 feet of surface water:

(A) Not more than 30 days after discovery of such release:

(i) Prepare and submit an immediate action report, pursuant to subsection (k) of this section that:

(I) Describes the nature and extent of such release, and includes the results of laboratory analysis of samples collected;

(II) Identifies each measure taken to prevent migration of such release; and

(III) includes a schedule for completing tier characterization of such release.

(g) **Certification by a PEP or Verification by an LEP**

(1) Immediate action required by this section may be directed by the commissioner in the event such release is determined to be an emergency or exigent condition pursuant to subsection (b) of this section. If such release is not determined to be an emergency or exigent condition pursuant to subsection (b) of this section, immediate action may be certified as complete by a PEP or verified as complete by an LEP, except that an immediate action shall be required to be verified by an LEP if:

(A) Such release was discovered through laboratory analysis of samples of soil, sediment, groundwater, or indoor air;

(B) Such release is causing persistent groundwater impact; or

(C) The actions proposed will satisfy the standards specified in the cleanup standards sections, and such cleanup standards require LEP verification.

(2) The need for an LEP to verify that an immediate action is complete shall not be considered a requirement that an LEP supervise or otherwise be present at all times during an immediate action, and no time period specified in this section shall be stayed due to the presence or absence of an LEP.

(3) Notwithstanding the requirements of this subsection, no person shall engage in the business of collecting, storing or treating waste oil or petroleum or chemical liquids or hazardous wastes, or of acting as a contractor to contain or remove or otherwise mitigate the effects of discharge, spillage, uncontrolled loss, seepage or filtration of such substance or material or waste, nor shall any person, municipality or regional authority dispose of waste oil or petroleum or chemical liquids or waste solid, liquid or gaseous products or hazardous wastes except in accordance with the requirements of a permit issued pursuant to section 22a-454 of the Connecticut General Statutes.

(h) **Immediate Action Transition-Points**

(1) Emergent Reportable Release Transition-Points

If the release for which immediate action was required is an emergent reportable release, such immediate action shall result in compliance with the standards specified at section 22a-134tt-8 of the RBCRs, the applicable numeric criteria in the cleanup standards sections, an applicable additional polluting substances criterion calculated pursuant to section 22a-134tt-App 8 of the RBCRs, or if such criteria cannot be met within 1 year of discovery, an applicable immediate action transition-point, specified below:

(A) For a release impacting a drinking water well, for which required actions are specified in subsection (e)(1) of this section, such transition-points shall be:

(i) without treatment, four quarters of water monitoring laboratory analytical results that demonstrate compliance with applicable standards for each substances detected in such well;

(ii) the installation of a suitable treatment system to each impacted drinking water well identified, provided that:

(I) four quarters of water monitoring laboratory analytical results demonstrate that the substances are not detected in effluent water from the treatment system on such well as submitted to the commissioner; and

(II) an immediate action report is submitted that includes all the information specified in subsection (k) of this section, a plan and schedule for the maintenance and monitoring of each treatment system installed, and the analytical results of such quarterly monitoring; or

(iii) the replacement of each impacted drinking water well identified with a connection to an unimpacted public water supply system, provided that an immediate action report is submitted that contains all the information specified in subsection (k) of this section.

(B) For a release impacting groundwater, for which required actions are specified in subsection (e)(2) of this section, such transition-points shall be when, 1 year following discovery of the release, such release is entered into a cleanup tier requiring DEEP oversight, and an immediate action report is submitted that contains all the information specified in subsection (k) of this section;

(C) For a release impacting soil for which required actions are specified in subsection (e)(3) of this section, such transition-point shall be the removal of the release from soil to the maximum extent practicable, and the mitigation of the risk of exposure to any remaining impacted soil, provided that an immediate action report is submitted that contains all the information specified in subsection (k) of this section; and

(D) For a release impacting groundwater of volatile organic substances or volatile petroleum substances for which required actions are specified in subsection (e)(4) of this section, such transition-point shall be when:

(i) mitigation measures, identified in subsections (e)(4)(A) and (e)(4)(B) of this section have been installed or implemented and are operating but an environmental use restriction has not yet been recorded;

(ii) the analysis of 9 indoor air samples, taken in consecutive months, indicate concentrations of less than 10 times the applicable TAC; and

(iii) an immediate action report is submitted that contains all the information specified in subsection (k) of this section;

(E) For a release impacting surface water, for which required actions are specified in subsection (e)(5) of this section, such transition-point shall be when the release that is the source of the impact has been removed or mitigated to the maximum extent practicable and all visible sheen is collected or otherwise eliminated, provided an immediate action report is submitted that contains all the information specified in subsection (k) of this section.

(2) Significant Existing Release Transition-Points

If the release for which immediate action was required is a significant existing release, such immediate action must result in compliance with the standards specified in the cleanup standards sections, or an applicable immediate action transition-point, specified as follows:

(A) For a release impacting a drinking water well, for which required actions are specified in subsection (f)(1) of this section, such transition-point shall be:

(i) without treatment, four quarters of water monitoring laboratory analytical results that demonstrate compliance with applicable standards for each substances detected in such well;

(ii) the installation of a suitable treatment system to each impacted drinking water well identified, provided that:

(I) four quarters of water monitoring laboratory analytical results demonstrate that the substances are not detected in effluent water from the treatment system on such well as submitted to the commissioner; and

(II) an immediate action report is submitted that includes all the information specified in subsection (k) of this section, a plan and schedule for the maintenance and monitoring of each treatment system installed, and the analytical results of such quarterly monitoring; and

(iii) the replacement of each impacted drinking water well identified with a connection to an unimpacted public water supply system, provided that an immediate action report is submitted that contains all the information specified in subsection (k) of this section.

(B) For a release impacting groundwater, for which required actions are specified in subsection (f)(2) of this section, such transition-point shall be when, 1 year following discovery of the release, such release is entered into a cleanup tier requiring DEEP oversight, and an immediate action report is submitted that contains all the information specified in subsection (k) of this section.

(C) For a release to soil, for which required actions are specified by subsection (f)(3) of this section, such transition-point shall be when direct exposure to such soil is mitigated, pursuant to subsection (f)(3)(B) of this section, provided an immediate action report is submitted that contains all the information specified in subsection (k) of this section;

(D) For a release to groundwater of volatile organic substances or volatile petroleum substances for which required actions are specified in subsection (f)(4) of this section, such transition-point shall be when:

(i) mitigation measures, identified in subsection (f)(4)(B) of this section, have been installed or implemented, and are operating but an environmental use restriction has not yet been recorded;

(ii) the analysis of 9 indoor air samples, taken in consecutive months, indicate concentrations of less than 10 times the applicable TAC; and

(iii) an immediate action report is submitted that contains all the information specified in subsection (k) of this section; and

(E) For a release to groundwater near surface water, for which required actions are specified in subsection (f)(5) of this section, tier characterization is complete and such release has been entered into a cleanup tier by filing a tier assignment and paying the required fee.

(i) **Remediation of Remaining Substances Released**

(1) To the extent that the completion of the required immediate action does not result in the achievement of the standards specified in the cleanup standards sections for each substances released to the land and waters of the state, a release shall remain subject to the requirement to remediate to such cleanup standards.

(2) If a release remains present in the land and waters of the state following the completion of an immediate action, such release shall be:

(A) Tier characterized not later than 1 year after discovery, pursuant to section 22a-134tt-6 of the RBCRs.

(B) Assigned to a cleanup tier pursuant to the process specified in section 22a-134tt-6 of the RBCRs, except that if all substances remaining in the land and waters of the state are remediated to the standards specified in the cleanup standards sections, and a release remediation closure report has been prepared that satisfies the requirements of section 22a-134tt-13 of the RBCRs, then entry into a cleanup tier shall not be required.

(j) **Immediate Action Plan**

(1) The commissioner may require a person who created or is maintaining an emergent reportable release to submit an immediate action plan. The commissioner shall notify such person, verbally or in writing, that submission of an immediate action plan is required, and shall specify a deadline for the submission of such plan.

(2) A person who created or is maintaining a significant existing release, except a release to groundwater requiring immediate action pursuant to subsection (f)(5) of this section, shall submit an immediate action plan to the commissioner in the time specified by subsection (f) of this section, or, if a time period is not specified in such subsection, not more than 90 days after discovery of a significant existing release.

(3) An immediate action plan shall contain a description of the actions already underway and those proposed to achieve an immediate action transition-point specified by subsection (h) of this section or a standard specified in the cleanup standards sections, and shall:

(A) Be prepared using a form prescribed by the commissioner;

(B) Identify one or more persons who created or is maintaining the release;

(C) Identify the person who will certify or verify the completion of the immediate action;

(D) Reference the initial release report for such release, and update any information provided therein based on the most current available information regarding such release;

(E) Propose a schedule for achieving an immediate action transition-point specified in subsection (h) or a standard specified in the cleanup standards sections on or before 1 year following the discovery of a release;

(E) Provide any other information specified by subsections (d) of this section, and subsections (e) or (f), as applicable; and

(F) Provide any other information specified by the commissioner on such form.

(4) The commissioner may review the immediate action plan, and may approve or reject such plan, in writing. The commissioner's determination shall be provided to the person who submitted the immediate action plan and the person identified as certifying completion of the immediate action. If the commissioner determines that the proposed actions and schedule therein are not protective of human health or the environment, the commissioner shall reject the immediate action plan. If the commissioner rejects the plan, the commissioner shall state the reasons for rejection, which may include, but shall not be limited to:

(A) The actions proposed are incomplete or otherwise inappropriate;

(B) The schedule proposed does not address the release with sufficient urgency when considering any imminent threat to human health or the environment, even if the schedule proposed otherwise satisfies the deadlines specified in subsection (e) of this section, and subsection (f) or (g), as applicable; or

(C) The immediate action plan does not identify the PEP or LEP, if an LEP is required, who will certify the immediate action is complete.

(5) If the commissioner rejects the proposed actions and schedule, the actions and schedule shall be revised and resubmitted for the commissioner's review within 7 days. If the commissioner does not reject the immediate action plan within 21 days after receipt, the plan, including the proposed actions and schedule shall be automatically deemed approved.

(k) **Immediate Action Report**

(1) An immediate action report shall be submitted on the earlier of the following:

(A) For emergency reportable releases, shall be submitted on the earlier of the following:

(i) the assignment of such release to a tier; or

(ii) the submission of a release remediation closure report; and

(B) For a significant existing release, shall be submitted on the earlier of the following:

(i) A deadline specified by the commissioner in writing for the submission of a plan;

(ii) Not more than 60 days after completion of the actions required to achieve an immediate action transition-point specified by subsection (h) of this section or a standard specified in the cleanup standards sections; or

(iii) Not more than 1 year following discovery of an emergent reportable release or a significant existing release.

(2) Such report shall:

(A) Be prepared using a form prescribed by the commissioner;

(B) Identify each known person who created or is maintaining the release;

(C) Identify the person who, pursuant to subsection (g) of this section, supervised the immediate action;

(D) Identify the immediate action transition-point specified by subsection (h) of this section, or the standards specified in the cleanup standards sections that have been achieved;

(E) Provide information regarding the investigation and characterization of the release sufficient to demonstrate that the transition-point or cleanup standards identified have been achieved, including confirmatory sampling of soil or groundwater, if required;

(E) Identify any remaining characterization of the nature and extent of a release necessary to satisfy the requirements of section 22a-134tt-4 of the RBCRs;

(F) Identify any remaining remediation required to achieve the standards specified in the cleanup standards sections for any substances still present in the land and waters of the state; and

(G) Provide any other information specified by the commissioner on such form.

(3) If, at the time an immediate action report is submitted, the release has not been remediated to the standards specified in the cleanup standards sections, the immediate action report and a tiering assignment shall be simultaneously submitted to the commissioner.

(4) The commissioner may audit the immediate action report pursuant to subsection 22a-134tt-13 of the RBCRs and may approve or reject such report.

(A) If the commissioner rejects the immediate action report, the commissioner may require:

(i) The submission of a modified report containing additional information not later than a specified deadline;

(ii) The submission of a schedule for additional investigation and characterization of the release and an updated immediate action report not later than a specified deadline;

(iii) The performance of additional immediate actions not later than a deadline specified by the commissioner, the submission of a schedule for the performance of such additional immediate actions, and an updated immediate action report upon completion of such actions; and

(iv) the submission of a revised tiering determination.

(B) Notwithstanding the provisions of subparagraph (B) of this subsection, if any deadline to complete immediate actions specified by this section has passed, and an immediate action report has not been submitted to the commissioner, nothing herein shall prevent the commissioner from taking any action authorized by section 22a-134ss of the Connecticut General Statutes.

(l) Nothing contained in this section shall be construed to affect the authority of the Commissioner of Energy and Environmental Protection pursuant to any other statute or regulation.

Section 22a-134tt-6 – Tiers

(a) Requirement to Tier Releases

Not more than 1 year following discovery of a release, each release shall be assigned to a cleanup tier if such release remains present in the land and waters of the state and has not achieved compliance with the cleanup standards sections.

(b) **Establishment of Cleanup Tiers**

(1) There shall be established the following:

(A) tier 1A;

(B) tier 1B;

(C) tier 2; and

(D) tier 3.

(2) Releases shall be assigned to such tiers using the checklist specified in section 22a-134tt-App1 of the RBCRs.

(3) Releases presenting the highest risk to human health and the environment shall be assigned to tier 1A. Releases presenting less risk to the environment shall be assigned to tier 1B or tier 2, as specified. Releases that have reached groundwater and remain only as a diminishing state groundwater plume may be assigned to tier 3.

(c) **Tier Assignment**

(1) Not more than 1 year after discovery of a release, each release shall be assigned to a cleanup tier if a release remediation closure report has not been submitted for such release. To assign a release to a cleanup tier, a tier assignment form shall be submitted to the commissioner, which shall include:

(A) A complete tier checklist, including an LEP's verification;

(B) All characterization information necessary to complete the tier checklist, pursuant to section 22a-134tt-4 of the RBCRs;

(C) A copy of the immediate action plan and immediate action report, if immediate action was performed;

(D) The fee specified by subsection (f) of this section; and

(E) Any other information specified by the commissioner on such form.

(2) A release may be assigned to a different cleanup tier when a release has been partially remediated such that risk to human health or the environment has been reduced, or shall be assigned to a different cleanup tier not more than 30 days after additional information has identified previously unaccounted for risks to human health or the environment, in order for continued remediation to occur in a cleanup tier corresponding with the risk to human health and the environment presented by such release as specified by section 22a-134tt-App1 of the Regulations of Connecticut State Agencies. To change the

tier assignment, a change in tier assignment form shall be submitted to the commissioner on a form prescribed by the commissioner, which shall include:

(A) A complete tier checklist, including an LEP's verification;

(B) All characterization information necessary to complete the tier checklist, pursuant to section 22a-134tt-4 of the RBCRs;

(C) Copies of each approval issued by the commissioner when a remedy requiring the approval of the commissioner has been implemented;

(D) A list of LEP-approved remedies that have been implemented, and all documentation necessary to demonstrate that such remedy has been properly selected and implemented;

(E) The fee specified by subsection (f) of this section, if applicable; and

(F) Any other information specified by the commissioner on such form.

(3) A release may be assigned to tier 3 provided that soil impacted by the release has been remediated to the standards identified by section 22a-134tt-9 of the RBCRss, and that the plume of groundwater created by such release is in a diminishing state without need for further active remediation and is being monitored for natural attenuation. In addition to the information specified in subdivision (2) of this subsection, a tier assignment form or change in tier assignment form submitted for the purpose of assigning a release to tier 3 shall include:

(A) Any document or information specified by section 22a-134tt-9 and 22a-134tt-12 of the RBCRss to demonstrate that soil impacted by the release has been remediated to such cleanup standards;

(B) A conceptual site model, supported by sufficient characterization data, that demonstrates that the plume of groundwater created by such release is in a diminishing state and is naturally attenuating;

(C) A groundwater monitoring plan and schedule, including the name, business address, and contact information for the person who will be conducting such monitoring;

(D) Any other information requested by the commissioner on such form.

(4) The commissioner may audit a tier assignment or change in tier assignment pursuant to section 22a-134tt-13 of the RBCRs. As a result of such audit, the commissioner may reject the tier assignment or change in tier assignment if all required information is not provided or a release is assigned to the incorrect tier. Upon rejection of a tier assignment or a change in tier assignment, the commissioner may:

(A) require the submission of additional information;

(B) require additional investigation or characterization of a release; or

(C) assign the release to an appropriate tier, which shall include but shall not be limited to, tier 1A;

(5) For the purposes of calculation of time, the date of tier assignment for a release shall be the day the day a tier assignment is first submitted pursuant to this section .

(d) **Cleanup Oversight**

Remediation of releases shall be overseen as follows:

(1) Releases assigned to tier 1A shall be supervised by the commissioner who may direct certain tasks to be performed by an LEP or other qualified professional;

(2) Releases assigned to tier 1B shall be supervised by an LEP;

(3) Releases assigned to tier 2 shall be supervised by an LEP; and

(4) Releases assigned to tier 3 may be supervised by a qualified professional, except that the performance of certain tasks, or the preparation of certain documents identified by the RBCRs may require the supervision of an LEP.

(e) **Deadlines for Remediation**

(1) Not more than 1 year following the date of tier assignment, a release assigned to tier 1A shall be closed, or assigned to tier 1B, tier 2, or tier 3.

(2) Not more than 2 years following the date of tier assignment, a release assigned to tier 1B shall be closed, or assigned to tier 2 or tier 3.

(3) Not more than 4 years following the date of tier assignment, a release assigned to tier 2 shall be closed, or assigned to tier 3.

(4) Not more than 5 years following the date of tier assignment, a release assigned to tier 3 shall be closed.

(5) All timelines specified by this subsection shall run concurrently.

(6) Extensions of the deadlines specified in this subsection may be granted as follows:

> (A) For releases assigned to tiers 1A, 1B, and 2, the commissioner may, in the commissioner's sole discretion, approve 1 year extensions of the deadlines specified by this subsection for good cause shown. A request for extension shall be made on a form prescribed by the commissioner, and shall include the fee calculated pursuant to subsection (f) of this section. The request for extension shall be made thirty days prior to the expiration of the deadline; and
>
> (B) An LEP may approve a single 1-year extension of the deadlines specified in this subsection for a release assigned to tier 1B or tier 2. Notice of such extension shall be made not less than 30 days before the expiration of such deadline on a form prescribed by the commissioner, and shall include the fee specified by subsection (f) of this section. Any additional extension of the deadline for the remediation of such release shall be approved by the commissioner.
>
> (C) A request for an extension of time for a release assigned to tier 3 shall be submitted to the commissioner, on a form prescribed by the commissioner. Notwithstanding clauses (i) and (ii) of this subparagraph:

(i) The commissioner shall approve a 5-year extension of the deadline specified in this subsection for a release assigned to tier 3 provided that the laboratory analysis of groundwater samples demonstrates that the groundwater plume caused by such release remains in a diminishing state and is naturally attenuating at a rate consistent with the conceptual site model submitted pursuant to subsection (c)(3)(B) of this section;

(ii) The commissioner shall approve as many 5-year extensions as are necessary, provided the groundwater plume created by a release assigned to tier 3 remains in a diminishing state and is naturally attenuating at a rate consistent with the conceptual site model submitted pursuant to subsection (c)(3)(B) of this section; and

(iii) If the commissioner determines that the groundwater plume is not in a diminishing state or will not naturally attenuate at a rate consistent with the conceptual site model submitted pursuant to subsection (c)(3)(B) of this section, the commissioner may deny an extension of the deadline specified in this subsection for such release. If the commissioner denies an extension of the deadline, the commissioner shall, in the commissioner's sole discretion, assign the release to an appropriate cleanup tier, and specify a deadline for the remediation of such release.

(f) **Fees**

(1) Tier Assignment Fees

The following fees shall be paid at the time a tier assignment is submitted to the commissioner. If a tier assignment is rejected, and the release is subsequently assigned to a different tier, the difference between the fee paid and the fee due shall be paid not more than 30 days following the date of tier assignment.

(A) For a release assigned to tier 1A, 3,000 dollars;

(B) For a release assigned to tier 1B, 1,500 dollars;

(C) For a release assigned to tier 2, 1,000 dollars; and

(D) For a release assigned to tier 3, 500 dollars.

(2) Annual Fees

(A) An annual fee shall be due one year following the date of tier assignment, and each year thereafter until a release is verified. The base annual fee shall be:

(i) For a release assigned to tier 1A, 3,000;

(ii) For a release assigned to tier 1B, 1,500;

(iii) For a release assigned to tier 2, 1,000; and

(iv) For a release assigned to tier 3, 500 dollars.

(B) The annual fee shall be calculated as follows:

[FEE] + ((.1[FEE]x[number of years since tier assignment date]) = annual fee due

Where:

FEE is equal to the base annual fee for the tier to which the release is assigned on the date the annual fee is due.

(3) Fees for Extension of Time

(A) If a 1-year extension of time is approved by the commissioner or an LEP pursuant to subsections (e)(6)(i) and (e)(6)((ii) of this section, a fee equal to the annual fee calculated pursuant to subdivision (2)(B) of this subsection shall be paid to the commissioner.

(B) There shall be no fee for a 5-year extension of time approved pursuant to subsection (e)(6)(iii) of this section.

(4) Single Deadline for Annual Fees

Notwithstanding the requirements of this subsection, the commissioner may authorize the payment of the annual fees for multiple releases for which the same creator or maintainer is responsible on a date specified by the commissioner. A request for a single deadline for annual fee payments shall be submitted to the commissioner in accordance with section 22a-134tt-1(c) of the RBCRs.

RCSA 22a-134tt-7 – General Cleanup Standards Provisions

(a) Time-frames for Issuance of Approvals by the Commissioner

The commissioner shall make best efforts within available resources to process in a timely manner any variance or alternative criteria request pursuant to the cleanup standards sections. The commissioner shall, upon request, provide estimated time frames for any such review. In establishing estimated time frames pursuant to this subsection, the commissioner shall take into account available resources, the complexity of the request, and the environmental and economic significance of the remediation.

(b) Environmental Use Restrictions

(1) Whenever an EUR is required under the RBCRs:

(A) An ELUR may always be used; and

(B) A NAUL may only be used:

(i) Pursuant to section 22a-134tt-9(b)(2) of the RBCRs, provided the subject area is zoned for industrial/commercial use and no holder of an interest in such area, other than the owner of such area, has a right of residential activity or use;

(ii) Pursuant to section 22a-134tt-9(b)(3)(B) of the RBCRs, provided the concentrations of substances in such inaccessible soil do not exceed 10 times the applicable direct exposure criteria;

(iii) Pursuant to section 22a-134tt-9(b)(6) of the RBCRs;

(iv) Pursuant to section 22a-134tt-9(c)(5)(A) of the RBCRs, provided that:

(I) The concentrations of substances in such soil do not exceed 10 times the applicable direct exposure criteria and the applicable pollutant mobility criteria; or

(II) The total volume of soil that is environmentally isolated that exceeds 10 times the applicable direct exposure criteria and the applicable pollutant mobility criteria is equal to or less than 10 cubic yards;

(v) Pursuant to section 22a-134tt-9(d)(2)(A) of the RBCRs;

(vi) Pursuant to section 22a-134tt-9(f)(1) of the RBCRs;

(vii) Pursuant to section 22a-134tt-9(f)(2)(B) or section 22a-134tt-9(f)(2)(C) of the RBCRs, provided that the concentrations of the substances in polluted soil at the subject area are equal to or less than 10 times the applicable direct exposure criteria;

(viii) Pursuant to section 22a-134tt-10(c)(1) or section 22a-134tt-10(c)(2)(A) of the RBCRs, provided the subject area is zoned for industrial/commercial use and no holder of an interest in such area, other than the owner of such area, has a right of residential activity or use;

(ix) Pursuant to section 22a-134tt-10(c)(2)(B) of the RBCRs;

(x) Pursuant to sections 22a-134tt-10(c)(3), 22a-134tt10(c)(4), and 22a-134tt-10(c)(5) of the RBCRss;

(xi) When an ELUR is required and the parcel on which it is to be recorded is owned by the state of Connecticut or the state of Connecticut purchases a property subject to an existing ELUR, the NAUL shall be approved by the commissioner;

(xii) Pursuant to section 22a-134tt-9(b)(2)(C)of the RBCRs; or

(xiv) Pursuant to section 22a-134tt-9(b)(2)(D) of the RBCRs.

(2) Each EUR under the RBCRs shall be subject to and comply with all applicable requirements in section 22a-133o of the Connecticut General Statutes, the EUR Regulations and the RBCRs.

(3) If the RBCRs require an EUR:

(A) Such EUR shall be in effect prior to:

(i) An LEP's verification, including an LEP's interim verification, or certification, as those terms are defined in sections 22a-134(19), 22a-134(28), and 22a-134pp(9) of the Connecticut General Statutes and sections 22a-134tt-1(16) and 22a-134tt-1 (158) of the RBCRs, including, but not limited to, a verification or certification pursuant to section 22a-134tt-10 of the RBCRs; or

(ii) When required by the commissioner, the review and approval of the remediation by the commissioner; or

(B) When voluntary remediation is conducted pursuant to section 22a-133y of the Connecticut General Statutes, the documents required to be prepared by sections 22a-133q-2(b) or 22a-133q-3(b) of the EUR Regulations, as applicable, shall be submitted as part of the final remedial action report at the time such report is submitted to the commissioner. Upon approval of such report by the commissioner, the EUR shall be executed within 36 days of such approval and be put into effect in accordance with the EUR Regulations.

(4) An EUR shall only be deemed to be in effect when such EUR is recorded on the land records in compliance with the EUR Regulations.

(5) When a remedy is selected under the cleanup standards sections for which an EUR is required to be in effect for different subject areas on a parcel, a request may be submitted to the commissioner to extend any deadline specified in the cleanup standards sections to prepare the materials required to obtain and request such EUR. The commissioner may approve or deny in writing such extension request. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that significant progress has been made to complete the remediation of the parcel and strict adherence to the stated deadline would create an extraordinary hardship.

(c) Financial Assurance

(1) A financial assurance shall be required to support an engineered control variance or a technical impracticability variance. Such assurance shall be:

(A) Established and maintained for the duration of the period that the engineered control or technical impracticability variance will be used to achieve compliance with the RBCRs;

(B) Directly available to the commissioner to cover the costs of complying with the variance, including, but not limited to, operation, maintenance, inspection, monitoring, reporting, and other reasonably anticipated repairs and contingencies, in the event that the commissioner determines that such measures have not been performed as required by the RBCRs; and

(C) Established in an amount equal to the cost of 20 percent of 30 years of operation, maintenance, inspection, monitoring, reporting, and other reasonably anticipated repairs and contingencies, which amount shall be maintained in effect for as long as the variance is used to achieve compliance with the RBCRs, except this amount may be adjusted in accordance with subdivision (4) of this subsection.

(2) One or more of the following instruments, and no others, shall be used to satisfy the financial assurance requirements of this subsection:

(A) Trust agreement or trust fund;

(B) Irrevocable standby letter of credit;

(C) Payment of funds in cash as directed by the commissioner; or

(D) Certificate of insurance.

(3) The wording of any instrument used to satisfy the requirements of this subsection shall be identical to the language prescribed by the commissioner, which language shall be posted on the department's internet website. In addition, only an entity that satisfies the following requirements, as applicable, may issue an instrument used to satisfy the requirements of this subsection:

(A) Any trustee shall be an entity with authorization to act as a trustee and whose trust operations are regulated and examined by a federal or state agency;

(B) Any surety issuing a bond shall be among those listed as acceptable sureties on federal bonds in Circular 570 of the U.S. Department of Treasury;

(C) Any institution issuing a letter of credit shall be an entity that has the authority to issue letters of credit and whose letter of credit operations are regulated and examined by a federal or state agency; and

(D) Any insurer shall be licensed to transact the business of insurance, or eligible to provide insurance as an excess or surplus lines insurer, in one or more states.

(4) The amount of the financial assurance established pursuant to this subsection:

(A) Shall be adjusted for inflation at each 5 year interval from the anniversary date of the establishment of the financial instrument. The adjustment shall be made by using an inflation factor derived from the most recent Implicit Price Deflator for Gross National Product published by the U.S. Department of Commerce in its "Survey of Current Business" and by multiplying the latest adjusted surety estimate for the site by that 5-year inflation factor; and

(B) May be adjusted, subject to the discretion and written approval of the commissioner, to reflect any recalculation of the costs of operation, maintenance, inspection, monitoring, reporting, and other reasonably anticipated repairs and contingencies, in current dollars. Any request for an adjustment pursuant to this subparagraph shall be submitted to the commissioner in accordance with subsection (g) of this section.

(5) The requirements of this subsection shall not apply when:

(A) The entity responsible for remediation is a municipality, an agency or a political or administrative subdivision of the state or federal government; or

(B) The amount established under subdivision (1)(C) of this subsection is less than $10,000, unless the commissioner requires compliance with this subsection as a condition of approving the engineered control or technical impracticability variance.

(d) Public Participation

(1) Erection of a Sign

A sign not less than 6 feet by 4 feet that is clearly visible from the public roadway, and includes the words "ENVIRONMENTAL CLEAN UP IN PROGRESS. FOR FURTHER INFORMATION CONTACT:" and includes a telephone number and an electronic mail address from which any party may obtain additional information about the proposed remediation shall be erected and maintained whenever:

(A) Active remediation of an existing release, including but not limited to excavating, removing or stockpiling soil, is underway on a parcel; or

(B) The remediation of an emergent reportable release is underway, and the commissioner has directed in writing that a sign shall be erected and maintained.

(2) Public Notice

(A) Public notice of remediation shall be required for each release assigned to a tier, pursuant to section 22a-134tt-6 of the RBCRs. Such notice shall be provided before the date of tier assignment. Public notice shall be prepared using a form prescribed by the commissioner, and shall include:

(i) The address of the parcel on which remediation will be undertake or, if no address is available, a description of the location of the parcel relative to the nearest intersection of named streets;

(ii) A brief description of the nature of the release and the substances being remediated;

(iii) An electronic mail and postal mailing address, telephone number, and a point of contact to whom comments regarding the remediation can be submitted and from whom any interested person may obtain additional information about the proposed remediation;

(iv) A statement that public comments may be submitted, via electronic mail or in writing, for thirty (30) days after the date of publication of such notice; and

(iv) Any other information specified by the commissioner on such form.

(B) Public notice shall be provided by mailing the public notice form to the chief elected municipal official and to the Director of Health of the municipality in which remediation will occur and publishing in a newspaper having general circulation in the municipality in which the release is located.

(C) There shall be a public comment period on the proposed remediation for thirty (30) days after publication of the newspaper notice required by subdivision (1)(A)(ii) of this subdivision. If comments on the proposed remediation are received during the public comment period, no later than thirty (30) days after close of the public comment period, the person responsible for remediation shall submit to the commissioner a written summary of all such comments and a proposed response to each such comment.

(i) Based on the summary of comments and proposed responses, the commissioner may:

(I) Direct the person responsible for remediation to send the written summary and response document to each person who submitted comments within thirty (30) days after the direction is given by the commissioner. If an electronic mail address is known, the summary and response document may be sent to a commenter using electronic mail;

(II) Revise the written summary and response document and direct the person responsible for remediation to send the written summary and response document, as revised by the commissioner, to each person who submitted comments within thirty (30) days after the direction is given by the commissioner. If an electronic mail address is known, the summary and response document as revised by the commissioner may be sent to a commenter using electronic mail; or

(III) Determine that there is substantial public interest in the proposed remediation and direct the person responsible for the remediation to hold a public meeting regarding the proposed remediation. Notice of any such meeting shall be published in a newspaper of substantial circulation in the area of the proposed remediation at least thirty (30) days prior to such meeting. At such meeting all interested persons shall have reasonable opportunity to submit data, views, or arguments orally or in writing. Any such meeting shall not be conducted as, nor be considered to be, a contested case as that term is defined in section 4-166 of the Connecticut General Statutes. After the public meeting, the person responsible for remediation shall comply with subparagraph (C) of this subdivision and, except for this clause, the commissioner may then take actions specified under this subparagraph. Within thirty (30) days after a public meeting held in accordance with subparagraph (D)(iii) of this subdivision, the person responsible for remediation shall provide to the commissioner a written summary of and response to any comments received during the public meeting and the commissioner may then take any of the actions in subclauses (i), (ii), or (iv) of subparagraph (D) of this subdivision.;

(d) Other Requirements

All remediation undertaken to satisfy the RBCRs shall be conducted in accordance with all federal, state, and local requirements, including, but not limited to, 40 CFR 761, all permits, and other required authorizations. Nothing in this subsection shall be construed as requiring any further remediation of any release which has been remediated and which remediation has been approved in writing by the commissioner, unless the commissioner takes action to require such remediation pursuant to any section of Chapter 446k of the Connecticut General Statutes.

22a-134tt-8 Releases Certified as Closed by a Permitted Environmental Professional

(a) Emergent Reportable Releases Certified as Closed by a Permitted Environmental Professional

(1) The remediation of a release shall be determined to have satisfied the requirements of the RBCRs if:

(A) The approximate location and volume of such release was known at the time remediation was commenced;

(B) The substance or substances released are known;

(C) The release:

(i) did not occur in or directly to a surface water body and has not migrated to any such surface water body; or

(ii) occurred in or migrated to a surface water body, and each substance released is soluble or has a specific gravity of less than 1;

(D) The release:

(i) consists of a substance or substances other than oil or petroleum and has not contacted groundwater; or

(ii) consists only of oil or petroleum, is not within 500 feet of a drinking water well, and has not caused a persistent impact to groundwater as determined by subsection (c) of this section;

(E) Remediation commences within the time specified by section 22a-134tt-5 of the Regulations of Connecticut State Agencies, and all immediate actions required by section 22a-134tt-5 of the Regulations of Connecticut State Agencies are completed in the time specified by that section;

(F) Soil impacted by the release is removed and properly disposed; and

(G) A PEP who responded to and directed the cleanup of such release certifies, pursuant to section 22a-134tt-11 of the Regulations of Connecticut State Agencies, that each of the requirements of this subsection has been satisfied.

(2) For the purposes of determining compliance with subsections (a)(1)(C) and (a)(1)(D) of this section, a release to a secondary containment system designed, installed and operated to collect and contain the release shall not be considered to have occurred in or directly impacted a surface water body or to have contacted or caused a persistent impact to groundwater, provided that:

(A) The volume of the release is less than the volume that the secondary containment system is designed, installed and operated to collect and contain, and the secondary containment system has contained such release;

(B) An assessment of the secondary containment system identifies no damage to such system. Such assessment shall include, but may not be limited to, a visual inspection of surfaces coated with epoxy or other coatings. The secondary containment system shall be determined to be

damaged if cracks, voids, or gaps in the secondary containment system or in any epoxy or other coating are identified; and

(3) For the purposes of determining compliance with subsection (a)(1)(D)(i) of this section, a release shall be determined to have contacted groundwater if:

(A) Groundwater is encountered in the course of excavating or removing the volume of soil necessary to remove soil impacted by the release;

(B) One or more substances released is detected in a properly constructed and developed groundwater monitoring well located immediately downgradient from the approximate location of the release and not more than 5 feet from the edge of the area excavated for the purposes of remediation; or

(C) A substance or substances released is determined to be present in the groundwater using any other method or protocol specified by the commissioner by publishing such method or protocol on the department's internet website.

(4) For the purposes of determining compliance with subsection (a)(1)(D)(ii) of this section, a release of oil or petroleum shall be determined to have caused a persistent impact to groundwater if:

(A) A visible sheen remains on groundwater after 3 attempts within 24 hours at removing the sheen by vacuum extraction of groundwater from an excavation or adjacent monitoring well;

(B) One or more of the substances released is detected in a properly constructed and developed groundwater monitoring well located immediately downgradient from the approximate location of the release and not more than 5 feet from the edge of the area excavated for purposes of remediation 24 or more hours after completion of the excavation of the soil impacted by the release; or

(C) A substance or substances released is determined to be present in the groundwater using any other method or protocol specified by the commissioner by publishing such method or protocol on the department's internet website.

(b) Releases of Home Heating Fuel on Residential Properties

(1) Notwithstanding the requirements of section 22a-134tt-9 of the Regulations of Connecticut State Agencies, the remediation of a release of home heating fuel pursuant to the standards specified in this subsection shall be determined to have satisfied the requirements of the RBCRs provided:

(A) Applicability

(i) the release consists entirely of home heating fuel;

(ii) such heating fuel is being used, or stored for future use on the parcel at which it is being stored, on a parcel with not more than four dwelling units; and

(iii) such release was created by the owner of the parcel on which the home heating fuel is being used or stored for future use, or by the owner or occupant of a dwelling unit on such parcel. A release shall be determined to have been created by the owner of such a parcel or the owner or occupant of such a dwelling unit if the release would not have occurred but for

the actions or inactions of such person or if such person owns, leases, or is otherwise in possession of the equipment that cause the release of home heating fuel;

(B) Cleanup Standard

An LEP verifies or a PEP certifies that:

(i) all soil impacted by the release has been removed, except that soil impacted by the release may remain if the excavation of such soil may undermine the structural integrity of the dwelling units;

(ii) soil impacted by the release that has not been removed is not impacting groundwater; and

(iii) soil impacted by the release that has not been removed is not impacting indoor air;

(C) Documentation

A release remediation closure report has been prepared pursuant to section 22a-134tt-12 of the Regulations of Connecticut State Agencies that:

(i) Identifies the nature and extent of soil impacted by the release that has not been removed; and

(ii) Demonstrates that the remediation of the release of home heating fuel resulted in the removal of soil impacted by the release to the maximum extent prudent.

(iii) Indicates groundwater:

(I) was not impacted by the release of home heating fuel; or

(II) was impacted by the release of home heating fuel, and an LEP has verified that groundwater has been remediated pursuant to the requirements of section 22a-134tt-10 of the Regulations of Connecticut State Agencies.

22a-134tt~~3k~~-~~29~~. Cleanup ~~Remediation~~ Standards for Soil

22a-134tt~~3k~~-~~92~~(a) Soil Criteria

Unless otherwise specified in the RBCRs~~SRs~~, polluted soil at a release area shall be remediated so that the concentration of a substance in such soil is equal to or less than:

(1) The direct exposure criteria and the pollutant mobility criteria; or

(2) The background concentration for soil.

22a-134tt~~3k~~-~~29~~(b) Direct Exposure Criteria

(1) Residential Direct Exposure Criteria

Except as otherwise specified in the RBCRs~~SRs~~, polluted soil at a release area shall be remediated so that the concentrations of substances in such soil are equal to or less than the residential direct exposure criteria.

(2) Use of Industrial/Commercial Direct Exposure Criteria, Managed Multifamily Direct Exposure Criteria, and Passive Recreation Direct Exposure Criteria

(A) Except for soil polluted with PCBs, polluted soil at a release area may be remediated so that the concentrations of substances in such soil are equal to or less than the industrial/commercial direct exposure criteria provided that:
- (i) The subject area is not currently used for any residential activity;
- (ii) Access to the parcel containing such release area is limited to individuals working at or temporarily visiting the subject parcel for industrial/commercial activity; and
- (iii) An EUR is in effect for the subject area, which restriction shall:
  - (I) Prohibit residential activity; and
  - (II) Require compliance with clause (ii) of this subparagraph.

(B) Soil polluted with PCBs at a release area may be remediated so that the concentration of PCBs in such soil is equal to or less than the industrial/commercial direct exposure criteria for PCBs, provided that:
- (i) The subject area is not currently used for any residential activity;
- (ii) The parcel on which PCBs are present is used in accordance with title 40 CFR Part 761, including, but not limited to, those provisions of 40 CFR Part 761 regarding the requirement for high-occupancy areas;
- (iii) The parcel upon which such release area is located is an "outdoor electrical substation," as defined in 40 CFR 761.123, or an "other restricted access (nonsubstation) location", as defined in 40 CFR 761.123; and
- (iv) An ELUR is in effect for the subject area, which restriction shall:
  - (I) Prohibit residential activity; and
  - (II) Require compliance with clauses (ii) and (iii) of this subparagraph.

(C) Except for soil polluted with PCBs, polluted soil at a release area may be remediated so that the concentrations of substances in such soil are equal to or less than the managed multifamily residential direct exposure criteria provided that:

(i) The only residential activity for which the subject area is used is managed multifamily residential activity;

(ii) The parcel on which the subject area is located is managed by an association or a professional property management company;

(iii) ~~I~~Lease agreements or condominium declarations or bylaws:

(I) Prohibit residents from digging in soil, including, but not limited to, prohibiting Gardening; and

(II) Allow for active recreation only on areas with impervious surface; and

(iv) An EUR is in effect, which restriction shall:

(I) Prohibit residential activity other than managed multifamily residential activity; and

(II) Require compliance with clause (ii) and (iii) of this subparagraph.

(D) Except for soil polluted with PCBs, polluted soil at a release area may be remediated so that the concentrations of substances in such soil are equal to or less than the passive recreation residential direct exposure criteria provided that:

(i) the only residential activity for which the subject area is used is passive recreation activity; and

(ii) Either:

(I) an EUR is in effect which restriction prohibits residential activity other than passive recreation; or

(II) a conservation easement granted to a municipality, the state of Connecticut, or the United States of America, or any political subdivision thereof, prohibits residential activity other than passive recreation activity.

(3) Conditional Exemptions for Inaccessible Soil

The provisions of this subdivision do not apply to soil polluted with PCBs.

(A) Soil at a release area that is fifteen feet or more below the ground surface is not required to be remediated to the direct exposure criteria.

(B) Inaccessible soil at a release area is not required to be remediated to the direct exposure criteria, provided that an EUR is in effect for the subject area, which restriction shall:

(i) Prohibit exposure to inaccessible soil, including, but not limited to, as a result of excavation, demolition, other intrusive activities, or natural occurrences;

(ii) Require that if soil is used to render polluted soil inaccessible, that such soil used to render polluted soil inaccessible is maintained and immediately replaced, as needed, to maintain the four (4) feet of soil cover and the elevation and topography of the ground surface; and

(iii) Require, as applicable, that:

(I) Bituminous or reinforced concrete that renders the soil inaccessible is maintained in good condition, free of gaps or cracks that could expose such soil;

(II) A building that is used to render soil inaccessible shall consist of a roof, exterior walls, and a concrete floor, maintained in good condition, free of gaps or cracks that could expose such soil and such building shall not be removed; or

(III) Provided that written notice is submitted to the commissioner, a permanent structure that renders the soil inaccessible, shall be maintained in good condition to the extent required to prevent exposure of such soil and shall not be removed.

(C) Inaccessible soil at a release area is not required to be remediated to the direct exposure criteria, provided that such soil:

(i) Is located beneath concrete or bituminous concrete used for parking or vehicle travel, or below a building foundation;

(ii) Is managed pursuant to the requirements of the permit by rule specified in subparagraph (D) of this subdivision;

(iii) Either:

(I) Does not contain VOCs at greater than the applicable direct exposure criteria; or

(II) Contains VOCs at greater than the applicable direct exposure criteria, but such soil is 30 feet or more in every direction from any building; and

(iv) Is impacted by pollutants at concentrations:

(I) Less than or equal to both the industrial direct exposure criteria and 15 times the applicable direct exposure criteria; or

(II) Greater than the industrial direct exposure criteria but less than or equal to fifteen times the applicable direct exposure criteria, provided soil with concentrations in excess of the industrial direct exposure criteria is not less than one foot below the bituminous or reinforced concrete.

(D) Soil rendered inaccessible by concrete or bituminous concrete used for parking or vehicle travel, or below a building foundation pursuant to subparagraph (C) of this subdivision shall be subject to the following permit by rule requirements:

(i) The owner of the parcel on which such conditions exist shall:

(I) Ensure that such parking lot or vehicle travel-way is maintained in good condition, and free of gaps or cracks that could expose such soil or that such building foundation is maintained in such a manner as to not expose soil;

(III) Shall inspect such concrete or bituminous concrete used for parking or vehicle travel or such building foundation every five years to determine whether it remains in good condition;

(IV) Report to the commissioner on the condition of the concrete or bituminous concrete and maintenance taken to ensure such concrete or bituminous concrete is in good condition every five years, using a form prescribed by the commissioner; and

(V) Shall properly manage polluted soil exposed during temporary maintenance or replacement of the concrete or bituminous concrete or any infrastructure located thereunder.

(ii) Prior to any submission to the commissioner that verifies compliance with the provisions of the RBCRs, the owner of the parcel on which soil is rendered inaccessible pursuant to subparagraphs (C) and (D) of this subdivision shall record an affidavit of facts on the municipal land records in the town in which such release is located. Such affidavit shall include the following:

(I) A statement that polluted soil has been rendered inaccessible by concrete or bituminous concrete used for vehicle travel or a building foundation on the parcel;

(II) A description of the concrete or bituminous concrete used to render soil inaccessible, including its intended use or purpose, location and the materials used in its construction; and

(III) A statement that the owner will manage polluted soil pursuant to the provisions of this subparagraph, and subparagraph (C) of this subdivision.

(iii) Notwithstanding the requirements of this subparagraph, if the soil is rendered inaccessible by a concrete or bituminous concrete used as a public road:

(I) Any action or obligation assigned herein to the owner of the parcel on which such release is present shall be complied with by the person responsible for the maintenance of the public road which renders such release inaccessible; and

(II) The recording of an affidavit of facts shall not be required, provided a notice containing the information required by clause (ii) of this subparagraph is submitted to the commissioner, provided to the owner of any known underground utilities within the right of way of such public road, and a copy of such notice is maintained by the person responsible for the maintenance of the public road; and

(iv) Removal of the concrete or bituminous concrete, other than temporary removal for maintenance or replacement of such concrete or bituminous concrete, or any infrastructure located thereunder, shall constitute non-compliance with the requirements of this subdivision and the discovery of a historical release subject to the requirements of chapter 445b of the Connecticut General Statutes. Reporting a release following the permanent removal of concrete or bituminous concrete shall not affect the authority of the commissioner under any other statute or regulation, including, but not limited to, the authority to seek civil or criminal penalties or issue any order to prevent or abate pollution.

(4) Conditional Exemption for Inaccessible Soil Polluted with PCBs

(A) ~~Unless alternative criteria have been approved in accordance with subsection (d)(2) of this section, i~~Inaccessible soil polluted with PCBs may be remediated to the concentrations specified in subparagraph (B) of this subdivision, provided that an ELUR is in effect for the subject area, which restriction shall:

(i) Prohibit exposure to such inaccessible soil, including, but not limited to, as a result of excavation, demolition, other intrusive activities, or natural occurrences;

(ii) Prohibit residential activity;

(iii) Require that if soil is used to render polluted soil inaccessible, that such soil used to render polluted soil inaccessible is maintained and immediately replaced, as needed, to maintain the elevation and topography of the ground surface; and

(iv) Require, as applicable, that:

(I) Bituminous or reinforced concrete that renders the soil inaccessible is maintained in good condition, free of gaps or cracks that could expose such soil;

(II) A building that is used to render soil inaccessible shall consist of a roof, exterior walls, and a concrete floor, maintained in good condition, free of gaps or cracks that could expose such soil and such building shall not be removed; or

(III) Provided that written notice is submitted to the commissioner, a permanent structure that renders the soil inaccessible shall be maintained in good condition to the extent required to prevent exposure of such soil and shall not be removed.

(B) Provided the requirements of subparagraph (A) of this subdivision are met, inaccessible soil at a release area polluted with PCBs may be remediated so that the concentrations of PCBs in such soil are equal to or less than:

(i) Ten (10) ppm PCBs by dry weight; and

(ii) Twenty-five (25) ppm PCBs by dry weight if such inaccessible soil is located on an "other restricted access (nonsubstation) location" or an "outdoor electrical substation" as those terms are defined in 40 CFR 761.123, provided that PCBs may be remediated to fifty (50) ppm by dry weight at an outdoor electric substation if a label or notice is visibly placed in the area in accordance with 40 CFR 761.125(c)(2).

(5) Conditional Exemption for Incidental Sources

Soil at a release area polluted with metals, petroleum hydrocarbons, or semi-volatile organic substances is not required to be remediated to the direct exposure criteria for ~~those~~ such substances, provided such pollution is the result of:

(A) An incidental release due to the normal operation of motor vehicles, not including refueling, repair or maintenance of a motor vehicle; or

(B) Normal paving and maintenance of a consolidated bituminous concrete surface, provided such bituminous concrete surface has been maintained for its intended purpose.

(6) Conditional Exemption for Soil Polluted with Pesticides

Soil polluted with pesticides at a release area as a result of the application of pesticides is not required to be remediated to the direct exposure criteria for such pesticides, provided that a determination has been made that such pesticides are present solely as a result of the application of pesticides and:

(A) If the release area is used for residential activity:

(i) Protective measures are developed, implemented, and maintained to prevent

human exposure to soil polluted with pesticides that exceeds residential direct exposure criteria. At a minimum, such measures shall consist of:

(I) Blending existing soil so that the concentration of substances for such pesticides in the top one (1) foot of soil are equal to or less than the direct exposure criteria, except for the area around existing mature trees;

(II) Covering soil with pavement, hardscape, buildings, or permanent structures; or

(III) Growing dense or vexatious vegetation on steep slopes to minimize the potential for direct exposure and erosion; and

(ii) An EUR is in effect for the subject area, which restriction shall:

(I) Identify the nature and extent of soil polluted with pesticides above residential direct exposure criteria and serve as notice of such polluted soil; and

(II) Require compliance with clause (i) of this subparagraph.

(B) If the release area is used for industrial/commercial activity:

(i) A soil management plan shall be developed, implemented, and maintained which plan shall include protective measures and ensure, at a minimum that any soil that exceeds the industrial/commercial direct exposure criteria is not exposed, including, but not limited to, as a result of excavation, demolition, or other activities and that any such soil is managed, restored, or disposed in a manner that is protective of human health and the environment and prevents human exposure to such soil, except that such soil management plan need not apply to any portion of a release area that is currently used for raising crops where pesticides are used; and

(ii) An EUR is in effect for the subject area, which restriction shall:

(I) Prohibit residential activity; and

(II) Require compliance with clause (i) of this subparagraph.

(7) Direct Exposure Criteria for Additional Polluting Substances

(A) Substances at a particular release area, for which direct exposure criteria are not specified in section 22a-134tt-App2 ~~Appendix A~~ of the RBCRs~~SRs~~ shall be remediated to background concentration or to criteria obtained pursuant to this subdivision. A request under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) A proposed risk-based direct exposure criterion calculated in accordance with section 22a-134tt-App8 ~~Appendix G~~ of the RBCRs~~SRs~~, for each substance in such request;

(ii) The laboratory reporting limit for each substance; and

(iii) Any information about the health effects each substance may cause due to exposure pathways not accounted for in the risk-based direct exposure criterion proposed under clause (i) of this subparagraph.

(B) The commissioner may approve or deny in writing a request made under subparagraph (A) of this subdivision. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that the requirements of this subdivision have been satisfied and that the proposed direct exposure criteria will be protective of human health and the

environment.

(C) Unless prohibited in writing by the commissioner, criteria approved by the commissioner pursuant to subparagraph (A) of this subdivision, may be the subject of a request for alternative criteria under subsection (d)(2)(A) of this subsection.

22a-134tt-3k-29(c) Pollutant Mobility Criteria

(1) Pollutant Mobility Criteria

(A) Except as otherwise specified in the RBCRsSRs, polluted soil at a release area located in a GA area shall be remediated to the seasonal low water table; whereas polluted soil at a release area located in a GB area shall be remediated to the seasonal high water table. All such polluted soil shall be remediated so that the concentrations of substances in such soil are equal to or less than the applicable pollutant mobility criteria, as determined using:

(i) Mass analysis for such substances, other than inorganic substances and PCBs; and

(ii) TCLP or SPLP analysis expressed in mg/L, or mass analysis in mg/kg divided by twenty, for inorganic substances and PCBs.

(B) In GA area, if it is determined that remediation to the seasonal low water table is technically impracticable or would not result in the permanent elimination of a source of pollution, this subsection shall apply to polluted soil above the seasonal high water table.

(2) Optional Criteria for Polluted Soil in a GA Area

(A) Polluted Soil in any GA Area

Substances in polluted soil in a GA area may be remediated to a concentration equal to or less than the groundwater protection criteria for such substance based upon the analytical laboratory results of a TCLP or SPLP analysis.

(B) Polluted Soil, Except for PCBs or ETPH, in Certain GA Areas

(i) Substances, except for either PCBs or ETPH, in polluted soil in a GA area may be remediated to a concentration at which the analytical laboratory results of:

(I) TCLP or SPLP analysis for such substance in soil is equal to or less than ten (10) times the groundwater protection criteria~~:~~;

(II) TCLP or SPLP analysis for such substance in soil is equal to or less than the groundwater protection criteria multiplied by an alternative dilution or dilution and attenuation factor, approved in writing by the commissioner in accordance with subsection (d)(3)(B) of this section;

(III) Mass analysis for such substance in soil is equal to or less than ten (10) times the applicable pollutant mobility criteria in section 22a-134tt-App3~~Appendix B of~~ to the RBCRsSRs or approved in writing by the commissioner in accordance with subsection (c)(6) of this section; or

(IV) Mass analysis for such substance in soil is equal to or less than the applicable pollutant mobility criteria multiplied by an alternative dilution

or dilution and attenuation factor approved in writing by the commissioner in accordance with subsection (d)(3)(B) of this section.

(ii) The remediation standards specified in clause (i) of this subparagraph may be used only if conditions at a release area satisfy the requirements of subparagraphs (C) and (D) of this subdivision and the notice requirements of subparagraph (E) of this subdivision are satisfied.

(C) Conditions at the release area shall comply with the following requirements:

(i) NAPL is not present as determined in accordance with subdivision (4) of this subsection;

(ii) The water table is at least fifteen (15) feet above the surface of the bedrock; and

(iii) The downward vertical flow velocity of groundwater is equal to or less than the horizontal flow velocity.

(D) Conditions at the release area shall satisfy clause (i) or (ii) of this subparagraph:

(i) (I) A public water supply distribution system is available within two hundred (200) feet of the parcel on which the release area is located, within two hundred (200) feet of all adjacent parcels, and within two hundred (200) feet of any parcel within the areal extent of the groundwater plume from the subject release area;

(II) The groundwater within the areal extent of the groundwater plume from the subject release area is not used for drinking water;

(III) No public or private water supply wells exist within five hundred (500) feet of the subject release area; and

(IV) The groundwater affected by the subject release area is not a potential public water supply resource or in an aquifer protection area; or

(ii) The groundwater plume resulting from the subject release is a diminishing state groundwater plume and either:

(I) The concentration of any substance in the groundwater plume from the subject release area and within seventy-five (75) feet of the nearest downgradient parcel boundary is equal to or less than the groundwater protection criteria; or

(II) The concentration of any substance within the groundwater plume from the subject release area is equal to or less than the groundwater protection criteria for such substance at a location downgradient of the subject release area, on the subject parcel, and within twenty-five (25) feet of such release area.

(E) Written notice of the use of optional criteria calculated by an LEP under this subparagraph shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~.

(3) Optional Criteria for Polluted Soil in a GB Area

(A) Polluted Soil in a GB Area

Provided that NAPL is not present in the release area above the seasonal high water table,

as determined in accordance with subdivision (4) of this subsection, substances in soil in a GB area may be remediated to a concentration at which the results of a TCLP or SPLP analysis of each substance is equal to or less than the groundwater protection criteria:

(i) Multiplied by ten (10);

(ii) Multiplied by the ratio of the summation of the downgradient area and upgradient area compared to the release area, provided that such ratio is equal to or less than five hundred (500); or

(iii) Multiplied by an alternative dilution or dilution and attenuation factor approved in writing by the commissioner in accordance with subsection (d)(3) of this section.

(B) Optional Criteria Based Upon Release-Specific Dilution in a GB Area

(i) The criteria in this clause may only be used if the requirements in clauses (ii) and (iii) of this subparagraph are satisfied. Except for soil polluted with PCBs, substances in soil in a GB area may be remediated to a concentration at which the results of either:

(I) Mass analysis for each substance is equal to or less than the pollutant mobility criteria applicable to such substance in a GA area multiplied by a release-specific dilution factor calculated in accordance with clause (iv) of this subparagraph; or

(II) TCLP or SPLP analysis for each substance is equal to or less than the groundwater protection criterion for such substance multiplied by a release-specific dilution factor calculated in accordance with clause (iv) of this subparagraph.

(ii) Conditions at the subject release area comply with the following requirements:

(I) NAPL is not present above the seasonal high water table as determined in accordance with subdivision (4) of this subsection;

(II) The water table is at least fifteen (15) feet above the surface of the bedrock;

(III) The downward vertical flow velocity of groundwater is equal to or less than the horizontal flow velocity; and

(IV) For each substance in groundwater, the background concentration is equal to or less than the groundwater protection criteria.

(iii) Written notice of the use of optional criteria calculated by an LEP under this subparagraph shall be submitted to the commissioner in accordance with section 22a-134~~tt~~3~~k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and shall also include the calculation in clause (iv) of this subparagraph, value and basis of terms, and the ~~till~~ infiltration rate and dilution factor from the following table, based on the geologic material and infiltration rate.

Geologic Material	Infiltration Rate (feet/year)
Stratified Drift	2.0
Till	0.5 - 1.0
Lacustrine Deposits	0.4

(iv) The release-specific dilution factor referred to in clause (i) of this subparagraph, shall be calculated using the following formula, and the value of terms referred to in clause (i) of this subparagraph shall be calculated using the following formula:

$$DF = (1 + \left(\frac{Kid}{IL}\right))(1 - F_{adj})$$

Term	Description	Value	Units
DF	Release-specific dilution factor	substance-specific	unitless
K	Hydraulic conductivity of the unconsolidated aquifer underlying the release area	calculated	ft/year
i	Horizontal hydraulic gradient	calculated	ft/ft
d	Aquifer mixing zone default value of 3 feet or a release-specific value calculated using: $d = (0.0112L^2)^{0.5} + d_\alpha[1 - e^{\left(-\frac{LI}{Ki\ \alpha}\right)}]$	3, or as otherwise calculated	ft
dα	Aquifer thickness	as determined from boring logs	ft
I	Infiltration rate, as identified in section 22a-134tt~~3k~~-~~92~~(c)(3)(B)(iii)~~(IV)~~ of the RBCRs~~SRs~~	calculated	ft/year
L	Length of the release area parallel to the direction of groundwater flow	as measured	ft
F_{adj}	Background concentration for groundwater divided by the groundwater protection criteria for the subject substance or, where the background concentration for groundwater cannot be	calculated	ug/L

Term	Description	Value	Units
	quantified, one half the laboratory reporting limit for the subject substance divided by the groundwater protection criteria for the subject substance		

(4) Determining the Presence of NAPL in Soil

For the purpose of this subsection, the presence of NAPL in soil shall be determined using either:

(A) The following equation where the variables in the equation are assigned the values in the Table following the equation:

$$C_{NAP} = (S/2\rho_b)(K_d\rho_b + \theta_w + H'\theta_a)$$

Term	**Description**	**Value**	**Units**
C_{NAP}	Concentration of an organic substance at which or above which such substance may be present in a non-aqueous phase	calculated	mg/kg
S	Effective solubility	substance-specific	mg/L
ρ_b	Dry soil bulk density	1.5 or the lowest value measured at the subject release area	kg/L
K_d	Soil-water partition coefficient, which is calculated using $K_d = K_{OC}*f_{OC}$	calculated	L/kg
K_{OC}	Soil organic carbon-water partition coefficient	substance-specific	L/kg
f_{OC}	Fraction organic carbon of soil	0.006 or the lowest value measured at the subject release area	g/g
θ_w	Water-filled soil porosity L_{water}/L_{soil}	0.15 for unsaturated soil or 0.43 for saturated soil	L_{water}/L_{soil}
θ_a	Air-filled soil porosity L_{air}/L_{soil}	0.28 for unsaturated soil or 0.0 for saturated soil	L_{air}/ L_{soil}
H'	Henry's law constant (dimensionless)	H x 41 where 41 is a conversion factor	unitless
H	Henry's law constant	substance-specific	atm-m^3/mol

(B) The commissioner may approve or deny in writing a request for an alternative to the equation in subparagraph (A) of this subdivision to determine the presence of NAPL in soil. Such proposed alternative methods may be based upon emerging technologies and

approaches for which guidance, a standard, or an industrial code has been published by a regulatory agency, governmental advisory group, or other recognized professional organization. A request under this subdivision shall be submitted to the commissioner on a form prescribed by the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include any other information that the commissioner deems necessary to evaluate such request. Any approval by the commissioner may specify conditions necessary to protect human health and the environment.

(5) Conditional Exemptions to Pollutant Mobility Criteria

(A) Environmentally Isolated Soil

Polluted soil at a release area above the seasonal high water table is not required to be remediated to the pollutant mobility criteria, provided that:

(i) Such soil does not contain substances that are a continuing source of pollution;

(ii) Regardless of groundwater classification, if such soil contains volatile organic substances in excess of GA area pollutant mobility criteria, the concentrations of such substances have been reduced or immobilized to the maximum extent prudent;

(iii) An EUR is in effect for the subject area, which restriction shall:

(I) Prohibit infiltration of liquid into such soil;

(II) Require compliance with clause (i) and, if applicable, clause (ii) of this subparagraph; and

(iv) The EUR specified in clause (iii) of this subparagraph shall also;

(I) Require that any building that renders soil environmentally isolated consists of a roof and structural walls that prevent infiltration of liquid into the soil beneath the building footprint, and prohibit removal of such building; or:

(II) Require that the use of a permanent structure that renders soil environmentally isolated and prevents infiltration of liquid into the soil beneath the structure's footprint has been approved in writing by the commissioner and prohibit the removal of such structure.

(B) Polluted Material

(i) Polluted material at a release area is not required to be remediated to the pollutant mobility criteria, provided that:

(I) The pollutant mobility criteria in such polluted material is exceeded solely as a result of the presence of coal ash, wood ash, coal fragments, coal slag, coal clinkers, asphalt paving fragments, or any combination thereof;

(II) Such polluted material is not polluted with any volatile organic substances that exceed the applicable pollutant mobility criteria;

(III) Such polluted material does not exceed the applicable soil vapor volatilization criteria, or if it does, all such polluted material is under a building in accordance with section 22a-134tt~~3k-3~~10(c)(3) of the RBCRs~~SRs~~, a permanent structure approved in writing by the commissioner, or an engineered control in compliance with subsection (f)(2)(B) of this section;

(IV) Such polluted material has achieved compliance with the direct exposure criteria in section 22a-134tt~~3k-29~~(b) of the RBCRs~~SRs~~;

(V) Such polluted material is not affecting and will not affect the quality of an existing use of groundwater, including, but not limited to, a potential public water supply resource or an aquifer protection area;

(VI) A public water supply distribution system is available within two hundred (200) feet of the parcel on which polluted material is located and within two hundred (200) feet of all parcels adjacent thereto; and

(VII) The placement of the polluted material used as fill was not prohibited by law at the time of placement.

(ii) This subparagraph shall apply only to polluted materials identified in clause (i) of this subparagraph and releases from such materials. It shall not apply to releases that are not from polluted materials, even if such releases are in the same location as the polluted materials identified in clause (i) of this subparagraph.

(C) Soil Subject to Infiltration

Polluted soil at a release area polluted with substances, other than volatile organic substances that exceed DEC or PMC, is not required to be remediated to the pollutant mobility criteria, provided that at such release area:

(i) Eighty (80) percent or more of the mass of the substances remaining at the release area has been subject to infiltration;

(ii) Infiltration was not obstructed by anthropogenic features, for at least five (5) years;

(iii) Groundwater monitoring complies with the requirements of section 22a-134tt~~3k-3~~10(h)(1) of the RBCRs~~SRs~~; and

(iv) The laboratory analytical results for all groundwater sample events collected as specified in section 22a-134tt~~3k-3~~10(h)(3) of the RBCRs~~SRs~~ are equal to or less than the following:

(I) For a GA area, an aquifer protection area, or groundwater area used as a source for either a private or public drinking water supply located in a GB area, groundwater protection criteria and the surface--water protection criteria or, if applicable, the water quality criteria; or

(II) For a GB area, other than a GB area specified in subclause (I) of this clause, the surface--water protection criteria or, if applicable, the water quality criteria.

(D) Conditional Exemption for Incidental Sources

Soil at a release area polluted with metals, petroleum hydrocarbons, or semi-volatile organic substances is not required to be remediated to the pollutant mobility criteria for such substances, provided such pollution is the result of:

(i) An incidental release due to the normal operation of motor vehicles, not including refueling, repair or maintenance of a motor vehicle; or

(ii) Normal paving and maintenance of a consolidated bituminous concrete surface provided such bituminous concrete surface has been maintained for its intended purpose.

(E) Conditional Exemption for Soil Polluted with Pesticides

Soil polluted with pesticides at a release area as a result of the application of pesticides at such release area is not required to be remediated to the pollutant mobility criteria, provided that a determination has been made that such pesticides are present solely as a result of the application of pesticides and:

(i) Compliance with the direct exposure criteria or the requirements in subsection (b)(6) of this section has been achieved; and

(ii) Compliance with the groundwater standards specified in section 22a-134tt~~3k-3~~10(a) of the RBCRs~~SRs~~ or the requirements of section 22a-134tt~~3k-3~~10(g) of the RBCRs~~SRs~~ has been achieved.

(6) Pollutant Mobility Criteria for Additional Polluting Substances

(A) Substances at a particular release area for which pollutant mobility criteria are not specified in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ shall be remediated to background concentration or to criteria obtained pursuant to this subdivision. A request under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k-~~1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) A proposed risk-based pollutant mobility criteria for each substance calculated in accordance with section 22a-134tt-App8~~Appendix G~~ of the RBCRs~~SRs~~, as applicable to the groundwater classification of the release area;

(ii) A method for determining compliance with each criteria;

(iii) The laboratory reporting limit for each substance; and

(iv) Any information demonstrating whether a proposed criteria will ensure that soil water at such release area does not exceed:

(I) In a GA area, the groundwater protection criteria; or

(II) In a GB area, the groundwater protection criteria multiplied by a dilution factor of ten (10).

(B) The commissioner may approve or deny in writing a request made under subparagraph (A) of this subdivision. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that the requirements of this subdivision have been satisfied and that the proposed pollutant mobility criteria will be protective of human health and the environment.

(C) Unless prohibited in writing by the commissioner, criteria approved by the commissioner pursuant to subparagraph (A) of this subdivision, may be the subject of a request for alternative criteria under subsection (d)(3)(A) of this subsection.

22a-134tt~~3k-29~~(d) Alternative Soil Criteria and Alternative Dilution or Dilution Attenuation Factor

(1) Information Required in a Request for Approval of Alternative Soil Criteria

A request for approval of the alternative direct exposure criteria or alternative pollutant mobility criteria at a particular release area may be submitted to the commissioner under this subsection. Any such request shall be submitted to the commissioner in accordance with section 22a-134tt~~3k-~~1(c)~~(g)~~ of the RBCRs~~SRs~~, including any additional information specified in subdivisions (2) or (3) of

this subsection, as applicable, and shall also include:

(A) A detailed description of any other release area located on the same parcel as the subject release area and whether such other release area is affected or potentially affected by the subject release area, or is affecting or may potentially affect the subject release area; and

(B) When an EUR is required under this subsection, the acknowledgement and consent of the owner of the subject area to such alternative direct exposure criteria.

(2) Commissioner Approval of Alternative Release-Specific Direct Exposure Criteria

With respect to a substance, except PCBs, for which direct exposure criteria are specified in section 22a-134tt-App2 ~~Appendix A~~ of the RBCRs~~SRs~~ or approved in writing by the commissioner pursuant to section 22a-134tt~~3k-29~~(b)(7) of the RBCRs~~SRs~~, the commissioner may approve or deny in writing a request for an alternative release-specific direct exposure criteria or an alternative method for determining compliance with such criteria.

(A) For substances in soil at a release area, no request shall be approved unless it is demonstrated to the commissioner's satisfaction that:

(i) The application of such alternative direct exposure criteria or method of compliance will protect human health and the environment from the risks associated with direct exposure to polluted soil;

(ii) The concentration of each carcinogenic substance in such soil is equal to or less than a 1 X 10^{-6} excess lifetime cancer risk level and the concentration of each non-carcinogenic substance in such soil does not exceed a hazard index of 1;

(iii) For a release area polluted with ten (10) or more carcinogenic substances, the cumulative excess lifetime cancer risk for all carcinogenic substances in such soil with the same target organ is equal to or less than 1 X 10^{-5}; and

(iv) For a release area polluted with ten (10) or more non-carcinogenic substances, the cumulative hazard index is equal to or less than 1 for non-carcinogenic substances in such soil with the same target organ.

(B) A request for approval of direct exposure criteria or method of compliance shall include a risk assessment prepared in accordance with the most recent EPA Risk Assessment Guidance for Superfund, or other risk assessment method approved by the commissioner.

(C) Any approval of the commissioner under this subdivision may require that an EUR is or will be in effect for the subject area, which restriction shall require compliance with any conditions specified by the commissioner when issuing such approval.

(3) Commissioner Approval of Alternative Release-Specific Pollutant Mobility Criteria

(A) Alternative Release-Specific Pollutant Mobility Criteria

With respect to substances for which pollutant mobility criteria are specified in section 22a-134tt-App3 ~~Appendix B~~ of the RBCRs~~SRs~~ or approved by the commissioner pursuant to subsection (c)(6) of this section, the commissioner may approve or deny in writing a request for an alternative release-specific pollutant mobility criteria or an alternative method for determining compliance with such criteria. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that application of such alternatives:

(i) For a substance in soil located in a GA area, will ensure that soil water at the release area is equal to or less than the groundwater protection criteria for such substance; or

(ii) For a substance in soil located in a GB area, will ensure that the groundwater plume, after dilution resulting from infiltration on the parcel, is equal to or less than the groundwater protection criteria for such substance.

(B) Alternative Release-Specific Dilution or Dilution Attenuation Factor

With respect to substances for which pollutant mobility criteria are specified in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ or approved by the commissioner pursuant to subsection (c)(6) of this section, the commissioner may approve or deny in writing a request for an alternative release-specific dilution or dilution attenuation factor. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that application of such dilution attenuation factor:

(i) For a substance in soil located in a GA area, will ensure that the release area will not degrade groundwater quality and thereby prevent the achievement of the groundwater criteria or background concentration, in accordance with section 22a-134tt~~3k-3~~10 of the RBCRs~~SRs~~; or

(ii) For a substance in soil located in a GB area, will ensure that the soil water at the release area will not cause the groundwater at the nearest downgradient parcel boundary to exceed the groundwater protection criteria for each substance.

(C) Condition for Approval

For any request for approval of alternative pollutant mobility criteria or alternative dilution or dilution attenuation factor specified in this subdivision, alternative groundwater criteria shall not be used for the same substance for which alternative soil criteria is requested.

(4) LEP Calculation and Use of Alternative Release–Specific Pollutant Mobility Criteria

With respect to substances for which pollutant mobility criteria are specified in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~, alternative release–specific pollutant mobility criteria for a release area may be calculated by an LEP in accordance with section 22a-134tt-App9~~Appendix H~~ of the RBCRs~~SRs~~, provided that:

(A) The calculated alternative pollutant mobility criteria shall not exceed one thousand (1,000) mg/kg in a GA area or ten thousand (10,000) mg/kg in a GB area;

(B) Collection of ~~All~~ representative groundwater samples and the laboratory analytical results

of such groundwater samples used to determine compliance with any such alternative criteria shall be conducted in accordance with section 22a-134tt~~3k-3~~10(h) of the RBCRs~~SRs~~. An alternative criteria under this subdivision shall not be used if any groundwater sample results are equal to or greater than:

(i) The groundwater protection criteria in section 22a-134tt-App4~~Appendix C~~ of the RBCRs~~SRs~~, if the subject release area is in a GA area, an aquifer protection area, or an area where groundwater is used as a source of either private or public drinking water supply;

(ii) Either the surface--water protection criteria in section 22a-134tt-App5~~Appendix D~~ of the RBCRs~~SRs~~ or, if required under section 22a-134tt~~3k-3~~10(a)(3) of the RBCRs~~SRs~~, the water quality criteria; and

(iii) The volatilization criteria in section 22a-134tt-App6~~Appendix E~~ of the RBCRs~~SRs~~; and

(C) Notice of the use and derivation of the calculated criteria is submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~.

(5) LEP Calculated, Risk-Based Alternative Direct Exposure Criteria

Notwithstanding the requirements of this section, at any location at which there is polluted soil containing multiple polluting substances, an LEP may calculate and use risk-based alternative direct exposure criteria provided:

(i) A parcel-wide investigation has been conducted and all discovered releases will be remediated pursuant to the cleanup standards sections;

(ii) Remediation to such risk-based alternative direct exposure criteria ensures that the risk posed by such substances does not exceed:

(I) A cumulative excess lifetime cancer risk of 10^{-5} for 2 or more carcinogenic substances;

(II) An excess lifetime cancer risk of 10^{-6} for each individual carcinogenic substance; and

(II) A cumulative hazard index of 1 for non-carcinogenic substances with the same target organ;

(iii) No risk-based alternative direct exposure criteria may be calculated for PCBs pursuant to this subdivision; and

(iv) Such risk-based alternative direct exposure criteria shall be calculated using a form prescribed by the Commissioner.

22a-134tt~~3k-29~~(e) Determining Compliance with the Soil Criteria

(1) Direct Exposure Criteria

Unless an alternative method for determining compliance with direct exposure criteria has been approved in writing by the commissioner pursuant to subsection (d)(2) of this section, compliance with direct exposure criteria for each substance is achieved when either:

(A) All laboratory analytical results of soil samples from a release area are equal to or less than the applicable direct exposure criteria; or

(B) Except for PCBs, the ninety-five (95) percent upper confidence level of the arithmetic mean of a statistically representative sampling data set of all laboratory analytical results for such substance from a release area, consisting of ten (10) or more soil samples, is equal to or less than the applicable direct exposure criteria.

(2) Pollutant Mobility Criteria

Unless an alternative method for determining compliance with pollutant mobility criteria has been approved in writing by the commissioner pursuant to subsection (d)(3) of this section, compliance with pollutant mobility criteria for each substance is achieved when either:

(A) All laboratory analytical results of soil samples from a release area are equal to or less than the applicable pollutant mobility criteria; or

(B) Except for PCBs, the ninety-five (95) percent upper confidence level of the arithmetic mean of a statistically representative sampling data set of all laboratory analytical results for such substance from a release area, consisting of ten (10) or more soil samples that are located above the water table, is equal to or less than the applicable pollutant mobility criteria.

(3) Background Concentration

Compliance when remediating to the background concentration for a given substance in soil is achieved when:

(A) A representative sampling program is used to characterize the background concentration for soil that is:
  (i) Of similar texture and composition;
  (ii) Collected from the nearest location practicable outside the subject release area, as demonstrated to the satisfaction of the commissioner; and
  (iii) Not affected by another discrete release of the same substance, or having an effect on the concentrations of the same substance for which a background concentration is determined; and either

(B) All laboratory analytical results of soil samples from the subject release area are equal to or less than the background concentration for soil, or

(C) A statistical comparison of the background concentrations in soil to the concentrations of substances in soil from the subject release area, results in a statistically significant similarity.

22a-134tt~~3k-29~~(f) Soil Criteria Variances

(1) Widespread Polluted Fill Variance

(A) Eligibility

Geographically-extensive polluted fill present at a parcel may be eligible for a variance from compliance with the pollutant mobility criteria in accordance with subparagraph (B) or (C) of this subdivision, provided that:

(i) The fill for which a variance is sought does not contain volatile organic substances in excess of pollutant mobility criteria;

(ii) Such fill is not affecting and will not affect the quality of an existing or potential public water supply resource or an existing private drinking water supply;

(iii) For each substance in such fill, compliance with the direct exposure criteria in subsection (b) of this section has been achieved;

(iv) Any substances released into such fill subsequent to the placement of such fill that exceed the pollutant mobility criteria shall be remediated to concentrations equal to or less than the concentrations of those substances already within such fill;

(v) The placement of such fill was not prohibited by law at the time of placement;

(vi) Such fill shall remain on the parcel within the area for which such variance has been certified by an LEP in accordance with subparagraph (B) of this subdivision or approved in writing by the commissioner in accordance with subparagraph (C) of this subdivision; and

(vii) The owner of the parcel for which a variance is sought acknowledges and consents to such variance and the EUR required by subparagraph (D) of this subdivision.

(B) LEP Certification of a Widespread Polluted Fill Variance

A variance for widespread polluted fill in accordance with this subdivision may be certified in writing by an LEP, provided such LEP determines that a parcel complies with that the eligibility requirements in subparagraph (A) of this subdivision and the LEP demonstrates that the following requirements have been satisfied:

(i) Such fill extends over an area larger than ten (10) acres;

(ii) Such fill is located within the coastal boundary as defined in section 22a-94(b) of the Connecticut General Statutes;

(iii) Such fill is located within a GB area;

(iv) Such fill is not located within the drainage basin of a Class A stream, as identified in the Water Quality Standards;

(v) Compliance with the groundwater standards in section 22a-134tt~~3k-3~~10 of the RBCRs~~SRs~~ has been achieved for each substance in groundwater;

(vi) Such fill is not hazardous waste, as defined in section 22a-448 of the Connecticut General Statutes;

(vii) Except in the case of a municipality, state, or federal agency, the person requesting the variance or the owner of the parcel subject to the variance did not place the fill on the subject parcel and is not affiliated with any person responsible

for such placement through any direct or indirect familial relationship or any contractual, corporate, or financial relationship other than that by which such person's or such owner's interest in such parcel was conveyed or financed; and

(viii) Notice of the use of such variance shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~.

(C) Commissioner Approval of a Widespread Polluted Fill Variance

The commissioner may approve or deny in writing a request for a variance under this subsection. No request shall be approved unless such request demonstrates to the commissioner's satisfaction the eligibility requirements in subparagraph (A) of this subdivision and the requirements of this subparagraph have been satisfied. A request for such variance shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) Information demonstrating that a public water supply distribution system is available to all areas between the groundwater plume and the downgradient surface water discharge area;

(ii) The comparable cost of achieving compliance with pollutant mobility criteria without such variance;

(iii) The degree to which such fill exceeds pollutant mobility criteria;

(iv) The extent of such fill on the subject parcel that extends below the water table;

(v) The three-dimensional extent of such fill and the percentage of such fill occurring on the subject parcel; and

(vi) Information demonstrating that, except in the case of a municipality, state, or federal agency, the person requesting the variance or the owner of the parcel subject to the variance did not place such fill on the subject parcel or is not affiliated with any person responsible for the placement of such fill through any direct or indirect familial relationship or any contractual, corporate or financial relationship other than that by which such person's or such owner's interest in such parcel is to be conveyed or financed.

(D) Actions Required for Maintaining a Widespread Polluted Fill Variance

(i) No later than one hundred and eighty (180) days after an LEP certifies a widespread polluted fill variance under subdivision (1)(B) of this subsection, an EUR that complies with the requirements of this subsection and the EUR regulations shall be in effect for the subject area, which restriction shall prohibit any movement or reuse of such fill in a manner that does not comply with the RBCRs~~SRs~~; or

(ii) No later than one hundred and eighty (180) days after a widespread polluted fill variance has been certified by an LEP or approved by the commissioner, a request for an ELUR or NAUL that complies with the requirements of this subsection and the EUR regulations shall be submitted to the commissioner. The EUR in effect for the subject area, shall:

(I)~~(iii)~~ Prohibit any movement or reuse of such fill in a manner that does not comply with the RBCRs~~SRs~~; and

(II)~~(iv)~~ Require compliance with any condition imposed by the commissioner when approving a variance under this section.

(2) Engineered Control Variance

(A) Eligibility

A release area may be eligible for a variance from compliance with the direct exposure criteria, the pollutant mobility criteria, or both, under this subdivision through the use of an engineered control, provided that:

(i) The commissioner authorized the disposal of solid waste or polluted soil at the subject release area;

(ii) The soil at such release area is polluted with a substance for which remediation is technically impracticable;

(iii) The commissioner has determined that the removal of such substance or substances from such release area would create an unacceptable risk to human health;

(iv) An LEP, pursuant to subparagraph (B) of this subsection, has determined that the cost of remediating the polluted soil at the subject release area is significantly greater than the cost of installing and maintaining an engineered control for such soil and conducting groundwater monitoring that complies with section 22a-134tt~~3k-3~~10(h) of the RBCRs~~SRs~~ at the subject release area; or

(v) The commissioner, pursuant to subparagraph (C) of this subsection, has determined that the cost of remediating the polluted soil at the subject release area significantly outweighs the risk to the environment and human health if the engineered control fails, causing the mobilization of a substance in the soil or human exposure to such substance, and the cost of remediating the polluted soil at the subject release area is significantly greater than the cost of installing and maintaining an engineered control for such soil and conducting groundwater monitoring that complies with section 22a-134tt~~3k-3~~10(h) of the RBCRs~~SRs~~ at the subject release area.

(B) LEP Certification of an Engineered Control Variance

A variance from compliance with the direct exposure criteria may be available when an engineered control is used at a release area, provided an LEP certifies to the commissioner, in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, that the eligibility requirements of subparagraph (A) of this subdivision and the following requirements have been satisfied:

(i) The engineered control is designed and constructed and will be maintained to meet the following specifications, as applicable:

(I) For non-paved surfaces consisting of shallow-rooted vegetation, mulch, or gravel, there shall be a minimum of one (1) foot of material as measured from the ground surface, provided that the concentrations of any substances in such material are equal to or less than the applicable direct exposure criteria. Such material shall be underlain by a demarcation layer, unless there is a pre-existing mature lawn for a minimum of three (3) years.

(II) For non-paved surfaces consisting of shrubbery, such shrubbery shall be underlain by a minimum of eighteen (18) inches of material as measured

from the ground surface, provided that the concentrations of any substances in such material are equal to or less than the applicable direct exposure criteria. Such material shall be underlain by a demarcation layer, unless there is pre-existing mature shrubbery.

(III) For non-paved surfaces consisting of trees, such trees shall be underlain by a minimum of eighteen (18) inches of material, provided that the concentrations of any substances in such material are equal to or less than the applicable direct exposure criteria, measured vertically from the ground surface and extending horizontally to a radius equivalent to the full extent of the tree crown when mature. Such material shall be underlain by a demarcation layer, unless there are pre-existing trees.

(IV) For non-paved surfaces consisting of hardscape, a professional engineer shall sign and seal a plan and specifications indicating that the hardscape is appropriately designed for its intended use, with minimal maintenance and repair for fifteen (15) years, and is or shall be constructed with a minimum of nine (9) inches of a combined thickness of hardscape and sub-base. Such material shall be underlain by a demarcation layer, unless such hardscape is pre-existing.

(V) For paved surfaces, a professional engineer shall sign and seal a plan and specifications indicating that the engineered control is appropriately designed to work for such paved surface's intended use, with minimal maintenance and repair for fifteen (15) years, and shall be constructed with a minimum of two and one-half (2.5) inches of bituminous concrete with a minimum of six (6) inches of sub-base or a minimum of four (4) inches of reinforced concrete In addition any bituminous concrete or reinforced concrete less than five (5) feet wide or less than five hundred (500) square feet, the surface shall be underlain by a demarcation layer, unless such paved surface is pre-existing.

(VI) For a ground-mounted solar array anchored by a concrete ballast, the concrete ballast for the solar array shall be underlain with a minimum of one (1) foot of material and all remaining infrastructure associated with the solar array installation shall consist of a minimum of two (2) feet of material, provided that any substances in such are equal to or less than the applicable direct exposure criteria and all such material is underlain by a demarcation layer;

(ii) PCBs are not present in the soil in excess of the residential direct exposure criteria;

(iii) Consolidation of polluted soil under an engineered control is such that the soil does not exceed four (4) feet above the pre-consolidation elevation;

(iv) Measures are in place to ensure that the structural integrity, function, and effectiveness of the engineered control will be maintained. Such measures shall include, without limitation:

(I) Measures to prevent storm run-on or run-off from damaging the engineered control;

(II) Inspection conducted semi-annually. Such inspections may be done in conjunction with and satisfy the inspection requirements in the EUR Regulations; and

(III) Repairs to correct the effects of settling, subsidence, erosion, or other

damaging events or conditions no later than sixty (60) days following identification of damage to the engineered control, provided if weather prevents repairs from being made within sixty (60) days of the identification of damage, as long as temporary repairs or measures have been taken, repairs can be made as soon as the weather permits;

(v) The owner of the subject area on which such engineered control will be placed acknowledges and consents to such engineered control;

(vi) An EUR is, or will be, in effect for the subject area, which restriction shall:

(I) Prohibit the disturbance of the engineered control and the polluted soil; and

(II) Require compliance with the requirements of this subparagraph, except for clauses (vii) and (viii);

(vii) A copy of the required public notice that was posted in accordance with section 22a-134tt~~3k-17~~(d) of the RBCRs~~SRs~~; and

(viii) Calculation of the required financial assurance in accordance with section 22a-134tt~~3k-17~~(c)~~(f)~~ of the RBCRs~~SRs~~.

(C) Commissioner Approval of an Engineered Control Variance

The commissioner may approve or deny in writing a request for a variance under this subsection. No request shall be approved unless such request demonstrates to the commissioner's satisfaction that the eligibility requirements in subparagraph (A) of this subdivision and the requirements of this subparagraph have been met. A request for the commissioner's approval of an engineered control variance shall be submitted in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. Any such request shall include a demonstration of compliance with the eligibility requirements of subparagraph (A) of this subdivision and include a detailed written report and plan which demonstrate that:

(i) Such engineered control is supported by specifications that are signed and sealed by a professional engineer and indicate that such engineered control will function with minimum maintenance, will promote drainage and minimize erosion of or other damage to such control, and will accommodate settling and subsidence of the underlying soil so as to maintain the control's functional integrity;

(ii) Measures are in place to ensure that the structural integrity, function, and effectiveness of the engineered control will be maintained. Such measures shall include, without limitation:

(I) Measures that ensure the continued effectiveness of the engineered control;

(II) Measures to prevent storm run-on or run-off from damaging the engineered control;

(III) Inspections, on a schedule approved by the commissioner. Such inspections may be done in conjunction with and satisfy the inspection requirements in the EUR Regulations; and

(IV) Repairs to correct the effects of any settling, subsidence, erosion or other damaging events or conditions no later than sixty (60) days following identification of damage to the engineered control, provided if weather prevents repairs from being made within sixty (60) days of the identification of damage, as long as temporary repairs or measures have

been taken, repairs can be made as soon as the weather permits;

(iii) An EUR is or will be in effect for the subject area, which restriction shall:

(I) Prohibit any activity that could disturb either the engineered control or the polluted soil; and

(II) Except for clauses (iv) and (v) of this subparagraph, require compliance with the requirements of this subparagraph and with all conditions imposed by the commissioner when approving such variance under this subdivision;

(iv) A copy of the required public notice that was posted in accordance with section 22a-134tt~~3k-~~ ~~71~~(d) of the RBCRs~~SRs~~;

(v) Calculation of the required financial assurance in accordance with section 22a-134tt~~3k-17~~(c)~~(f)~~ of the RBCRs~~SRs~~;

(vi) The owner of the subject area on which such engineered control will be placed acknowledges and consents to such engineered control; and

(vii) In addition to clauses (i) to (vi), inclusive of this subparagraph:

(I) For a variance from direct exposure criteria, such engineered control shall be designed, constructed, and will be maintained, to physically isolate polluted soil from human contact with such soil;

(II) For a variance from pollutant mobility criteria, such engineered control shall be designed, constructed, and will be maintained, to minimize migration of liquids through polluted soil and reduce the permeability of such soil to a permeability of less than 10^{-6} cm/sec and groundwater monitoring at the release area shall be adequate to ensure that any substance migrating from the release area will be detected. In addition, if a variance under this subclause includes volatile organic substances, such engineered control shall be designed, constructed, and will be maintained, to ensure that any soil vapor migrating from the subject release area complies with all applicable volatilization criteria in accordance with section 22a-134tt~~3k-3~~10(c)(3) of the RBCRs~~SRs~~;

(III) For an engineered control that includes immobilization, including, but not limited to, the immobilization of NAPL, such engineered control shall be designed, constructed, and will be maintained, to reduce the migration of contaminants from the subject area, achieve compliance with groundwater criteria, and reduce the permeability of such soil to a permeability of less than 10^{-6} cm/sec or if permeability is reduced by immobilization that such permeability of impacted soil is approved in writing by the commissioner and at a minimum is adequate to immobilize contaminants in the soil to achieve compliance with applicable groundwater criteria; and

(IV) For an engineered control using paved surfaces or hardscape, the engineered control is based on specifications which demonstrate that the surface and sub-base materials are suitable for the intended use and are able to function with minimal maintenance and repair for fifteen (15) years and which specifications are signed and sealed by a professional engineer.

(D) Actions Required for Maintaining an Engineered Control Variance

After an engineered control has been certified by an LEP or approved by the commissioner pursuant to this subdivision, the following actions shall be taken within the timeframes prescribed:

(i) A Final Engineered Control Completion Statement shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, within one hundred and twenty (120) days from completion of construction of the engineered control. Such statement shall be accompanied by as-built drawings, signed and sealed by a professional engineer, and certified by an LEP to demonstrate that the engineered control complies with the requirements of this subdivision;

(ii) A financial assurance mechanism shall be established within one hundred and twenty (120) days of completion of construction of the engineered control. Such financial assurance shall comply with the requirements of section 22a-134tt~~3k-17~~(c)~~(f)~~ of the RBCRs~~SRs~~; and

(iii) A request for an EUR that complies with the requirements of this subsection and the EUR regulations shall be certified by an LEP or submitted to the commissioner, as applicable within one hundred and eighty (180) days of completion of construction of the engineered control.

(E) If the commissioner approves a request for an engineered control variance, under this subdivision, any such approval may include any additional measures which the commissioner deems appropriate to protect human health and the environment. Nothing in this subdivision shall preclude the commissioner from taking any action the commissioner deems necessary to protect human health or the environment if an approved engineered control fails.

(3) Public Roadways Variance

(A) The commissioner may grant a variance from compliance with the direct exposure criteria, the pollutant mobility criteria, or both, for polluted soil at a release area beneath an existing public roadway. Such variance, if approved, shall apply only so long as such polluted soil is beneath the public roadway. A request for such a variance shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. Any such request shall also include a statement, in writing, from the entity that owns the public roadway, in which such entity acknowledges:

(i) Such entity's understanding of and consent to the variance requested under this subdivision;

(ii) That the polluted soil under and within the public roadway remains subject to the RBCRs~~SRs~~, including, but not limited to, any conditions imposed by the commissioner when approving a variance under this subdivision; and

(iii) That if, at some future time, such public roadway is proposed to be removed, at least ninety (90) days before such public roadway is removed, notice of such removal shall be provided to the commissioner along with a proposed plan for the commissioner's review and approval of the investigation and remediation of all polluted soil for which a variance was obtained under this subdivision.

(B) Polluted soil at a release area is not eligible for a variance under this subdivision unless such soil is beneath an existing roadway.

(C) The commissioner may approve or deny in writing a request for a variance under this subdivision. No request shall be approved unless such request demonstrates to the commissioner's satisfaction that:

(i) The requirements of subparagraph (A) of this subdivision have been satisfied;

(ii) Removal of the polluted soil is neither feasible nor prudent; and

(iii) The granting of the variance will not endanger public health or the environment.

(D) The approval or any variance by the commissioner under this subdivision may include any conditions that the commissioner deems necessary to protect human health and the environment.

22a-134tt~~3k-29~~(g) Non-aqueous Phase Liquids

(1) NAPL shall be removed to the maximum extent practicable.

(2) The commissioner may approve or deny in writing a request for a variance from the requirement to remove NAPL to the maximum extent practicable in accordance with this subsection. No request shall be approved unless such request demonstrates to the commissioner's satisfaction that the requirements of subdivision (3) of this subsection have been satisfied. A request for the approval under this subsection shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and shall include the acknowledgement and consent of all owners of the release area containing NAPL.

(3) A release area containing NAPL is eligible for a variance under this subsection only if:

(A) All NAPL for which a variance is sought has been contained or removed to the maximum extent prudent such that:

(i) There is no migration of such NAPL;

(ii) In the circumstance where NAPL contains PCBs, such PCBs shall be remediated in compliance with 40 CFR Part 761;

(iii) Compliance with applicable groundwater criteria for groundwater impacted by such NAPL has been achieved;

(iv) Where the NAPL contains volatile organic substances located at or above the seasonal low water table and is beneath a building without mitigation in accordance with section 22a-134tt~~3k-3~~10(c)(3) of the RBCRs~~SRs~~, compliance with volatilization criteria for soil vapor in accordance with section 22a-134tt~~3k-3~~10(c)(2) of the RBCRsSRs has been achieved; and

(B) An ELUR is or will be in effect for the subject area, which restriction shall:

(i) Except for ongoing remediation, prohibit the disturbance and exposure of NAPL;

(ii) Prohibit the construction of a building over such NAPL if there is NAPL containing volatile organic substances located at or above the seasonal low water table; and

(iii) Require compliance with subparagraph (A) of this subdivision.

(4) The requirements of this subsection shall not apply to NAPL subject to regulation under section 22a-449(d)-101 et seq. of the Regulations of Connecticut State Agencies. Any such NAPL shall

remain subject to regulation under section 22a-449(d)-101 et seq. of the Regulations of Connecticut State Agencies.

22a-134tt~~3k-29~~(h) Use of Polluted Soil and Reuse of Treated Soil

Any soil excavated from or treated at a release area during remediation shall be managed as follows:

(1) Hazardous Waste

Treatment, storage, disposal and transportation of soil which is hazardous waste as defined pursuant to section 22a-448 of the Connecticut General Statutes shall be carried out in conformance with the provisions of section 22a-449(c)-101 to 119, inclusive, of the Regulations of Connecticut State Agencies, and any other applicable law;

(2) Special Waste

In accordance with section 22a-209-8 of the Regulations of Connecticut State Agencies, the commissioner may authorize polluted soil, which is not hazardous waste as defined pursuant to section 22a-448 of the Connecticut General Statutes, to be disposed of as special wastes as defined in section 22a-209-1 of the Regulations of Connecticut State Agencies.

(3) Polluted Soil

To be reused in any manner, polluted soil shall comply with all requirements of the RBCRs~~SRs~~, shall not be placed below the water table, shall not be placed in an area subject to erosion, and shall comply with the requirements in subparagraph (A), (B) or (C) of this subdivision. Prior to the reuse of such soil, a notice or request for the reuse of such soil pursuant to subparagraph (A), (B) or (C) of this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. Any such notice or request shall also include a map showing the proposed location and depth of the placement of such soil, and shall also demonstrate compliance with subparagraph (A), (B), or (C) of this subdivision. The commissioner may approve or deny in writing any request submitted pursuant to subparagraph (B) or (C) of this subdivision. No request shall be approved unless such request demonstrates to the commissioner's satisfaction, compliance with the requirements of subparagraph (B) or (C) of this subdivision, as applicable, and that the proposed reuse of soil is protective of human health and the environment.

(A) Polluted soil from a release area may be reused on the same parcel from which it was excavated by providing notice to the commissioner only if the following requirements are met:

(i) (I) If the soil to be reused is polluted with substances at concentrations that are all equal to or less than the applicable direct exposure criteria in section 22a-134tt-App2~~Appendix A~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (b)(7) of this section and the applicable pollutant mobility criteria in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (c)(6) of this section, such soil may be reused at any location on such parcel; or

(II) If the concentration of any substance in such soil exceeds the GA area

pollutant mobility criteria in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (c)(6) of this section, such soil may be reused only in a GB area and placed over soil and groundwater that has already been affected by a release; and

(ii) Any soil to be reused is not placed under a building, if the polluted soil contains volatile organic substances, other than volatile petroleum substances; and

(iii) Any soil to be reused does not contain PCBs.

(B) Polluted soil from a release area may be reused on the same parcel from which it was excavated, on a different parcel affected by the same release, or on an abutting parcel affected by a release of similar substances, only in the following circumstances:

(i) (I) If the polluted soil exceeds the direct exposure criteria or the pollutant mobility criteria applicable to the location on the parcel where the polluted soil will be reused or relocated, such polluted soil shall be rendered inaccessible pursuant to subsection (b)(3) of this section, environmentally isolated pursuant to subsection (c)(5)(A) of this section, or is subject to an engineered control pursuant to subsection (f)(2) of this section;

(II) If the polluted soil contains volatile organic substances, other than volatile petroleum substances, that are greater than the GA area pollutant mobility criteria in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (c)(6) of this section, or if such polluted soil is placed under a building that overlies a release area that has already been affected by a release of volatile organic substances, the requirements of section 22a-134tt~~3k~~ ~~3~~10(c)(3) of the RBCRs~~SRs~~ shall apply; or

(III) If the polluted soil contains PCBs, the commissioner has issued a written approval in accordance with section 22a-467 of the Connecticut General Statutes and subsection (f)(2) of this section; and

(ii) Prior to any reuse on an abutting parcel affected by the same release, or on a different parcel affected by a release of similar substances, written approval from the commissioner is required.

(C) Polluted soil from a release area may be reused on a parcel other than the parcel for which the polluted soil was excavated, only if prior to any reuse, the commissioner approves such reuse in writing and such soil to be reused:

(i) Is polluted with substances at concentrations equal to or less than the applicable direct exposure criteria in section 22a-134tt-App2~~Appendix A~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (b)(7) of this section and the applicable pollutant mobility criteria in section 22a-134tt-App3~~Appendix B~~ of the RBCRs~~SRs~~ or criteria otherwise approved by the commissioner pursuant to subsection (c)(6) of this section for the location on the parcel where the polluted soil will be relocated;

(ii) Is placed over soil and groundwater which has already been affected by a release of similar substances; and

(iii) Either:

(I) The cumulative depth of all reused polluted soil from all other parcels

does not exceed four (4) feet above the pre-remedial grade; or

(II) The cumulative depth of all reused polluted soil from all other parcels does not exceed ten (10) feet, provided that a demonstration has been made to the commissioner's satisfaction that the depth greater than four (4) feet is required for redevelopment purposes and all slopes are designed, created, and will be maintained to prevent erosion.

(4) Natural Soil

Polluted soil may be used at any parcel of land if:

(A) Any substance is present therein in concentrations not exceeding naturally-occurring conditions in soil at the release area from which such soil is removed; and

(B) No other substance is detectable in such soil at a concentration greater than its laboratory reporting limit.

(5) Polluted Soil Containing Pesticides

Notwithstanding the provisions of subdivision (3) of this subsection, the commissioner may approve or deny in writing a request for agricultural reuse of soil containing pesticides excavated on one parcel for reuse on another parcel. Any request regarding the reuse of soil under this subdivision shall be made to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and, if soil is being reused on a parcel different from the parcel from which it was excavated, shall include the acknowledgement and consent of the owner of the parcel receiving such soil. No reuse shall be approved under this subdivision unless the request for reuse demonstrates to the commissioner's satisfaction that:

(A) The concentration of substances in soil to be reused is equal to or less than the direct exposure criteria and the pollutant mobility criteria for all substances, other than pesticides;

(B) Such soil to be reused is excavated only from the soil horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral matter from which plants receive the most nutrients;

(C) Such soil is reused only at current agricultural properties;

(D) The pesticides in the soil to be reused are the result of the application of pesticides in accordance with accepted practices at the time of application; and

(E) Such reuse is protective of human health and the environment.

22a-134tt~~3k-29~~(i) Additional Remediation of Polluted Soil

Nothing in the RBCRs~~SRs~~ shall preclude the commissioner from taking any action necessary to prevent or abate pollution or to prevent or abate any threat to human health or the environment, including without limitation:

(1) Ecological Risk Assessment and Remediation

At any location at which, despite remediation in accordance with the RBCRs~~SRs~~, the commissioner determines that there is a potential ecological risk, the commissioner may require that an ecological risk assessment be conducted and that additional remediation be conducted to mitigate any risks identified in such assessment;

(2) Aquatic Life Assessment and Remediation

At any location at which polluted soil has eroded into a surface water body, the commissioner may require that the effect of such polluted soil on aquatic life be assessed and that remediation to protect or restore aquatic life and surface water quality from the effects of such polluted soil be undertaken; or

(3) Multiple Polluting Substances

At any location at which there is polluted soil containing multiple polluting substances, the commissioner may require additional remediation to ensure that the risk posed by such substances does not exceed:

(A) A cumulative excess lifetime cancer risk of 10^{-5} for ten (10) or more carcinogenic substances with the same target organ; and

(B) A cumulative hazard index of 1 for non-carcinogenic substances with the same target organ.

22a-134tt-9(j) Conditional Exemption for Historically Impacted Material

Notwithstanding any other requirement of this section, the purpose of this subsection is to allow for the on-site management of historically impacted material and to prohibit the relocation of such historically impacted material to a different parcel through a permit by rule.

(1) Applicability

An owner of a parcel may obtain a permit by rule to manage historically impacted material in place if:

(A) Only industrial/commercial activity takes place on the parcel;

(B) It has been determined, through tier characterization, there is historically impacted material on the parcel and it is not prudent to remove such material;

(C) Not more than two years after discovery of a release consisting of historically impacted material, each significant existing release has been identified;

(D) Soil containing each identified significant existing release has been removed or rendered inaccessible in the time specified to complete an Immediate Action before submitting notification pursuant to subsection (e) of this section; and

(E) The owner complies with the provisions of this section.

(2) Requirements

(A) Owners shall:

(i) Ensure that historically impacted material on the parcel is not relocated to a different parcel.

(ii) Inspect the parcel every five years to determine whether the historically impacted material has been relocated and to identify each current use of the parcel.

(iii) If ownership of the parcel, or of a portion of the parcel, or an interest in the parcel that allows for the possession of such parcel or a part of such parcel is transferred, the owner shall notify the transferee of the permit by rule. If ownership of the parcel, or of a portion of the parcel has been transferred, the new owner shall be covered by the permit by rule and shall comply with the requirements of this section.

(iv) Maintain only industrial/commercial activity on the parcel.

(v) Record an affidavit of facts in accordance with subsection (f) of this section.

(B) Failure to comply with any of the requirements in subdivision (1) of this subsection shall result in the termination of the permit by rule. Upon the termination of the permit by rule, the owner shall remediate the parcel to the applicable cleanup standard in accordance with section 22a-134tt-9 of the Regulations of Connecticut State Agencies.

(3) Termination of permit by rule due to change in use

If the parcel changes from an industrial/commercial activity as required in subsection (b)(1) of this section~~,~~ to a residential activity, prior to the change in use, the owner shall report the historical release and remediate the parcel to the residential cleanup standard in accordance with 22a-134tt-9 of the RBCRss. The owner shall notify the commissioner in writing as soon as practicable, but not later than 30 days after the change in activity. Such notification shall include a release closure report documenting that the parcel has been remediated to the residential cleanup standard.

(4) Notification

Notwithstanding the requirements of section 22a-134tt-6 of the Regulations of Connecticut State Agencies, not more than 1 year following discovery of a release, a notification that tier characterization has determined that the release is a release of historically impacted material and that such release will be managed pursuant to this provisions of this subsection shall be submitted on a form and in a manner prescribed by the commissioner. If such notification is submitted, submission of the tier checklist shall not be required, and such release shall be assigned to tier 2.

(5) Affidavit of facts

After making each determination as required by subsection (b) of this section, the owner shall record an affidavit of facts on the municipal land records in the town in which such release is located. Such affidavit shall include the following:

(A) A statement that there is polluted material on the parcel; and

(B) A statement that the owner has registered for the permit that will manage the polluted material in place.

(6) Closure report

A release remediation closure report that relies on the permit by rule to demonstrate compliance with the RBCRs shall be prepared and submitted to the commissioner pursuant to section 22a-134tt-12 of the Regulations of Connecticut State Agencies and contain the following:

(A) Evidence that the affidavit of facts is recorded on the municipal land records;

(B) Documentation of the limited characterization conducted to determine that the release is historically impacted material; and

(C) Documentation that no SERs are present in the historically impacted material subject to the permit by rule.

(7) Reporting

(A) Report to the commissioner on the status of the parcel every 5 years as required in subsection (c)(1)(B) of this section. The report shall be limited to the certification of current land use activity and that historically impacted material has not been relocated. Such report shall be maintained by the owner and made available for inspection upon request of the commissioner.

(B) The owner shall submit a notification to the commissioner within 15 days of any violation of a requirement in this section.

~~(1)~~(8) Nothing in this section shall preclude the additional remediation of historically impacted material in accordance with the cleanup standards sections.

~~(2)~~(9) If at anytime the commissioner determines that work or activities conducted do not comply with the requirements of this section or the RBCRs, including, but not limited to, the conduct of activities not authorized by this permit by rule, the commissioner shall consider any such work or activity unauthorized and may take any action authorized by section 22a-134ss of the Connecticut General Statutes, including action to require additional remediation of the historically impacted material.

22a-134tt-9(k) Conditional Exemption for Dredge Spoils

Notwithstanding the requirements of this section, the disposal of dredge spoils shall not be subject to:

(1) The direct exposure criteria, provided:

(A) A permit authorizing the upland disposal of dredge spoils has been issued by the commissioner pursuant to sections 22a-361 or 22a-403;

(B) Dredge spoils are disposed of in compliance with all relevant permit terms and conditions; and

(C) Disposed dredge spoils are covered by one foot of crushed stone or another cover depth and material approved by the commissioner in a permit issued pursuant to sections 22a-361 or 22a-403; and

(2) The pollutant mobility criteria, provided:

(A) The provisions of subdivision (1) of this subsection are complied with; and

(B) Dredge spoils are disposed of in a location upgradient of the water body from which such dredge spoils have been removed.

22a-134tt~~3k~~-10~~3~~. Cleanup ~~Remediation~~ Standards for Groundwater

22a-134tt~~3k~~-~~3~~10(a) Groundwater Criteria

Unless otherwise specified in the RBCRs~~SRs~~, all substances in groundwater from a release shall be remediated to comply with the following, as applicable:

(1) Groundwater in a GA Area

Remediation of substances in groundwater in a GA area, including the portion of a groundwater plume migrating from a GB area into a GA area, shall result in the reduction of each substance to a concentration equal to or less than:

(A) The background concentration, except as provided in subsection (d) of this section, concerning groundwater protection criteria;

(B) Surface--water protection criteria or background concentration; and

(C) Volatilization criteria.

(2) Groundwater in a GB Area

Except for any portion of a groundwater plume migrating from a GB area into a GA area that is subject to the requirements of subdivision (1) of this subsection, remediation of substances in groundwater in a GB area shall result in the reduction of each substance to a concentration equal to or less than:

(A) (i) The surface--water protection criteria and volatilization criteria; or
(ii) The background concentration; and

(B) The groundwater protection criteria, where the existing use of groundwater is for drinking or other purposes, until the use of such groundwater for drinking or other purposes is permanently discontinued.

(3) Groundwater Plume Discharging to a Low-Dilution Surface Water Body

(A) Remediation of substances in groundwater shall result in the reduction of each substance to a concentration equal to or less than the criteria set forth in subparagraph (B) of this subdivision where such plume discharges to:
(i) A wetland;
(ii) A tidal flat;
(iii) An intermittent watercourse; or
(iv) A location where the areal extent of such groundwater plume occupies more than 0.5%, or other percentage approved in writing by the commissioner, of the

upstream drainage basin of the surface water body to which such plume discharges. The percentage of the upstream drainage basin shall be measured from the intersection of the surface water body with such groundwater plume.

(B) Each substance in groundwater specified in subparagraph (A) of this subsection shall be remediated to a concentration that is either:

(i) Equal to or less than the applicable water quality criteria or, if there are no such criteria, to criteria approved by the commissioner in accordance with subsection (i)(2) of this section; or

(ii) Equal to or less than the alternative surface-water protection criteria calculated by an LEP in accordance with subsection (b)(2) of this section or approved by the commissioner in accordance with subsection (b)(3) of this section.

22a-134tt-3k-310(b) Alternative Surface-Water Protection Criteria

With respect to substances in groundwater for which surface-water protection criteria are specified in section 22a-134tt-App5Appendix D of the RBCRsSRs or approved by the commissioner pursuant to subsection (i)(2) of this section, alternative surface-water protection criteria may be calculated by an LEP or approved in writing by the commissioner, pursuant to this subsection. For each substance, only one subdivision of this subsection may be used to calculate or to request commissioner approval of alternative surface-water protection criteria. In addition, the commissioner may approve an alternative method of demonstrating compliance with surface-water protection criteria under this subsection.

(1) Groundwater Plume Discharge to a Watercourse

(A) For a substance in a groundwater plume that discharges to an inland surface watercourse classified as AA, A, or B in the Water Quality Standards, alternative surface-water protection criteria may be calculated. Any such calculation shall be performed by multiplying the applicable water quality criteria or, if there are no such water quality criteria, the criteria approved by the commissioner pursuant to subsection (i)(2) of this section, by a dilution factor derived from the following equation:

$$DF = (0.25 \times Q99)/Q_{plume}$$

Terms	Description	Value	Units
DF	Release-specific dilution factor	substance-specific	unitless
Q99	Daily stream flow equal to or exceeded on 99 percent of days in a year	waterbody specific	ft^3/sec
Q_{plume}	Average daily discharge of the subject groundwater plume: $Q_{plume} = KiA$	calculated	ft^3/sec

K	Hydraulic conductivity	as measured	ft/sec
i	Hydraulic gradient	as measured	ft/ft
A	Area of discharge: A = h * w	as measured	ft^2
h	Thickness of groundwater plume at watercourse discharge area	as measured	ft
w	Width of groundwater plume at watercourse discharge area	as measured	ft

(B) For a substance in a groundwater plume that discharges to a coastal surface watercourse classified as SA or SB in the Water Quality Standards, alternative surface-water protection criteria may be calculated. Any such calculation shall be performed by multiplying the applicable water quality criteria, or if there are no such water quality criteria, the criteria approved by the commissioner pursuant to subsection (i)(2) of this section, by a dilution factor derived from the following equation:

$$DF = \left((W \times 0.25) \times L \times D\right)/\left(T \times Q_{plume}\right)$$

Terms	Description	Value	Units
D	Mean depth of the watercourse at mean low tide where the groundwater plume discharges	calculated	ft
DF	Release-specific dilution factor	substance-specific	unitless
L	Distance along which the groundwater plume intersects the watercourse discharge area	calculated	ft
W	Cross-sectional distance from one shoreline to the other for the tidally influenced watercourse under low tide	calculated	ft

	conditions: (0.25*watercourse width) where the maximum value for W is 100 feet		
T	Daily discharge duration	0.5	day
Q_{plume}	Average daily discharge of the subject groundwater plume: $Q_{plume} = KiA$	calculated	ft^3/sec *
K	Hydraulic conductivity	as measured	ft/day
i	Hydraulic gradient	as measured	ft/ft
A	Area of discharge: A = h * w	as measured	ft^2
h	Thickness of groundwater plume at watercourse discharge area	as measured	ft
w	Width of groundwater plume at watercourse discharge area	as measured	ft

** The units for Q_{plume} should be "ft^3/day".*

(C) For purposes of this subdivision, no alternative surface-water protection criteria shall exceed the maximum allowable alternative surface-water protection criteria specified in the table below, which is the water quality criteria multiplied by a dilution factor calculated pursuant to subparagraph (A) or (B) of this subdivision.

Distance from compliance point to nearest downgradient surface water	Maximum Allowable Alternative SWPC
Less than or equal to 100 feet	100 times WQC
Greater than 100 feet to 200 feet	200 times WQC
Greater than 200 feet to 300 feet	300 times WQC
Greater than 300 feet to 400 feet	400 times WQC
Greater than 400 feet to 500 feet	500 times WQC

Greater than 500 feet to 600 feet	600 times WQC
Greater than 600 feet to 700 feet	700 times WQC
Greater than 700 feet to 800 feet	800 times WQC
Greater than 800 feet to 900 feet	900 times WQC
Greater than 900 feet	1,000 times WQC

(D) Written notice of the use of alternative surface water protection calculated by an LEP under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and shall also include the calculation, value and basis of terms, and dilution factor used.

(2) Aquifer Dilution

(A) Alternative surface-~~-~~water protection criteria may be calculated in accordance with subparagraph (B) of this subdivision, provided that:

(i) The portion of the groundwater plume for which such alternative criteria are calculated is at least five hundred feet from the nearest downgradient surface water; and

(ii) A dilution ratio for such groundwater plume is calculated pursuant to the following equation, and such ratio is equal to or greater than five:

$$DR = RC/DC$$

Terms	Description	Value	units
DR	Release-specific dilution ratio	calculated	unitless
RC	Groundwater concentration of a substance within the release area	as measured	ug/L
DC	Groundwater concentration no more than fifty feet downgradient from the location where the RC was collected	as measured	ug/L

(B) For substances in a groundwater plume that comply with subparagraph (A) of this subdivision, alternative surface water protection-~~-~~criteria shall be calculated by multiplying the surface-~~-~~water protection criteria, or if applicable the water quality criteria, by the dilution factor identified in the following table:

Distance to nearest downgradient surface water	Dilution factor
Greater than 500 feet to 600 feet	5
Greater than 600 feet to 700 feet	6
Greater than 700 feet to 800 feet	7
Greater than 800 feet to 900 feet	8
Greater than 900 feet to 1000 feet	9
Greater than 1,000 feet	10

(C) Written notice of the use of alternative surface- -water protection criteria calculated by an LEP under this subparagraph shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and shall also include the calculation, value and basis of terms, and dilution factor used.

(3) Commissioner Approval

The commissioner may approve or deny in writing a request for a release- specific alternative surface- -water protection criteria or an alternative method of demonstrating compliance with surface- -water protection criteria. No request under this subdivision shall be approved until it is demonstrated to the commissioner's satisfaction that such alternative criteria or alternative method for demonstrating compliance will protect all existing and proposed uses of surface water and is protective of human health and the environment. A request for such approval shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. Upon receipt of such request the commissioner shall specify which of the following shall be provided to the commissioner:

(A) The Q99 stream flow rate of the surface water body into which the subject groundwater plume discharges;

(B) The identification of other surface water or groundwater discharges to the surface water body within one-half mile of the areal extent of the subject groundwater plume;

(C) A report on the instream water quality into which the subject groundwater plume discharges, including assessment and use attainment information in the most current integrated water quality report and any applicable total maximum daily loads; and

(D) The flow rate of the subject groundwater plume that discharges to the surface water body and the extent and degree of mixing of such discharge in such surface water.

22a-134tt~~3k~~-~~103~~(c) Volatilization Criteria

(1) Volatilization Criteria for Groundwater

(A) Residential Volatilization Criteria

Unless otherwise specified in this subsection, each volatile organic substance in groundwater shall be remediated to a concentration that is equal to or less than the residential volatilization criteria for groundwater.

(B) Industrial/Commercial Volatilization Criteria

Each volatile organic substance in groundwater may be remediated to a concentration that is equal to or less than the industrial/commercial volatilization criteria for groundwater, provided that the subject area above the groundwater polluted with volatile organic substances:

(i) Is not used for residential activity;

(ii) Has limited access only to those individuals working at or temporarily visiting for industrial/commercial activity; and

(iii) An EUR is in effect for the subject area or the entire parcel, which restriction shall:

(I) Prohibit residential activity;

(II) Require compliance with clause (ii) of this subparagraph.

(C) Applicability of Volatilization Criteria

Subdivision (1) of this subsection shall apply to:

(i) Volatile organic substances, other than volatile petroleum substances, within thirty (30) feet or less of the ground surface and within thirty (30) feet or less of the lowest portion of a building under which groundwater is polluted with such substances; and

(ii) Volatile petroleum substances, within ten (10) feet or less of the ground surface and within ten (10) feet or less of the lowest portion of a building under which groundwater is polluted with such substances.

(2) Alternative Demonstration of Compliance with Volatilization Criteria for Groundwater

(A) Soil Vapor Below a Building

For volatile organic substances in groundwater, remediation to the volatilization criteria specified in subdivision (1) of this subsection may not be required if the concentration of such substances in soil vapors below a building is equal to or less than:

(i) The residential volatilization criteria for soil vapor; or

(ii) The industrial/commercial volatilization criteria for soil vapor, provided that to use such criteria, the requirements of subdivision (1)(B) of this subsection are satisfied.

(B) Concentrations at the Water Table

For volatile organic substances in groundwater, remediation to the volatilization criteria specified in subdivision (1) of this subsection may not be required if the substances in groundwater exceeding volatilization criteria are not at the water table and all of the laboratory

analytical results from sampling the concentration of such substances at the water table, as seasonally demonstrated by groundwater monitoring representative of the uppermost portion of the water column are equal to or less than:

(i) The residential volatilization criteria for groundwater; or

(ii) The industrial/commercial volatilization criteria for groundwater, provided that to use such criteria, the requirements of subdivision (1)(B) of this subsection are satisfied.

(3) Exemption from Volatilization Criteria for Groundwater through Vapor Mitigation

For volatile organic substances in groundwater beneath an existing building, remediation to the volatilization criteria for groundwater specified in subdivision (1) of this subsection may not be required, provided that:

(A) Measures to prevent the migration of volatile organic substances into any overlying building have been implemented and submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. The submittal shall also include:

(i) A brief description of the measures implemented to control the migration of such volatile organic substances into any overlying building;

(ii) A demonstration of the effectiveness of such control measures;

(iii) The plan for monitoring the effectiveness of such control measures over time and maintaining such control measures in good condition; and

(iv) A map showing all existing buildings, the areal extent of the groundwater plume, and the location of such control measures;

(B) The commissioner deems the measure proposed under subparagraph (A) of this subdivision acceptable and such measures have been and continue to be implemented and monitored; and

(C) An EUR, or other permanent control measures approved in writing by the commissioner, is or will be in effect for the subject area, which restriction or control measure shall:

(i) Prohibit removal of any building above such volatile organic substances in groundwater; and

(ii) Require compliance with:

(I) Control measures deemed acceptable by the commissioner under subparagraphs (A) and (B) of this subdivision; and

(II) Any condition specified by the commissioner in the approval of such permanent control measures under this subparagraph.

(4) Alternative Release-Specific Volatilization Criteria and Alternative Method of Demonstrating Compliance with Volatilization Criteria

With respect to volatile organic substances in groundwater or soil vapor for which volatilization criteria are specified in sections 22a-134tt-App6 ~~Appendix E~~ or 22a-134tt-App7 ~~Appendix F~~ of the RBCRs~~SRs~~ or approved by the commissioner pursuant to subsection (i)(3) of this section, the commissioner may approve or deny in writing a request for a release-specific alternative volatilization criteria. In addition, the commissioner may approve or deny in writing an alternative method of determining compliance with such criteria.

(A) A request for approval of alternative volatilization criteria or for an alternative method of demonstrating compliance with volatilization criteria shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) A description of the distribution and concentration of volatile organic substances in groundwater or soil vapor beneath any overlying building;

(ii) A description of any site-specific conditions, including, but not limited to, the value of all terms used and the source of any release-specific values.

(B) No request under subparagraph (A) of this subdivision shall be approved unless such request demonstrates to the commissioner's satisfaction that such criteria or alternative method of determining compliance is protective of human health and will ensure that volatile organic substances in groundwater or soil vapor do not accumulate in the air of any building at a concentration which:

(i) For any carcinogenic substance creates a risk to human health in excess of a 10^{-6} excess lifetime cancer risk level, and for any non-carcinogenic substance does not exceed a hazard index of one (1); and

(ii) For a groundwater plume or soil vapor polluted with ten (10) or more volatile organic substances, does not exceed a cumulative excess cancer risk level of 10^{-5} for carcinogenic substances, and for non-carcinogenic substances with the same target organ, the cumulative hazard index does not exceed one (1).

(C) Any approval of the commissioner under this subdivision, may require that an EUR is or will be in effect for the subject area, which restriction shall enumerate and require compliance with any conditions specified by the commissioner when issuing such approval.

(5) Exemption from Volatilization Criteria for Groundwater Through a No Build Restriction

For volatile organic substances in groundwater, remediation to the applicable volatilization criteria specified in subdivision (1) of this subsection may not be required if the following conditions are satisfied:

(A) The water table is less than thirty (30) feet below the ground surface;

(B) No building exists over the groundwater polluted with such substances at a concentration above applicable volatilization criteria;

(C) One of the following has been satisfied:

(i) An EUR is in effect for the subject area, which restriction shall;

(I) Prohibit construction of a building at the subject area; and

(II) Require compliance with subparagraph (B) of this subdivision;

(ii) The commissioner has approved in writing a request demonstrating that no building can reasonably be expected to be constructed over the subject groundwater; or

(iii) The commissioner has approved in writing a request demonstrating that natural attenuation or other methods of remediation will, within five (5) years, reduce

the concentration of volatile organic substances in such groundwater to a concentration equal to or less than:

(I) Residential volatilization criteria; or

(II) The industrial/commercial volatilization criteria, in which case subdivision (1)(B)~~(A)(ii)~~ of this subsection shall apply; and

(D) For any volatile organic substances, other than volatile petroleum substances, that exceed the applicable volatilization criteria within thirty (30) feet of any part of a building, the potential for a vapor intrusion pathway into such building shall be thoroughly evaluated. If such evaluation identifies a vapor intrusion pathway into such building, compliance with subdivision (3) of this subsection shall be required.

(6) Exemption from Volatilization Criteria Through Indoor Air Monitoring

For volatile organic substances in groundwater, remediation to the applicable volatilization criteria specified in subdivision (1) of this subsection may not be required for groundwater underlying an existing building. No request under subparagraph (A) of this subdivision shall be approved unless such request demonstrates to the commissioner's satisfaction that the conditions in the building overlying volatile organic substances in groundwater are ~~is~~ protective of human health and the environment.

(A) A request in accordance with this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) The acknowledgement and consent of the owner of the building for which approval of the air monitoring program is sought; and

(ii) An indoor air monitoring program and measures to control the level of any such volatile organic substances in the air of the subject building, including, but not limited to:

(I) A description of the distribution and concentration of volatile organic substances beneath the building;

(II) Any measures to be taken;

(III) The location of proposed monitoring points;

(IV) The proposed frequency of monitoring;

(V) The parameters to be monitored; and

(VI) The actions to be taken in the event such monitoring indicates that selected parameters are exceeded.

(B) The commissioner may approve or deny in writing a request submitted under this subdivision. Approval of any indoor air monitoring program pursuant to this subdivision shall require that an ELUR is or will be in effect for the subject area, which restriction shall require compliance with the indoor air monitoring program approved by the commissioner in writing, including any conditions imposed by the commissioner when approving such program.

(7) For the purpose of this subsection, "building" means any structure enclosed by a roof and walls that is capable of accumulating vapors from the subsurface.

22a-134tt~~3k~~-10~~3~~(d) Groundwater Protection Criteria

(1) Exemption from Attaining Background Concentration in a GA Area

For substances in groundwater in a GA area, remediation to the background concentration may not be required if the concentration of each substance in a groundwater plume is equal to or less than the groundwater protection criteria and one of the following conditions exist:

(A) (i) A public water supply distribution system is available within two hundred (200) feet of the parcel on which the release area is located, within two hundred (200) feet of all adjacent parcels, and within two hundred (200) feet of any parcel within the areal extent of the groundwater plume;
(ii) Such groundwater plume is not located in an aquifer protection area; and
(iii) Such groundwater plume is not located within the area of influence of any public water supply well;

(B) Prior to any soil or groundwater remediation, the groundwater plume is a diminishing state groundwater plume; or

(C) Each substance in groundwater is remediated to a concentration equal to or less than the groundwater protection criteria, and further reduction of the concentrations of such substances to the background concentration cannot be achieved using sound engineering and hydrogeologic remediation practices.

(2) Alternative Groundwater Protection Criteria

With respect to substances in groundwater for which groundwater water protection criteria are specified in section 22a-134tt-App4 ~~Appendix C~~ of the RBCRs~~SRs~~3, or approved by the commissioner pursuant to subsection (i)(1) of this section, alternative groundwater protection criteria may be calculated by an LEP pursuant to subdivision (3) of this subsection or approved in writing by the commissioner pursuant to subdivision (4) or (5) of this subsection.

(3) LEP Calculation of Alternative Groundwater Protection Criteria

(A) For a substance in groundwater located in an area designated on the department's "Potential Alternative Groundwater Protection Criteria Map" in section 22a-134tt-App-10~~Appendix I~~ of the RBCRs~~SRs~~, alternative groundwater protection criteria may be calculated by an LEP, in accordance with subparagraph (B) or (C) of this subdivision, as applicable, provided that:
(i) Written notice of the use of alternative groundwater protection criteria is submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and any such notice includes:
(I) The alternative groundwater protection criteria calculation in accordance with subparagraph (B) or (C) of this subdivision; and
(II) Documentation demonstrating compliance with the requirements of this subdivision, including, but not limited to, a water supply well receptor survey;
(ii) Any alternative groundwater protection criteria shall not exceed:
(I) One hundred (100) times the groundwater protection criteria specified in

section 22a-134tt-App4 ~~Appendix C~~ of the RBCRs~~SRs~~ or approved by the commissioner in accordance with subsection (i)(1) of this section; and

(II) The residential volatilization criteria for groundwater specified in section 22a-134tt-App6 ~~Appendix E~~ of the RBCRs~~SRs~~ or approved by the commissioner in accordance with subsection (i)(3) of this section;

(iii) No public or private drinking water supply well is present on any subject parcel within or adjacent to the areal extent of the portion of the subject groundwater plume in which a substance exceeds the background concentration;

(iv) A public water supply distribution system is available within five hundred (500) feet downgradient and two hundred (200) feet in any direction of the subject groundwater plume;

(v) All releases to soil that constitute a source of pollution resulting in the subject groundwater plume have been remediated so there is no longer an on-going source in soil impacting groundwater;

(vi) No alternative pollutant mobility criteria is used for the same substance for which an alternative groundwater protection criteria is used;

(vii) The subject groundwater plume is a diminishing state groundwater plume; and

(viii) The alternative groundwater protection criteria being calculated is not used for any portion of the subject groundwater plume located in bedrock unless approved by the commissioner in accordance with subdivision (5) of this subsection.

(B) For volatile organic substances, the following equation shall be used to calculate alternative groundwater protection criteria in accordance with this subparagraph:

$$\text{Alternative GWPC} = \frac{\text{TAC} \times \text{HV} \times \text{ER} \times \text{MC}}{\text{f} \times \text{WFR}}$$

Terms	Description	Value	Units
Alternative GWPC	Criteria in groundwater as alternative to groundwater protection criteria	calculated	µg/L
TAC	Target Indoor Air Concentration as approved by the commissioner in accordance with section 22a-134tt-App8 ~~Appendix G~~ of the RBCRs~~SRs~~	substance-specific	µg/m^3
f	Fraction of substance concentration volatilized	0.5	unitless
HV	House Volume	1,000	m^3

ER	Air exchange rate per day, as a time weighted average	134	times per day
MC	Mixing coefficient	0.33	none
WFR	Water Flow Rate	3,183	L/day

(C) For semi-volatile organic substances, inorganic substances and pesticides, the following equation shall be used to calculate alternative groundwater protection criteria in accordance with this subparagraph:

$$\text{Alternative GWPC} = \text{WSF} \times \text{RSC} \times \text{DEC} \times \text{UCF}$$

Terms	Description	Value	Units
Alternative GWPC	Criteria in groundwater as alternative to groundwater protection criteria	calculated	µg/L
WSF	Water to soil concentration factor, based upon accumulation of arsenic in soil	0.02	(mg/L)/ (mg/kg)
RSC	Relative source contribution to account for other background contributions t~~o semi volatile organic substances~~ in soil	0.2	unitless
DEC	Residential direct exposure criteria in section 22a-134tt-App2 ~~Appendix A~~ of the RBCRs~~SRs~~ or criteria approved by the commissioner pursuant to section 22a-134tt~~3k~~-~~29~~(b)(7) of the RBCRs~~SRs~~	Substance Specific	mg/kg
UCF	Unit Conversion Factor	1,000	µg/mg

(4) Commissioner Approval of Alternative Groundwater Protection Criteria Not In Mapped Areas

For a substance in groundwater that is not located in an area designated on the department's "Potential Alternative Groundwater Protection Criteria Map" in section 22a-134tt-App10~~Appendix I~~ of the RBCRs~~SRs~~, the commissioner may approve or deny in writing a request for an alternative groundwater protection criteria pursuant to this subparagraph. A request for such alternative groundwater protection criteria shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. No request shall be approved unless such request demonstrates to the commissioner's satisfaction:

(A) Compliance with the requirements of clauses (i) to (viii), inclusive, of subdivision (3)(A) of this subsection;

(B) Calculation of proposed alternative groundwater protection criteria in accordance with subparagraphs (B) and (C) of subdivision (3) of this subsection, as applicable; and

(C) Compliance with clause (i) or (ii) of this subparagraph:

(i) Documentation from a public or private water company subject to regulation by the Department of Public Health demonstrating that public drinking water is available in the area where the subject groundwater plume is located, including a public water service area map on file with the Department of Public Health indicating that public water is available. This clause can be used only if;

(I) A public water supply distribution system has become available to any parcel within or adjacent to the areal extent of the portion of the groundwater plume not previously included on the department's "Potential Alternative Groundwater Protection Criteria Map" in section 22a-134tt-App10~~Appendix I~~ of the RBCRs~~SRs~~; and

(II) The subject groundwater plume is not located in an aquifer protection area or in an aquifer suitable for development of a public water supply

(ii) As a result of stratified drift aquifer conditions where the subject groundwater plume is located:

(I) The aquifer is not suitable for development of a public water supply due to the hydrogeology, depth, saturated thickness of the surficial materials or other hydrogeologic factors

(II) There is less than twenty (20) feet of saturated sand or sand and gravel in such aquifer or pumping more than fifteen (15) gallons per minute from such aquifer is not sustainable for public water use; and

(III) A cross-sectional map is provided showing the nature and distribution of surficial materials in such aquifer.

(5) Commissioner Approval of Alternative Groundwater Protection Criteria Where Any Portion of a Plume Is In Bedrock

For a substance in groundwater that is located in an area designated on the department's "Potential Alternative Groundwater Protection Criteria Map" in section 22a-134tt-App10 ~~Appendix I~~ of the RBCRs~~SRs~~, and where the portion of the groundwater plume is located in bedrock. A request for such alternative groundwater protection criteria shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~. No request shall be approved unless such request includes a map showing the horizontal and vertical extent of the bedrock groundwater plume that exceeds or could be expected to exceed the groundwater protection criteria and demonstrates to the commissioner's satisfaction;

(A) Compliance with the requirements of clauses (i) to (vii), inclusive, of subdivision (3)(A) of this subsection; and

(B) That the groundwater plume that exceeds the groundwater protection criteria will not pose a risk to human health and the environment.

22a-134tt~~3k-3~~10(e) Technical Impracticability Variance

Groundwater may be eligible for a variance from compliance with the surface-~~-~~water protection criteria or the groundwater protection criteria if the commissioner determines that compliance with such criteria is technically impracticable. No request for a variance shall be approved unless such request demonstrates to the commissioner's satisfaction that the requirements of this subsection have been satisfied.

(1) Request for Technical Impracticability Variance

(A) A request for a technical impracticability variance shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) The substance and its concentration in the groundwater plume for which a variance is sought;

(ii) A map showing the horizontal and vertical extent of the groundwater plume that exceeds or could be expected to exceed surface-~~-~~water protection criteria or groundwater protection criteria;

(iii) A demonstration of compliance with the soil standards in section 22a-134tt~~3k-2~~9 of the RBCRs~~SRs~~, and unless it is demonstrated that remediation of soil is technically impracticable, that polluted soil is not contributing to the groundwater plume;

(iv) Laboratory analytical results of all representative sampling before, during, and after the implementation of such actions and a description of all actions to remediate the groundwater plume;

(v) A feasibility study for achieving compliance with the criteria for which a variance is sought that evaluates remediation methods and demonstrates that achieving compliance with such criteria in a reasonable timeframe is technically impracticable;

(vi) A demonstration that the subject groundwater plume is in a steady-state or is a diminishing state groundwater plume, or that the subject groundwater plume is hydraulically controlled;

(vii) A map and description of the proposed TI zone, including the identification of existing groundwater withdrawals and potential for future withdrawal of groundwater on parcels within and adjacent to the proposed TI zone, and a demonstration that such withdrawals will not induce movement of the subject groundwater plume into uncontaminated areas or adversely affect the protectiveness of the proposed variance;

(viii) A study to determine the risks posed by the polluted groundwater that would remain if a variance was granted. If such study shows a risk or a potential risk to human health or the environment, a contingency plan to eliminate or minimize such risk shall be included;

(ix) Measures for long-term monitoring, operation, maintenance, and reporting, to ensure that the selected remedy remains effective in its protectiveness. Such measures shall:

(I) Demonstrate through groundwater monitoring that the groundwater plume is not increasing in size or concentration, or otherwise migrating in a manner that would alter the risk assumptions of clause (viii) of this subparagraph;

(II) Confirm that unacceptable risks to human health and the environment do not occur and if such risk do occur, contingency actions will be taken to abate such risks, including, but not limited to, changes in land use; and

(III) Demonstrate through monitoring that any proposed operation and maintenance controls are working properly and remain effective; and

(x) The type and estimated amount of financial assurance to be posted in accordance with the requirements of section 22a-134tt~~3k-17(c)(f)~~ of the RBCRs~~SRs~~.

(B) Based upon the information submitted in accordance with subparagraph (A) of this subdivision, the commissioner shall indicate, in writing, either that a groundwater plume does not qualify for a variance under this subsection, or alternatively, that the information specified in subdivision (2) of this subsection shall be submitted and may include conditions the commissioner deems appropriate to protect public health and the environment.

(2) Additional Information to be Submitted Upon Request

After submission of the information required in this subdivision, the commissioner may approve or deny in writing a request for a technical impracticability variance. Unless otherwise specified by the commissioner, the following information shall be submitted within one hundred and twenty (120) days of a request for such information by the commissioner. The information shall be submitted to the commissioner in accordance with section 22a-134tt~~3k-1(c)(g)~~ of the RBCRs~~SRs~~, and shall also include:

(A) A demonstration that public notice has been provided in accordance with section 22a-134tt~~3k-17~~(d) of the RBCRs~~SRs~~;

(B) A certification that written notice of the extent and degree of such pollution allowed to remain in place has been provided to each owner of record of each parcel within the TI zone, at the address for such owner on the last-completed grand list of the municipality where the parcel is located, and to the Director of Health of the municipality or municipalities in which the TI zone is located;

(C) If the commissioner has specified that an ELUR is required, the acknowledgement and consent from the owner of each parcel in the TI zone to such variance;

(D) A demonstration that financial assurance has been obtained in accordance with section 22a-134tt~~3k-17(c)(f)~~ of the RBCRs~~SRs~~; and

(E) A demonstration, as specified by the commissioner in the written request for information under this subdivision, that either an ELUR is in effect on each parcel in the TI zone or other permanent control measure is in place. Any ELUR or other permanent control measure shall:

(i) Require compliance with the plan and measures specified in clauses (viii) and (ix)

of subdivision (1)(A) of this subsection;

(ii) Include conditions the commissioner deems appropriate to protect public health and the environment;

(iii) In addition to any requirement in the EUR Regulations, require the preparation of a report every five (5) years, which reviews the implementation and effectiveness of the variance approved by the commissioner, including, but not limited to, the impact of the use of groundwater on parcels adjacent to the TI zone. Such reports shall be maintained by the parcel owner who is requesting such variance until the technical impracticability variance is no longer required under this subsection and shall be provided to the commissioner upon request; and

(iv) In addition, for a variance from compliance with the groundwater protection criteria:

(I) Prohibit the use of groundwater for drinking or other purposes; and

(II) Prohibit the withdrawal of groundwater, unless a withdrawal has been approved in writing by the commissioner.

22a-134tt~~3k~~-103(f) Conditional Exemption for Incidental Sources

Compliance with the groundwater criteria specified in subsection (a) of this section is not required for the following substances in groundwater under the circumstances described in this subsection:

(1) Trihalomethanes or any other substance within drinking water released from a public water supply distribution system; or

(2) Metals, petroleum hydrocarbons, or semi-volatile organic substances, provided such substances are the result of:

(A) An incidental release due to the normal operation of motor vehicles, not including refueling, repair or maintenance of a motor vehicle; or

(B) Normal paving and maintenance of a consolidated bituminous concrete surface provided such bituminous concrete surface has been maintained for its intended purpose.

22a-134tt~~3k~~-103(g) Conditional Exemption for Groundwater Polluted with Pesticides

Compliance with the groundwater criteria specified in subsection (a) of this section is not required for pesticides in groundwater resulting from the application of pesticides at the release area, provided that:

(1) A determination has been made that such pesticides are present solely as a result of the application of pesticides;

(2) Compliance with the soil standards in section 22a-134tt~~3k-29~~ of the RBCRs~~SRs~~ has been achieved for any release of pesticides;

(3) The nature and approximate extent of pesticides in the groundwater has been evaluated;

(4) Potable water supply wells on the parcel where pesticides are in groundwater have been sampled and any exposure pathway to drinking water in such wells is eliminated or mitigated to the extent

necessary to protect human health;

(5) A potable water supply well receptor survey identifying surrounding drinking water uses has been conducted;

(6) With respect to the parcel for which a demonstration of compliance with the RBCRs~~SRs~~ is being made, if pesticides in the groundwater on such parcel exceed the groundwater criteria notice is recorded on the municipal land records identifying such exceedance;

(7) If pesticides applied at a parcel, for which a demonstration of compliance with the RBCRs~~SRs~~ is being made, are present in groundwater on other parcels at concentrations exceeding the groundwater criteria, best efforts have been made to ensure that an EUR has been placed providing notice that pesticides in groundwater on such affected parcels exceeds the groundwater criteria. A certification stating such best efforts have been made shall be submitted with the notice required under subdivision (8) of this section; and

(8) Notice of compliance with the requirements of this subsection, including all documents demonstrating such compliance, is submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and is also submitted to the Director of Health of the municipality in which such pesticides in groundwater are located.

22a-134tt~~3k-3~~10(h) Applying the Groundwater Criteria

Compliance with the standards for groundwater in this section, or standards specified in section 22a-134tt~~3k-2~~9 of the RBCRs~~SRs~~ that refer to or require groundwater monitoring, shall be based upon groundwater monitoring conducted in compliance with this subsection.

(1) Groundwater monitoring shall be capable of determining:

(A) The conceptual site model for the release is valid;

(B) The background concentration at the nearest location upgradient of and unaffected by the release;

(C) The effectiveness of any soil remediation to prevent the pollution of groundwater by substances from the release area;

(D) The effectiveness of any measures to render soil environmentally isolated;

(E) The effectiveness of any remediation to eliminate or minimize any risks to human health and the environment associated with each release being remediated, including, but not limited to, any risks identified during remediation or identified in any risk assessment conducted in accordance with subsection (e)(2) of this section;

(F) Whether the concentration of a substance in groundwater is equal to or less than the applicable groundwater criteria for such substance;

(G) Whether a groundwater plume in a GB area interferes with any existing use of

groundwater, including, but not limited to, a drinking water supply or an industrial, agricultural, or commercial use of groundwater; and

(H) The effectiveness of monitored natural attenuation to achieve compliance with groundwater criteria within a reasonable timeframe.

(2) Pre-requisites for Determining Compliance with Groundwater Criteria

The groundwater samples that will be used in determining compliance with an applicable criteria for a substance shall be collected after:

(A) All active remediation of soil and groundwater ~~remedial actions~~ conducted to achieve compliance with pollutant mobility criteria and the applicable groundwater criteria for such substance have been concluded, other than natural attenuation of a groundwater plume or the recording of an EUR;

(B) The aquifer is no longer subject to the transient effects on hydraulic head attributable to withdrawal from or injection to groundwater for the purpose of remediation, or other effects due to site redevelopment or remediation;

(C) Any changes to the geochemistry induced by remedial actions or monitoring well construction methods that might influence the concentration of such substance have stabilized and equilibrium geochemical conditions are established; and

(D) The groundwater plume is a diminishing state groundwater plume.

(3) Determining Compliance with Groundwater Criteria

With the exception of monitoring conducted in accordance with subparagraph (B)(ii) or (C)(ii) of this subdivision, when determining compliance with applicable groundwater criteria for substances, a minimum of four (4) sampling events shall be performed which reflect seasonal variability on a quarterly basis, provided that all sampling events used to demonstrate compliance are performed within two (2) years prior to the most current sampling event used to determine compliance, and shall comply with this subdivision.

(A) Determining Compliance with Groundwater Protection Criteria or the Background Concentration

Compliance with the groundwater protection criteria or the background concentration for each substance in groundwater is achieved when sampling locations used for compliance are representative of the subject groundwater plume, and either:

(i) All laboratory analytical results for such substance at all sampling locations are equal to or less than the groundwater protection criteria or the background concentration, whichever is applicable; or

(ii) The ninety-five percent upper confidence level of the arithmetic mean of a statistically representative sampling data set consisting of all laboratory analytical results for such substance for no less than twelve consecutive monthly samples, calculated individually for each sampling location, is equal to or less than the

groundwater protection criteria or the background concentration, whichever is applicable.

(B) Determining Compliance with Surface-Water Protection Criteria or Water Quality Criteria

Compliance with the surface-water protection criteria for each substance groundwater is achieved when sampling locations are representative of the subject groundwater plume, and either:

(i) For sample locations in that portion of such groundwater plume which is upgradient of the area at which such groundwater discharges to the receiving surface water body:

(I) All laboratory analytical results for such substance are less than or equal to the surface-water protection criteria or, if applicable, the water quality criteria; or

(II) The ninety-five (95) percent upper confidence level of the arithmetic mean of a statistically representative sampling data set consisting of all laboratory analytical results for such substance for no less than twelve (12) consecutive monthly samples, calculated individually for each sampling location, is equal to or less than the surface-water protection criteria or, if applicable, the water quality criteria; or

(ii) The ninety-five (95) percent upper confidence level of the arithmetic mean of a statistically representative sampling data set consisting of all laboratory analytical results for such substance in the entire groundwater plume, collected to reflect seasonal variability on a quarterly basis, is equal to or less than the surface-water protection criteria or, if applicable, water quality criteria.

(C) Determining Compliance with Volatilization Criteria

(i) Compliance with volatilization criteria for each substance in groundwater is achieved when the sampling is representative of the subject groundwater plume and all laboratory analytical results for such substance are equal to or less than the applicable volatilization criteria for groundwater.

(ii) Compliance with volatilization criteria for each substance in soil vapor is achieved when the sampling is representative of the subject soil vapor, including during the heating and cooling seasons, and the results of all laboratory analytical results for such substance are equal to or less than the applicable volatilization criteria for soil vapor.

(D) Alternative Methods to Determine Compliance with the Groundwater Criteria

The commissioner may approve or deny in writing a request for an alternative to the methods prescribed in this subdivision to determine compliance with an applicable groundwater criteria. Such proposed alternative methods may be based upon emerging technologies and approaches for which guidance, a standard, or an industrial code has been published by a regulatory agency, governmental advisory group, or other recognized professional organization. A request under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall

also include any other information that the commissioner deems necessary to evaluate such request. Any approval by the commissioner may specify conditions necessary to protect human health and the environment.

(4) Upgradient Groundwater Plume

(A) In the circumstance where it is demonstrated that substances in a groundwater plume from an upgradient parcel are migrating or have migrated onto the subject downgradient parcel, the concentrations of such substances in the groundwater plume at the downgradient parcel may be equal to or less than the concentrations of such substances found in the groundwater plume at the boundary between such parcels, provided that:

(i) Soil on the downgradient parcel has been remediated and compliance with the standards for soil in section 22a-134tt~~3k-2~~9 of the RBCRs~~SRs~~ have been achieved;

(ii) At the downgradient parcel, all exposure pathways to drinking water supply wells and from volatilization of volatile organic substances into buildings have been eliminated or mitigated to the extent necessary to protect human health; and

(iii) Such substances are not already present in a groundwater plume at the downgradient parcel.

(B) In the circumstance where it is demonstrated that substances in a groundwater plume from an upgradient parcel are migrating onto a downgradient parcel and such substances have co-mingled with the same substances found in a groundwater plume at the downgradient parcel, in addition to the requirements in subparagraph (A) of this subdivision:

(i) The co-mingled groundwater plume on the downgradient parcel may be equal to or less than the concentrations of such substances found in the groundwater plume at the boundary between such parcels; and

(ii) All exposure pathways to drinking water supply wells and from volatilization of volatile organic substances into buildings at all parcels impacted by the groundwater plume emanating from the downgradient parcel have been eliminated or mitigated to the extent necessary to protect human health.

(C) Notice of the use of this provision as part of remediation shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~ and shall demonstrate compliance with this subdivision.

(D) This section does not apply to substances in a groundwater plume on a downgradient parcel where such substances are not migrating onto such parcel from an upgradient parcel or such substances are different than those migrating onto such parcel.

22a-134tt~~3k-10~~3(i) Additional Polluting Substances

(1) Groundwater Protection Criteria for Additional Polluting Substances

(A) Any substance in groundwater for which a groundwater protection criterion is not specified in section 22a-134tt-App4~~Appendix C~~ of the RBCRs~~SRs~~, shall be remediated to the background concentration or to criteria obtained pursuant to this subdivision. A request under this subdivision shall be submitted to the commissioner in accordance with

section 22a-134tt-3k-1(c)(g) of the RBCRsSRs, and shall also include:

(i) A proposed risk-based groundwater protection criteria for each substance calculated in accordance with section 22a-134tt-App8Appendix G of the RBCRsSRs;

(ii) The laboratory reporting limit for each substance;

(iii) A description of the organoleptic properties of each substance; and

(iv) Any information about the health effects such substance may cause due to exposure not accounted for in the proposed risk-based groundwater protection criteria.

(B) The commissioner may approve or deny in writing a request made under subparagraph (A) of this subdivision. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that the requirements of this subdivision have been satisfied and that the proposed groundwater protection criteria will be protective of human health and the environment.

(C) Unless prohibited in writing by the commissioner, criteria approved by the commissioner pursuant to subparagraph (B) of this subdivision, may be the subject of a request for alternative criteria under subsection (d)(2) of this section.

(2) Surface--Water Protection Criteria for Additional Polluting Substances

(A) Any substance in groundwater for which a surface water protection criterion is not specified in section 22a-134tt-App5Appendix D of the RBCRsSRs or for which there are no water quality criteria, shall be remediated to the background concentration or to criteria obtained pursuant to this subdivision. A request under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt-3k-1(c)(g) of the RBCRsSRs, and shall also include:

(i) A proposed risk-based surface--water protection criteria for each substance calculated in accordance with section 22a-134tt-App8Appendix G of the RBCRsSRs;

(ii) The laboratory reporting limit for each substance;

(iii) A description of the bioaccumulative properties of each substance; and

(iv) Any information about the ecological effects each substance may cause due to exposure not accounted for in the proposed risk-based surface--water protection criteria.

(B) The commissioner may approve or deny in writing a request made under subparagraph (A) of this subdivision. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that the requirements of this subdivision have been satisfied and that the proposed surface--water protection criteria will be protective of human health and the environment.

(C) Unless prohibited in writing by the commissioner, criteria approved by the commissioner pursuant to subparagraph (B) of this subdivision, may be the subject of a request for alternative criteria under section 22a-134tt-3k-310(b) of the RBCRsSRs.

(3) Volatilization Criteria for Additional Polluting Substances

(A) Any substance in groundwater for which a volatilization criterion are not specified in sections 22a-134tt-App6 or 22a-134tt-App 7~~Appendix E or Appendix F~~ of the RBCRs~~SRs~~, shall be remediated to the background concentration or to criteria obtained pursuant to this subdivision. Such request may include target indoor air concentrations and volatilization criteria to apply to such substances in groundwater or soil vapor. A request under this subdivision shall be submitted to the commissioner in accordance with section 22a-134tt~~3k~~-1(c)~~(g)~~ of the RBCRs~~SRs~~, and shall also include:

(i) A risk-based target indoor air concentration or volatilization criteria for each substance calculated in accordance with section 22a-134tt-App8~~Appendix G~~ of the RBCRs~~SRs~~;

(ii) The laboratory reporting limit for each substance;

(iii) A description of the odor threshold of each substance; and

(iv) Any information about the health effects each substance may cause due to exposure not accounted for in the proposed risk-based volatilization criteria.

(B) Such volatilization criteria shall ensure that such target indoor air concentrations will not be exceeded above the polluted groundwater.

(C) The commissioner may approve or deny in writing a request made under subparagraph (A) of this subdivision. No request shall be approved unless it is demonstrated to the commissioner's satisfaction that the requirements of this subdivision have been satisfied and that the proposed volatilization criteria will be protective of human health and the environment.

(D) Unless prohibited in writing by the commissioner, criteria approved by the commissioner pursuant to subparagraph (C) of this subdivision, may be the subject of a request for alternative criteria under section 22a-134tt~~3k~~-10~~3~~(c)(4) of the RBCRs~~SRs~~.

22a-134tt~~3k~~-~~3~~10(j) Additional Remediation of Groundwater

Nothing in the RBCRs~~SRs~~ shall preclude the commissioner from taking any action necessary to prevent or abate pollution, or to prevent or abate any threat to human health or the environment. If the presence of any substance impairs the aesthetic quality of any groundwater which is or can reasonably be expected to be a source of water for drinking or other uses, additional remediation shall be conducted in order to reduce the concentration of such substance to a concentration appropriate for such use.

22a-134tt-11 – Certification and Verification

(a) Release records requiring Certification or Verification

(1) An LEP shall render a verification for each of the following release records:

(A) An immediate action report, provided such report is generated as the result of an immediate action required by section 22a-134tt-5 of the RBCRs to be verified by an LEP;

(B) A tier assignment, prepared pursuant to section 22a-134tt-6(c) of the RBCRs;

(C) A change in tier assignment, prepared pursuant to section 22a-134tt-6(c) of the RBCRs; and

(D) A release remediation closure report, prepared pursuant to section 22a-134tt-12 of the RBCRs, except that a release closure report that relies only upon section 22a-134tt-8 of the RBCRs shall not require verification by an LEP.

(2) A PEP shall provide a certification or an LEP may render a verification for each of the following release records:

(A) An immediate action report, provided such report is generated as the result of an immediate action that may be certified as complete by a PEP pursuant to section 22a-134tt-5(g) of the RBCRs; and

(B) A release remediation closure report, prepared pursuant to section 22a-134tt-12 of the Regulations of Connecticut State Agencies, provided that such release is remediated pursuant to section 22a-134tt-8 of the RBCRs.

(b) Form of Certification or Verification.

(1) An LEP shall verify a release record by:

(A) Signing or electronically signing the release record;

(B) Affixing the LEP's seal to the release record, either physically or electronically; and

(C) Providing any other information specified on the form prescribed by the commissioner for such release record which shall include, but may not be limited to, the LEP's name, business address, telephone number and electronic mail address.

(2) A PEP shall certify a release record by:

(A) Signing or electronically signing the release record;

(B) Providing the number and expiration date of the permit issued pursuant to section 22a-454 of the Connecticut General Statutes to the PEP or under which the named PEP is permitted; and

(C) Providing any other information specified on the form prescribed by the commissioner for such release record which shall include, but may not be limited to, the PEP's name, business address, telephone number and electronic mail address.

22a-134tt-12 – Release Remediation Closure Report

A release to the land and waters of the state shall be remediated to the applicable standards identified in the cleanup standards sections. Upon achieving such standard, a release remediation closure report that complies with the requirements of this section shall be prepared using a form prescribed by the commissioner, and shall be submitted to the commissioner if submission is required pursuant to subsection (c) of this section. A release remediation closure report shall:

(1) Include the following information:

(A) The name, mailing address, electronic mail address, and telephone number of each creator or maintainer of the release;

(B) The location of the release, including the property address and geographic information system coordinates;

(C) The date on which the release was discovered;

(D) The date on which the release was reported to the commissioner, if the reporting of such release was required by regulations adopted pursuant to section 22a-134tt or 22a-450 of the Connecticut General Statutes;

(E) The date on which the first tier assignment for such release was submitted to the commissioner, if such an assignment was required by section 22a-134tt-6 of the RBCRs; and

(F) Any other information specified by the form prescribed by the commissioner, including, but not limited to, any release records or supporting documentation required to be prepared by the RBCRs.

(2) Be verified by an LEP or, if authorized by sections 22a-134tt-7 and 22a-134tt-8(a)(2) of the RBCRs, certified by a PEP, pursuant to section 22a-134tt-8(b) of the RBCRs;

(3) Be submitted to the commissioner if:

(A) The release is an emergent reportable release; or

(B) The release was required to be reported to the commissioner pursuant to section 22a-134tt-3 of the RBCRs;

(4) Be retained by the person who created or maintained such release for not less than 10 years, and, if not submitted previously to the commissioner, be submitted to the commissioner not more than 30 days following a request in writing for submission; and

(5) Unless rejected by the department pursuant to section 22a-134tt-13 of the RBCRs, a release remediation closure report prepared pursuant to this section shall indicate that a release has been

remediated to the standards specified by Chapter 445b of the Connecticut General Statutes and that, if the land and waters of the state impacted by such release remains in the condition and subject to the controls specified by the release remediation closure report, no further action regarding such release shall be required.

(6) Notwithstanding the requirements of this section, and section 22a-134tt-11 of the RBCRs, the commissioner may, in the commissioner's sole discretion, issue a release remediation closure report if the commissioner determines that such release has achieved the standards specified in the cleanup standards sections. A release remediation closure report issued by the commissioner shall have the same force and effect as a release remediation closure report certified by a PEP or verified by an LEP.

22a-134tt-13 – Audits

(a) Audit of Release Records

(1) The commissioner may conduct an audit of any release record verified by an LEP or certified by a PEP to determine compliance with Chapter 445b of the Connecticut General Statutes and the RBCRs. Such audit may be a screening audit, a focused audit, or a full audit. If no audit is conducted, no notification will be provided.

(2) For the purposes of this section:

(A) a release record shall be in compliance if it satisfies each relevant requirement of Chapter 445b of the Connecticut General Statutes and RBCRs;

(B) "screening audit" means the administrative review of records by the commissioner in the manner specified by subsection (b) of this section;

(C) "focused audit" means the review of 1 release record by the commissioner, including requesting additional supporting information regarding the remediation of a release in the manner specified by subsection (c) of this section; and

(D) "full audit" means the thorough review of many or all release records associated with a release initiated after submission of a release remediation closure report, including requesting additional supporting information regarding the remediation of a release in the manner specified by subsection (d) of this section.

(b) Screening Audit

(1) The commissioner may conduct a screening audit of any release record verified by an LEP or certified by a PEP. Except as provided herein, a screening audit shall result in an outcome specified by subparagraph (B) of this subdivision not more than 180 days after submission. A screening audit:

(A) May be commenced and conducted without notice to person who verified or certified the release record or the person who created or maintained the release that is the subject of such release record, provided the commissioner may, in their sole discretion, notify any such person at any time;

(B) May review and assess a release record in its entirety, or any part thereof, to determine compliance. The commissioner's review may result in one of the following outcomes:

(i) Acceptance of the release record;

(ii) Rejection of the release record, if the commissioner determines the release record is not in compliance; or

(iii) If additional information is necessary to determine whether the release record is in compliance, commencement of a focused audit or full audit, pursuant to subsections (c) and (d) of this subsection.

(2) If the commissioner determines a release record is not in compliance, the commissioner shall:

(A) Reject the release record, and shall Notify the person who verified or certified the release record and the person who created or maintained the release in writing;

(B) Retain any fee associated with the release record; and

(C) Require submission of a new release record that is in compliance, and may set a deadline for the submission of such record, provided that any deadline set pursuant to this subparagraph shall not extend the deadline for any fee associated with the release.

(3) If additional information is required to determine whether a release record is in compliance, the commissioner shall notify the person who verified or certified the release record and the person who created or maintained the release in writing and shall commence a focused audit or full audit. A notice of audit, sent pursuant to subsection (e)(2) of this section, shall satisfy the requirements of this subdivision.

(c) Focused Audit

(1) The commissioner may conduct a focused audit of any release record. Except as provided herein, a notice of audit commencing a focused audit shall be sent not more than 180 days after submission of a release record, and such focused audit shall result in an outcome specified by subparagraph (D) of this subdivision not more than 18 months after submission of such release record. A focused audit may be commenced without conducting a screening audit. A focused audit:

(A) Shall be commenced by providing a notice of audit to the person who verified or certified the release record and the person who created or maintained the release that is the subject of such record. Such notice shall:

(i) State the reason for such focused audit, which may include but shall not be limited to, an issue identified during a screening audit or the random selection of a release record; and

(ii) Specify additional information necessary for the commissioner to determine if the release record is in compliance, and the date by which such information shall be submitted;

(B) May evaluate a release record in its entirety, may be limited only to specific issues identified in a screening audit, or may be limited to specific issues selected by the Commissioner in their sole discretion for random audits;

(C) If, at any time after commencing a focused audit, the commissioner determines additional information is necessary to complete the audit, which may include, but shall not be limited to, responses to technical questions on the approach used to remediate of the release, the commissioner shall request such information in writing, and specify a deadline for the submission of such information. If the requested information is not provided in the time

required, the commissioner may determine the release record is not in compliance and reject the release record.

(D) Shall result in one of the following outcomes:

(i) Acceptance of the release record;

(ii) Rejection of the release record; or

(iii) Commencement of a full audit conducted pursuant to subsection (d) of this section, if a release remediation closure report has been submitted for such release.

(2) If the commissioner determines a release record is not in compliance, the commissioner:

(A) Shall reject the release record, and shall notify the person who verified or certified the release record and the person who created or maintained the release in writing of the reasons for such rejection;

(B) Shall retain any fee associated with the release record;

(C) Shall require submission of a new release record that is in compliance, and may set a deadline for the submission of such record, provided that any deadlier set pursuant to this subparagraph shall not extend the deadline for any fee associated with the release; and
(D) May, in addition to rejecting the release record pursuant to this subdivision, commence a full audit of each release record associated with the release by providing a notice of audit pursuant to subsection (d) of this section.

(d) Full Audit

(1) Not more than 180 days following the submission of a release remediation closure report, or, if a focused audit has been initiated pursuant to subsection (c)(1)(A) of this section, at any time before such focused audit reaches an outcome specified in subsection (c)(1)(D) of this section, the commissioner may a commence a full audit of the remediation of such release by providing a written notice of audit. A full audit may be commenced without conducting a screening audit or focused audit. A full audit:

(A) Shall be commenced by providing a notice of audit to the person who verified or certified the release remediation closure report and the person who created or maintained the release that is the subject of such release remediation closure report. Such notice shall:

(i) State the reason for the full audit, which may include but shall not be limited to, an issue identified during a screening audit, focused audit, or the random selection of a release record; and

(ii) Specify additional information necessary to determine if each record associated with the release is in compliance and the date by which such information shall be submitted;

(B) May evaluate a release record in its entirety, may be limited only to specific issues

identified in a screening audit, or may be limited to specific issues selected by the Commissioner in their sole discretion for random audits;

(C) If, at any time after commencing a full audit, the commissioner determines additional information is necessary to complete the audit, which may include, but shall not be limited to, responses to technical questions on the approach to remediation of the release, the commissioner shall request such information in writing, and specify a deadline for the submission of such information. If the requested information is not provided in the time required, the commissioner may determine that the remediation is not in compliance and reject one or more release records associated with such release.

(D) (i) Shall result in one of the following outcomes:

(I) Acceptance of the release remediation closure report; or

(II) Rejection of one or more release records associated with the release.

(ii) If the commissioner rejects one or more release records regarding the remediation of the release, the commissioner shall specify the reasons for such rejection in writing and shall retain any fee associated with such release record. Upon rejection of any release record associated with a release, a new release remediation closure report shall be required to be submitted, in addition to the submission of any other record rejected by the commissioner. The commissioner may specify a timeline for the submission of additional release records and supporting information, including a new release remediation closure report. All provisions of the RBCRs shall remain in full force and effect until such time as all required release records regarding the remediation of such release, including a new release remediation closure report, have been accepted by the commissioner.

(e) Reopened Verifications and Certifications

(1) Notwithstanding any provision of this section, at any time following the submission of a release record verified by an LEP or certified by a PEP, the commissioner may commence a focused or full audit when:

(A) the commissioner has reason to believe that a verification or certification was obtained through the submittal of materially inaccurate or erroneous information, or otherwise misleading information material to the verification, or that misrepresentations were made in connection with the submittal of the verification;

(B) a verification is submitted pursuant to an order of the commissioner, in accordance with section 22a-134ss of the Connecticut General Statutes;

(C) any post-verification monitoring, or operations and maintenance, is required as part of a verification and which has not been completed;

(D) a verification relies upon an environmental land use restriction, and such environmental land use restriction was not recorded on the land records of the

municipality in which such land is located, in accordance with section 22a-133o of the Connecticut General Statutes and applicable regulations;

(E) the commissioner determines that there has been a violation of the provisions of sections 22a-134qq to 22a-134tt, inclusive, of the Connecticut General Statutes; or

(F) the commissioner determines that information exists indicating that the remediation may have failed to prevent a substantial threat to public health or the environment.

(2) Such focused audit or full audit shall be commenced by providing the notice specified in subsections (c)(1) and (d)(1) of this section, which shall also include a statement of the reasons for reopening such verification. A focused or full audit conducted pursuant to this subsection shall follow the procedures set out in subsection (c) and (d) of this section, except that such audit shall not be required to reach an outcome in the time specified in subsections (c)(1)(D) and (d)(1)(D)(i) of this section.

(f) Verification Necessary After Rejection

If a release remediation closure report certified by a PEP is rejected, the commissioner may determine whether such release remains eligible for certification by a PEP.

(g) Frequency of Audits

(1) The commissioner shall have a goal of conducting an audit of:

(A) 10 percent of the releases assigned to tier 1A at the time that such release was initially assigned to a tier;

(B) 20 percent of the releases assigned to tier 1B at the time that such release was initially assigned to a tier;

(C) 10 percent of the releases assigned to tier 2 at the time that such release was initially assigned to a tier; and

(D) 5 percent of the releases assigned to tier 3 at the time that such release was initially assigned to a tier.

(2) For the purposes of subdivision (1) of this subsection, such audit:

(A) Shall be conducted using the procedures specified in this section;

(B) May be a full audit of all release records associated with such release or a screening or focused audit of one or more release records associated with such release; and

(C) May be conducted after the submission of a release remediation closure report, or may be conducted at any time following the submission of a certified or verified release record regarding such release.

TIER CHECKLIST

Please fill out this form from the beginning each time tiering is conducted. If this is a re-tiering, please include a copy of the last submitted Tier Checklist. If the release complies with the cleanup standards, tiering may not be necessary, and closure documentation should be submitted. Refer to the Tiering Checklist Instructions for more information on how to fill out and submit this form properly. The address in the headers will automatically update upon printing or print-previewing.

DEEP Use Only	Date Received: Record #: Release ID #: Release ID #	

Part I: General Information

Parcel Name (current or former name)
Parcel Name

Parcel Street Address
Parcel Address

City/ Town
City/Town

State
CT

ZIP
00000

This property is described in the land records of:

Tax Assessor Town
Tax Assessor Town

Lot/Parcel ID
Lot/Parcel

Block
Block

Map
Map

Licensed Environmental Professional (LEP)

Name
Name

Company
Company Name

Address
Address

City/Town
City/Town

State
State

Zip
00000

Creator / Maintainer

Name of Signatory for Creator / Maintainer
Name

Creator / Maintainer
Creator/Maintainer

Address
Address

City/Town
City/Town

State
State

Zip
00000

Phone	Phone
Phone	Phone
E-mail	E-mail
E-mail	E-mail

Part II: Verification Information

This tier assignment verification pertains to the following release:

Release ID #	Date of Discovery	Release Area Designation
Release ID #	mm/dd/yyyy	Release Area Name

Tier Assignment ☐ **1A** ☐ **1B** ☐ **2** ☐ **3**

☐ This is an Initial Tier Assignment ☐ This is a Tier Reassignment

Previous Tier Assignment: ☐ 1A ☐ 1B ☐ 2

LEP Verification

"I verify in accordance with §22a-134tt-11(a)(1) and §22a-133v-1(z) of the Regulations of Connecticut State Agencies (RCSA), that this Tier Assignment has been prepared pursuant to 22a-134tt-6(c) of the RCSA."

Creator / Maintainer Signature

"In accordance with § 22a-134tt-6 of the Regulations of Connecticut State Agencies, I submit this Tier Checklist that has been verified and sealed by a licensed environmental professional (LEP), and the attached documentation, which has been approved in writing by an LEP."

LEP Signature	Creator / Maintainer Authorized Signature
LEP Printed/Typed Name: Name	Creator / Maintainer Authorized Signatory Printed/Typed Name: Name
Date of LEP Signature	Date of Creator / Maintainer Signature
LEP Seal	LEP License #: Number

Part III: Tier Determination

Tier 1A

Answer the following questions. Any box checked in the Tier 1A Indicator column at right designates the release as Tier 1A.

			Tier 1A Indicator
1. Receptors are known and documented			
1a. A scoping level ecological risk assessment has been completed.	☐ Yes		☐ No
1b. A drinking water receptor survey has been completed.	☐ Yes		☐ No
1c. A vapor intrusion receptor survey has been completed.	☐ Yes		☐ No
2. Does/did the release require Immediate Action under RCSA § 22a-134tt-5?	☐ No *(Skip to line 3)* ☐ Yes *(Proceed to 2a)*		
2a. Immediate Action requirements have been met		☐ Yes	☐ No
3. Tier characterization is complete.	☐ Yes		☐ No

If any boxes in this column are checked, stop here. This release is Tier 1A. Otherwise proceed to Tier 1B determination.

Tier 1B

If any of the Tier 1A indicators above are checked, do not proceed with Tier 1B determination.

Answer the following questions. Any box checked in the Tier 1B Indicator column at right designates the release as Tier 1B.

		Tier 1B Indicator
1. Groundwater has been impacted by the release.	☐ No *(Skip to line 2)* ☐ Yes *(Proceed to 1a)*	
1a. Groundwater plume migrates off the source parcel.	☐ No *(skip to line 2)* ☐ Yes *(proceed to 1b)*	
1b. Off-site groundwater plume exceeds applicable groundwater criteria.	☐ No	☐ Yes
2. The scoping level ecological risk assessment identified potential exposure pathways.	☐ No *(skip to line 3)* ☐ Yes *(proceed to 2a)*	
2a. A screening level ecological risk assessment has been completed.	☐ Yes	☐ No
3. For releases that include volatile organic substances, a vapor intrusion pathway is present.	☐ No *(skip to line 4)* ☐ Yes *(Proceed to 3a)*	
3a. Groundwater complies with volatilization criteria provisions in RCSA § 22a-134tt-10(c) .	☐ Yes	☐ No
4. A drinking water receptor pathway is present.	☐ No *(skip to line 5)* ☐ Yes *(Proceed to 4a)*	
4a. Groundwater complies with GWPC provisions RCSA § 22a-134tt-10(d).	☐ Yes	☐ No
5. A Remedial Action Plan has been prepared.	☐ Yes	☐ No

If any boxes in this column are checked, stop here. This release is Tier 1B. Otherwise proceed to Tier 2 determination.

Tier 2

If any of the Tier 1A or 1B indicators above are checked, do not proceed with Tier 2 determination.

Answer the following questions. Any box checked in the Tier 2 Indicator column at right designates the release as Tier 2.

		Tier 2 Indicator
1. All potential receptor pathways have been eliminated or investigations demonstrated that there are no receptor pathways (note: if vapor intrusion or drinking water pathways have not been eliminated, the release must be Tier 1B per question 3 under Tier 1B).	☐ Yes	☐ No
2. A scoping or screening level ecological risk assessment identified the need for a site-specific ecological risk assessment	☐ No *(Skip to line 3)* ☐ Yes *(Proceed to 2a)*	
2a. A site-specific ecological risk assessment has been completed and ecological risk has been addressed.	☐ Yes	☐ No
3. Soil remediation is/was required.	☐ No *(Skip to line 4)* ☐ Yes *(Proceed to 3a)*	
3a. Soil impacted by the release complies with the soil standards (including recording necessary EURs).	☐ Yes	☐ No
4. Groundwater complies with the groundwater standards (including completion of any applicable groundwater compliance monitoring).	☐ Yes * ☐ No *(Proceed to 4a)*	
4a. The only groundwater remediation remaining is MNA. Information required by RCSA § 22a-134tt-6(c)(3) has been submitted.	☐ Yes	☐ No

If any boxes in this column are checked, stop here. This release is Tier 2. Otherwise proceed to Tier 3 determination.

*If the release complies with the cleanup standards, tiering may not be necessary.

Tier 3

If any of the Tier 1A, 1B, or 2 indicators above are checked, do not proceed with Tier 3 determination.

Answer the following questions. Any box checked in the Tier 3 Indicator column at right designates the release as Tier 3.		**Tier 3 Indicator**
MNA is being conducted in accordance with RCSA § 22a-134tt-10(h)	☐ No *	☐ Yes

If any boxes in this column are checked, this release is Tier 3.

*If the release complies with the cleanup standards, tiering may not be necessary.

Part IV: Attachments

Check all that apply and attach appropriate documentation to this form:

☐ Attachment A – Previous Tier Checklist (if this is a re-tiering)

☐ Attachment B – Supporting Documentation (see RCSA § 22a-134tt-6(c)

Appendix 2A to the ~~RSRs~~ RBCRs

Direct Exposure Criteria for Soil

Substance	Residential DEC in mg/kg (ppm)	Industrial/ Commercial DEC in mg/kg (ppm)
Volatile Organic Substances		
Acetone	500	1,000
Acrylonitrile	1.1	11
Benzene	21	200
Bromoform	78	720
2-Butanone(MEK)	500	1,000
Carbon tetrachloride	4.7	44
Chlorobenzene	500	1,000
Chloroform	100	940
Dibromochloromethane	7.3	68
1,2-Dichlorobenzene	500	1,000
1,3-Dichlorobenzene	500	1,000
1,4-Dichlorobenzene	26	240
1,1-Dichloroethane	500	1,000
1,2-Dichloroethane	6.7	63
1,1-Dichloroethylene	1	9.5
cis-1,2-Dichloroethylene	500	1,000
trans-1,2-Dichloroethylene	500	1,000
1,2-Dichloropropane	9	84
1,3-Dichloropropene	3.4	32
Ethylbenzene	500	1,000

Substance	Residential DEC in mg/kg (ppm)	Industrial/ Commercial DEC in mg/kg (ppm)
Volatile Organic Substances		
Ethylene dibromide (EDB)	0.007	0.067

Substance	Residential DEC in mg/kg (ppm)	Industrial/ Commercial DEC in mg/kg (ppm)
Volatile Organic Substances		
Methyl-tert-butyl-ether	500	1,000
Methyl isobutyl ketone	500	1,000
Methylene chloride	82	760
Styrene	500	1,000
1,1,1,2-Tetrachloroethane	24	220
1,1,2,2-Tetrachloroethane	3.1	29
Tetrachloroethylene	12	110
Toluene	500	1,000
1,1,1-Trichloroethane	500	1,000
1,1,2-Trichloroethane	11	100
Trichloroethylene	56	520
Vinyl chloride	0.32	3
Xylenes	500	1,000

Substance	Residential DEC in mg/kg (ppm)	Industrial/ Commercial DEC in mg/kg (ppm)
Semi-volatile Organic Substances		
Acenaphthylene	1,000	2,500
Anthracene	1,000	2,500
Benzo(a)anthracene	1	7.8
Benzo(b)fluoranthene	1	7.8
Benzo(k)fluoranthene	8.4	78
Benzo(a)pyrene	1	1
Bis(2-chloroethyl)ether	1	5.2
Bis(2-chloroisopropyl)ether	8.8	82
Bis(2-ethyl hexyl)phthalate	44	410
Butyl benzyl phthalate	1,000	2,500
2-chlorophenol	340	2,500
Di-n-butyl phthalate	1,000	2,500
Di-n-octyl phthalate	1,000	2,500
2,4-Dichlorophenol	200	2,500
Fluoranthene	1,000	2,500
Fluorene	1,000	2,500
Hexachloroethane	44	410
Hexachlorobenzene	1	3.6
Naphthalene	1,000	2,500
Pentachlorophenol	5.1	48
Phenanthrene	1,000	2,500
Phenol	1,000	2,500

Pyrene	1,000	2,500
Substance	**Residential DEC in mg/kg (ppm)**	**Industrial/ Commercial DEC in mg/kg (ppm)**
Inorganic Substances		
Antimony	27	8,200
Arsenic	10	10
Barium	4,700	140,000
Beryllium	2	2
Cadmium	34	1,000
Chromium, trivalent	3,900	51,000
Chromium, hexavalent	100	100
Copper	2,500	76,000
Cyanide	1,400	41,000
Lead	400	1,000
Mercury	20	610
Nickel	1,400	7,500
Selenium	340	10,000
Silver	340	10,000
Thallium	5.4	160
Vanadium	470	14,000
Zinc	20,000	610,000

Substance	Residential DEC in mg/kg (ppm)	Industrial/ Commercial DEC in mg/kg (ppm)
Pesticides, PCBs and Extractable Total Petroleum Hydrocarbons		
Alachlor	7.7	72
Aldicarb	14	410
Atrazine	2.8	26
Chlordane	0.49	2.2
Dieldrin	0.038	0.36
Endrin	20	610
2-4 D	680	20,000
Heptachlor epoxide	0.067	0.63
Heptachlor	0.14	1.3
Lindane	20	610
Methoxychlor	340	10,000
Toxaphene	0.56	5.2
PCBs (The use of the Industrial/Commercial DEC requires the parcel to be used pursuant to section ~~22a-133k-2(b)(4)~~ 22a-134tt-9(b)(4), and in accordance with title 40 CFR Part 761)	1	10
TPH- Total Petroleum Hydrocarbons by EPA Method 418.1 (This method shall not be used for the analysis of samples collected after June 30, 2009)	500	2,500
Extractable Total Petroleum Hydrocarbons by CT ETPH Analysis (This method may be used for the analysis of samples collected on or after June 22, 1999)	500	2,500

Appendix 3B to the ~~RSRs~~ RBCRs

Pollutant Mobility Criteria for Soil

Substance	GA Area PMC in mg/kg (ppm)	GB Area PMC in mg/kg (ppm)
Volatile Organic Substances		
Acetone	14	140
Acrylonitrile	0.01	0.1
Benzene	0.02	0.2
Bromoform	0.08	0.8
2-Butanone(MEK)	8	80
Carbon tetrachloride	0.1	1
Chlorobenzene	2	20
Chloroform	0.12	1.2
Dibromochloromethane	0.01	0.1
1,2-Dichlorobenzene	3.1	3.1
1,3-Dichlorobenzene	12	120
1,4-Dichlorobenzene	1.5	15
1,1-Dichloroethane	1.4	14
1,2-Dichloroethane	0.02	0.2
1,1-Dichloroethylene	0.14	1.4
cis-1,2-Dichloroethylene	1.4	14
trans-1,2-Dichloroethylene	2	20
1,2-Dichloropropane	0.1	1.0
1,3-Dichloropropene	0.01	0.1
Ethyl benzene	10.1	10.1
Ethylene dibromide (EDB)	0.01	0.1

Substance	GA Area PMC in mg/kg (ppm)	GB Area PMC in mg/kg (ppm)
Volatile Organic Substances		
Methyl-tert-butyl-ether	2	20
Methyl isobutyl ketone	7	14
Methylene chloride	0.1	1.0
Styrene	2	20
1,1,1,2-Tetrachloroethane	0.02	0.2
1,1,2,2-Tetrachloroethane	0.01	0.1
Tetrachloroethylene	0.1	1
Toluene	20	67
1,1,1-Trichloroethane	4	40
1,1,2-Trichloroethane	0.1	1
Trichloroethylene	0.1	1.0
Vinyl chloride	0.04	0.40
Xylenes	19.5	19.5

Substance	GA Area PMC in mg/kg (ppm)	GB Area PMC in mg/kg (ppm)
Semi-volatile Organic Substances		
Acenaphthylene	8.4	84
Anthracene	40	400
Benzo(a)anthracene	1	1
Benzo(b)fluoranthene	1	1
Benzo(k)fluoranthene	1	1
Benzo(a)pyrene	1	1
Bis(2-chloroethyl)ether	1	2.4
Bis(2-chloroisopropyl)ether	1	2.4
Bis(2-ethyl hexyl)phthalate	1	11
Butyl benzyl phthalate	20	200
2-chlorophenol	1	7.2
Di-n-butyl phthalate	14	140
Di-n-octyl phthalate	2	20
2,4-Dichlorophenol	1	4
Fluoranthene	5.6	56
Fluorene	5.6	56
Hexachloroethane	1	1
Hexachlorobenzene	1	1
Naphthalene	5.6	56
Pentachlorophenol	1	1
Phenanthrene	4	40
Phenol	80	800
Pyrene	4	40

Substance	GA Area PMC in mg/kg (ppm)	GB Area PMC in mg/kg (ppm)
Pesticides and Extractable Total Petroleum Hydrocarbons		
Alachlor	0.230	0.4
Aldicarb	1	1
Atrazine	0.2	0.2
Chlordane	0.066	0.066
Dieldrin	0.007	0.007
2-4 D	1.4	14
Heptachlor epoxide	0.02	0.02
Heptachlor	0.013	0.013
Lindane	0.02	0.04
Methoxychlor	0.8	8
Simazine	0.8	8
Toxaphene	0.33	0.6
Total Petroleum Hydrocarbon by EPA Method 418.1 (This method shall not be used for the analysis of samples collected after June 30, 2009)	500	2,500
Extractable Total Petroleum Hydrocarbons by CT ETPH Analysis (This method may be used for the analysis of samples collected on or after June 22, 1999)	500	2,500

Substances	GA Area PMC by TCLP or by SPLP in mg/L (ppm)	GB Area PMC by TCLP or by SPLP in mg/L (ppm)
Inorganic Substances and PCBs		
Antimony	0.006	0.06
Arsenic	0.05	0.5
Barium	1	10.0
Beryllium	0.004	0.04
Cadmium	0.005	0.05
Chromium, total	0.05	0.5
Copper	1.3	13
Cyanide (by SPLP only)	0.2	2
Lead	0.015	0.15
Mercury	0.002	0.02
Nickel	0.1	1.0
Selenium	0.05	0.5
Silver	0.036	0.36
Thallium	0.005	0.05
Vanadium	0.05	0.50
Zinc	5	50
PCBs	0.0005	0.005

Appendix 4C to the ~~RSRs~~ RBCRs

Groundwater Protection Criteria

Substance	GWPC in µg/L (ppb)
Volatile Organic Substances	
Acetone	700
Acrylonitrile	0.5
Benzene	1
Bromoform	4
2-Butanone (MEK)	400
Carbon tetrachloride	5
Chlorobenzene	100
Chloroform	6
Dibromochloromethane	0.5
1,2-Dichlorobenzene	600
1,3-Dichlorobenzene	600
1,4-Dichlorobenzene	75
1,1-Dichloroethane	70
1,2-Dichloroethane	1
1,1-Dichloroethylene	7
cis-1,2-Dichloroethylene	70
trans-1,2-Dichloroethylene	100
1,2-Dichloropropane	5
1,3-Dichloropropene	0.5
Ethyl benzene	700
Ethylene dibromide (EDB)	0.05
Methyl-tert-butyl-ether	100

Substance	GWPC in µg/L (ppb)
Volatile Organic Substances	
Methyl isobutyl ketone	350
Methylene chloride	5
Styrene	100
1,1,1,2-Tetrachloroethane	1
1,1,2,2-Tetrachloroethane	0.5
Tetrachloroethylene	5
Toluene	1,000
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	5
Trichloroethylene	5
Vinyl chloride	2
Xylenes	530

Substance	GWPC in µg/L (ppb)
Semi-volatile Organic Substances	
Acenaphthylene	420
Anthracene	2,000
Benzo(a)anthracene	0.06
Benzo(b)fluoranthene	0.08
Benzo(k)fluoranthene	0.5
Benzo(a)pyrene	0.2
Bis(2-chloroethyl)ether	12
Bis(2-chloroisopropyl)ether	12
Bis(2-ethyl hexyl)phthalate	2
Butyl benzyl phthalate	1,000
2-chlorophenol	36
Di-n-butyl phthalate	700
Di-n-octyl phthalate	100
2,4-Dichlorophenol	20
Fluoranthene	280
Fluorene	280
Hexachloroethane	3
Hexachlorobenzene	1
Naphthalene	280
Pentachlorophenol	1
Phenanthrene	200
Phenol	4,000
Pyrene	200

Substance	GWPC in µg/L (ppb)
Inorganic Substances	
Antimony	6
Arsenic	50
Asbestos (in mfl)	7
Barium	1,000
Beryllium	4
Cadmium	5
Chromium (total)	50
Copper	1,300
Cyanide	200
Lead	15
Mercury	2
Nickel	100
Selenium	50
Silver	36
Thallium	5
Vanadium	50
Zinc	5,000

Substance	GWPC in µg/L (ppb)
Pesticides, PCBs and Extractable Total Petroleum Hydrocarbons	
Alachlor	2
Aldicarb	3
Atrazine	3
Chlordane	0.3
Dieldrin	0.002
2-4 D	70
Heptachlor epoxide	0.2
Heptachlor	0.4
Lindane	0.2
Methoxychlor	40
Simazine	4
Toxaphene	3
[PCB's]PCBs	0.5
Total Petroleum Hydrocarbon by EPA Method 418.1 (This method shall not be used for the analysis of samples collected after June 30, 2009)	500
Extractable Total Petroleum Hydrocarbons by CT ETPH Analysis (This method may be used for the analysis of samples collected on or after June 22, 1999)	250

Appendix 5D to the ~~RSRs~~ RBCRs

Surface Water Protection Criteria

for Substances in Groundwater

Substance	SWPC in µg/L (ppb)
Volatile Organic Substances	
Acrylonitrile	20
Benzene	710
Bromoform	10,800
Carbon tetrachloride	132
Chlorobenzene	420,000
Chloroform	14,100
Dibromochloromethane	1,020
1,2-Dichlorobenzene	170,000
1,3-Dichlorobenzene	26,000
1,4-Dichlorobenzene	26,000
1,2-Dichloroethane	2,970
1,1-Dichloroethylene	96
1,3-Dichloropropene	34,000
Ethylbenzene	580,000
Methylene chloride	48,000
1,1,2,2-Tetrachloroethane	110
Tetrachloroethylene	88
Toluene	4,000,000
1,1,1-Trichloroethane	62,000
1,1,2-Trichloroethane	1,260
Trichloroethylene	2,340
Vinyl chloride	15,750

Substance	SWPC in µg/L (ppb)
Semi-volatile Organic Substances	
Acenaphthylene	0.3
Anthracene	1,100,000
Benzo(a)anthracene	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Bis(2-chloroethyl)ether	42
Bis(2-chloroisopropyl)ether	3,400,000
Bis(2-ethyl hexyl)phthalate	59
Di-n-butyl phthalate	120,000
2,4-Dichlorophenol	15,800
Fluoranthene	3,700
Fluorene	140,000
Hexachloroethane	89
Hexachlorobenzene	0.077
Phenanthrene	14
Phenol	~~9,200,0000~~ 92,000,000
Pyrene	110,000

Substance	SWPC in µg/L (ppb)
Inorganic Substances	
Antimony	86,000
Arsenic	4
Asbestos (in mfl)	7
Beryllium	4
Cadmium	6
Chromium, trivalent	1,200
Chromium, hexavalent	110
Copper	48
Cyanide	52
Lead	13
Mercury	0.4
Nickel	880
Selenium	50
Silver	12
Thallium	63
Zinc	123

Substance	SWPC in µg/L (ppb)
Pesticides and PCBs	
Chlordane	0.3
Dieldrin	0.1
Endrin	0.1
Heptachlor epoxide	0.05
Heptachlor	0.05
Toxaphene	1
PCBs	0.5

Appendix 6E to the ~~RSRs~~ RBCRs

Volatilization Criteria for Groundwater

Volatile Substance	Residential Volatilization Criteria for Groundwater in µg/L (ppb)	Industrial/Commercial Volatilization Criteria for Groundwater in µg/L (ppb)
Acetone	50,000	50000
Benzene	215	530
Bromoform	75	2,300
2-Butanone (MEK)	50,000	50,000
Carbon Tetrachloride	5.3	14
Chlorobenzene	1,800	23,000
Chloroform	26	62
1,2-Dichlorobenzene	5,100	50,000
1,3-Dichlorobenzene	4,300	50,000
1,4-Dichlorobenzene	1,400	3,400
1,1-Dichloroethane	3,000	41,000
1,2-Dichloroethane	6.5	68
1,1-Dichloroethylene	190	920
1,2-Dichloropropane	7.4	58
1,3-Dichloropropene	11	360
Ethyl benzene	50,000	50,000
Ethylene dibromide (EDB)	0.30	11
Methyl-tert-butyl-ether	50,000	50,000
Methyl isobutyl ketone	13,000	50,000
Methylene chloride	160	2,200
Styrene	3,100	42,000

Volatile Substance	Residential Volatilization Criteria for Groundwater in µg/L (ppb)	Industrial/Commercial Volatilization Criteria for Groundwater in µg/L (ppb)
1,1,1,2-Tetrachloroethane	2	64
1,1,2,2-Tetrachloroethane	1.8	54
Tetrachloroethylene	340	810
Toluene	23,500	50,000
1,1,1-Trichloroethane	~~650~~ 6,500	16,000
1,1,2-Trichloroethane	220	2,900
Trichloroethylene	27	67
Vinyl chloride	1.6	52
Xylenes	21,300	50,000

Appendix 7~~F~~ to the ~~RSRs~~ RBCRs

Volatilization Criteria for Soil Vapor

Volatile Substance	Residential Volatilization Criteria for Soil Vapor in parts per million by volume (ppmv)	Residential Volatilization Criteria for Soil Vapor in milligrams per cubic meter (mg/m^3)	Industrial/ Commercial Volatilization Criteria for Soil Vapor in parts per million by volume (ppmv)	Industrial/ Commercial Volatilization Criteria for Soil Vapor in milligrams per cubic meter (mg/m^3)
Acetone	57	140	290	690
Benzene	0.78	2.5	1.4	4.6
Bromoform	0.04	0.42	0.98	10
2-Butanone (MEK)	130	376	230	690
Carbon Tetrachloride	0.06	0.38	0.12	0.75
Chlorobenzene	6.1	28	60	280
Chloroform	0.078	0.38	0.14	0.69
1,2-Dichlorobenzene	9.2	55	95	570
1,3-Dichlorobenzene	9.2	55	95	570
1,4-Dichlorobenzene	3	18	5.5	33
1,1-Dichloroethane	14	58	150	600
1,2-Dichloroethane	0.013	0.053	0.11	0.43
1,1-Dichloroethylene	1.9	7.6	7	28
1,2-Dichloropropane	0.021	0.098	0.13	0.58
1,3-Dichloropropene	0.035	0.16	0.89	4.0
Ethyl benzene	9.3	40	93	400
Ethylene dibromide (EDB)	0.0005	0.0056	0.007	0.053
Methyl-tert-butyl-ether	34	120	73	260

Volatile Substance	Residential Volatilization Criteria for Soil Vapor in parts per million by volume (ppmv)	Residential Volatilization Criteria for Soil Vapor in milligrams per cubic meter (mg/m^3)	Industrial/ Commercial Volatilization Criteria for Soil Vapor in parts per million by volume (ppmv)	Industrial/ Commercial Volatilization Criteria for Soil Vapor in milligrams per cubic meter (mg/m^3)
Methyl isobutyl ketone	6.8	28	68	280
Methylene chloride	0.65	2.3	6.8	24
Styrene	9.3	39	95	400
1,1,1,2-Tetrachloroethane	0.009	0.062	0.22	1.5
1,1,2,2- Tetrachloroethane	0.0012	0.0083	0.028	0.19
Tetrachloroethylene	0.56	3.8	1	6.9
Toluene	42	160	180	690
1,1,1-Trichloroethane	70	380	130	690
1,1,2-Trichloroethane	0.31	1.7	3.1	17
Trichloroethylene	0.14	0.76	0.26	1.4
Vinyl chloride	0.041	0.11	1	2.6
Xylenes	38	170	160	690

Appendix 8G to the ~~RSRs~~ RBCRs

Equations, Terms, and Values for Calculating Release-Specific Direct Exposure Criteria, Pollutant Mobility Criteria, Groundwater Protection Criteria, Surface Water Protection Criteria, and Volatilization Criteria, for Additional Polluting Substances and Alternative Volatilization Criteria.

(1) Direct Exposure Criteria ~~for Additional Polluting Substances~~

(A) Residential Direct Exposure Criteria shall be calculated using the following equations:

(i) For carcinogenic substances:

$$\mathrm{RDEC_{RB}} = \left(\frac{\mathrm{RL}}{\mathrm{CSF}}\right) \div \left[\left(\frac{\mathrm{IR_{child}} \times \mathrm{ED_{child}} \times \mathrm{EF} \times \mathrm{CF}}{\mathrm{BW_{child}} \times \mathrm{AT_c}}\right) + \left(\frac{\mathrm{IR_{adult}} \times \mathrm{ED_{adult}} \times \mathrm{EF} \times \mathrm{CF}}{\mathrm{BW_{adult}} \times \mathrm{AT_c}}\right)\right]$$

(ii) For non-carcinogenic substances:

$$\mathrm{RDEC_{RB}} = (\mathrm{RfD} \times \mathrm{HI}) \div \left[\left(\frac{\mathrm{IR_{child}} \times \mathrm{ED_{child}} \times \mathrm{EF} \times \mathrm{CF}}{\mathrm{BW_{child}} \times \mathrm{AT_{child}}}\right) + \left(\frac{\mathrm{IR_{adult}} \times \mathrm{ED_{adult}} \times \mathrm{EF} \times \mathrm{CF}}{\mathrm{BW_{adult}} \times \mathrm{AT_{adult}}}\right)\right]$$

(iii) The abbreviations in clauses (i) and (ii) of this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AT_c	Averaging Time – carcinogens	25,550	days
AT_{adult}	Averaging Time – adult non-carcinogen	8,760	days
AT_{child}	Averaging Time – child non-carcinogen	2,190	days
BW_{adult}	Body Weight – adult	70	kg
BW_{child}	Body Weight – child	15	kg
CF	Conversion Factor	0.000001	kg/mg
CSF	Cancer Slope Factor	Substance-specific	$(mg/kg\text{-}day)^{-1}$
$RDEC_{RB}$	Residential Risk-based Direct Exposure Criterion	calculated	mg/kg

Terms	Description	Value	Units
ED_{adult}	Exposure Duration – adult non-carcinogen	24	years
ED_{child}	Exposure Duration – child non-carcinogen	6	years
EF	Exposure Frequency	365	days/year
HI	Hazard Index	1.0	unitless
IR_{adult}	Ingestion Rate – adult	100	mg/day
IR_{child}	Ingestion Rate – child	200	mg/day
RfD	Reference Dose	Substance-specific	mg/kg-day
RL	Target Cancer Risk Level	1.0E-06	unitless

(iv) If the residential Direct Exposure Criteria calculated pursuant to this subparagraph exceeds the following ceiling values, the ceiling value shall be used in lieu of the calculated value:

Volatile Organic Substances	Semi-volatile Substances	Pesticides, PCBs and ETPH	Inorganic Substances	Units
500	1,000	500	50,000	mg/kg

(v) The residential direct exposure criteria may be adjusted up to the laboratory reporting limit if the commissioner determines that the calculated residential risk-based direct exposure criteria is less than the laboratory reporting limit for such substance.

(B) Industrial/commercial Direct Exposure Criteria shall be calculated using the following equations:

(i) For carcinogenic substances:

$$\text{I/C DEC}_{\text{RB}} = \left(\frac{\text{RL}}{\text{CSF}}\right) \times \left(\frac{\text{BW} \times \text{AT}_{\text{c}}}{\text{IR} \times \text{ED} \times \text{EF} \times \text{CF}}\right)$$

(ii) For non-carcinogenic substances:

$$\text{I/C DEC}_{\text{RB}} = \left(\frac{\text{RfD} \times \text{HI} \times \text{BW} \times \text{AT}}{\text{IR} \times \text{ED} \times \text{EF} \times \text{CF}}\right)$$

(iii) The abbreviations in clauses (i) and (ii) of this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AT_c	Averaging Time – carcinogens	25,550	days
AT	Averaging Time – non-carcinogen	9,125	days
BW	Body Weight – adult	70	kg
CF	Conversion Factor	0.000001	kg/mg
CSF	Cancer Slope Factor	substance-specific	$(mg/kg\text{-}day)^{-1}$
$I/CDEC_{RB}$	Industrial/Commercial Risk-based Direct Exposure Criterion	calculated	mg/kg
ED	Exposure Duration	25	years
EF	Exposure Frequency	250	days/year
HI	Hazard Index	1.0	unitless
IR	Ingestion Rate	50	mg/day
RfD	Reference Dose	substance-specific	mg/kg-day
RL	Target Cancer Risk Level	1.0E-06	unitless

(iv) If the industrial/commercial direct exposure criteria calculated pursuant to this subparagraph exceeds the following ceiling values, the ceiling value shall be used in lieu of the calculated value:

Volatile Substances	Semi-volatile Substances	Pesticides, PCBs and ETPH	Inorganic Substances	Units
1,000	2,500	1,000	50,000	mg/kg

(v) The industrial/commercial direct exposure criteria may be adjusted up to the laboratory reporting limit if the commissioner determines that the calculated industrial/commercial risk-based direct exposure criteria is less than the laboratory reporting limit for such substance.

(C) Managed Multifamily Residential Direct Exposure Criteria shall be calculated using the following equations:

(i) For non-carcinogenic substances:

$DEC_{C\_MF\_NC}$ (mg/kg) = (RfD x HI x $BW_{(0-6)}$ x AT_{c_res}) / ($SIR_{(0-6)\_mf}$ x EF_{res} x $ED_{(0-6)}$ x CF_{soil})

(ii) For substances (excluding Trichloroethylene) that are carcinogenic, but not mutagenic:

DEC_{MFres_Cnm} (mg/kg) = (RL x AT)/(CSF x CF_{soil} x TSD_{mf})

Where:

TSD_{mf} (mg/kg) = $SD_{0\text{-}6mf}$ + SD_{amf}

$SD_{0\text{-}6mf}$ (mg/kg) = ($SIR_{(0\text{-}6)mf}$ x $ED_{(0\text{-}6)}$ x EF_{res}) / $BW_{(0\text{-}6)}$

SD_{amf} (mg/kg) = (SIR_{amf} x ED_a x EF_{res}) / BW_a

(iii) For substances (excluding Trichloroethylene) that are carcinogenic and mutagenic:

DEC_{MFres_Cm} = (RL x AT) / (CSF x CF_{soil} x $TSDM_{mf}$)

Where:

$TSDM_{mf}$ (mg/kg) = $SD_{0\text{-}2mf}$ + $SD_{2\text{-}6mf}$ + $SD_{6\text{-}16mf}$ + $SD_{16\text{-}30mf}$

$SD_{0\text{-}2mf}$ (mg/kg) = ($SIR_{(0\text{-}2)\_mf}$ x $ADAF_{(0\text{-}2)}$ x $ED_{(0\text{-}2)}$ x EF_{res}) / $BW_{(0\text{-}2)}$

$SD_{2\text{-}6mf}$ (mg/kg) = ($SIR_{(2\text{-}6)}$ x $ADAF_{(2\text{-}6)}$ x $ED_{(2\text{-}6)}$ x EF_{res}) / $BW_{(2\text{-}6)}$

$SD_{6\text{-}16mf}$ (mg/kg) = ($IR_{(6\text{-}16)}$ x $ADAF_{(6\text{-}16)}$ x $ED_{(6\text{-}16)}$ x EF_{res}) / $BW_{(6\text{-}16)}$

$SD_{16\text{-}30mf}$ (mg/kg) = ($IR_{(16\text{-}30)}$ x $ADAF_{(16\text{-}30)}$ x $ED_{(16\text{-}30)}$ x EF_{res}) / $BW_{(16\text{-}30)}$

(iv) For Trichloroethylene:

$DEC_{mf\text{-}TCE}$ = (RL x AT) / (($CSF_{TCE\text{-}M}$ x CF_{soil} x $TSDM_{mf}$) + ($CSF_{TCE\text{-}C}$ x CF_{soil} x TSD_{mf}))

Where:

$TSDM_{mf}$ (mg/kg) = $SD_{0\text{-}2mf}$ + $SD_{2\text{-}6mf}$ + $SD_{6\text{-}16mf}$ + $SD_{16\text{-}30mf}$

$SD_{0\text{-}2mf}$ (mg/kg) = ($SIR_{(0\text{-}2)\_mf}$ x $ADAF_{(0\text{-}2)}$ x $ED_{(0\text{-}2)}$ x EF_{res}) / $BW_{(0\text{-}2)}$

$SD_{2\text{-}6mf}$ (mg/kg) = ($SIR_{(2\text{-}6)}$ x $ADAF_{(2\text{-}6)}$ x $ED_{(2\text{-}6)}$ x EF_{res}) / $BW_{(2\text{-}6)}$

$SD_{6\text{-}16mf}$ (mg/kg) = ($IR_{(6\text{-}16)}$ x $ADAF_{(6\text{-}16)}$ x $ED_{(6\text{-}16)}$ x EF_{res}) / $BW_{(6\text{-}16)}$

$SD_{16\text{-}30mf}$ (mg/kg) = ($IR_{(16\text{-}30)}$ x $ADAF_{(16\text{-}30)}$ x $ED_{(16\text{-}30)}$ x EF_{res}) / $BW_{(16\text{-}30)}$

TSD_{mf} (mg/kg) = $SD_{0\text{-}6mf}$ + SD_{amf}

$SD_{0\text{-}6mf}$ (mg/kg) = ($SIR_{(0\text{-}6)\ mf}$ x $ED_{(0\text{-}6)}$ x EF_{res}) / $BW_{(0\text{-}6)}$

SD_{amf} (mg/kg) = (SIR_a x ED_a x EF_{res}) / BW_a

(v) The abbreviations in clauses (i) to (iv), inclusive, of this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Exposure Values for Soil Exposures - Managed Multifamily Residential			
Terms	Description	Value	Units
Criteria Types			
$DEC_{C\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Child Residents in a Managed Multifamily Residential Setting	Chemical Specific	mg/kg
$DEC_{A\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Adult Residents in a Managed Multifamily Residential Setting	Chemical Specific	mg/kg
$DEC_{SW\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Site Workers in a Managed Multifamily Residential Setting Non Cancer	Chemical Specific	mg/kg
$DEC_{SW\_MF\_C}$	Direct Exposure Criteria for Soil Exposures to Site Workers in a Managed Multifamily Residential Setting (Carcinogen)	Chemical Specific	mg/kg
DEC_{MFres_Cnm}	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Carcinogens)	Chemical Specific	mg/kg
DEC_{MFres_Cm}	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Mutagens)	Chemical Specific	mg/kg
$DECmf_{\text{-}TCE}$	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Trichloroethylene)	Chemical Specific	mg/kg
Variables			

ADAF(0-2)	Age Dependent Adjustment Factor for mutagenic cancer risk - 0-2 years	10	unitless
ADAF(16-30)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 16-30 years	1	unitless
ADAF(2-6)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 2-6 years	3	unitless
ADAF(6-16)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 6-16 years	3	unitless
SDa_mf	Soil dose for adult residents in Multifamily Residential setting	5475	mg/kg
SD(0-6)_mf	Soil dose for ages 0-6 in Multifamily Residential setting	12658.95954	mg/kg
SD(0-2)_mf	Soil dose for ages 0-2 in Multifamily Residential setting	64,035.09	mg/kg
SD(2-6)_mf	Soil dose for ages 2-6 in Multifamily Residential setting	25,317.92	mg/kg
SD(6-16)_mf	Soil dose for ages 6-16 in Multifamily Residential setting	22,955.97	mg/kg
SD(16-30)_mf	Soil dose for ages 16-30 in Multifamily Residential setting	3,421.88	mg/kg
AT	Averaging Time -Carcinogens	25,550	days
ATa_PRec	Averaging Time - Adult Non-carcinogen (passive recreationexposure)	8,760	days
ATa_res	Averaging Time - Adult Non-carcinogen (residential exposure)	8,760	days
ATc_PRec	Averaging Time - Child Non-carcinogen (passive recreation exposure)	2,190	days
ATc_res	Averaging Time - Child Non-carcinogen (residential exposure)	2,190	days
ATsw_mf	Averaging Time Adult site worker non-carcinogen MultiFamily Residential Exposure Scenario	9,125	days
BW(0-2)	Body Weight - ages 0-2 years	11.4	kg
BW(0-6)	Body Weight - ages 0-6 years	17.3	kg
BW(16-30)	Body Weight - ages 16-30 years	80	kg
BW(2-6)	Body Weight - ages 2-6 years	17.3	kg
BW(6-16)	Body Weight - ages 6-16 years	47.7	kg
BWa	Body Weight - Adult	80	kg
CFsoil	Conversion Factor (kg/mg) for soil	0.000001	kg/mg
CSF	Cancer Slope Factor	chem specific	chem specific

CSF_{TCE-C}	Cancer Slope Factor for Trichloroethylene carcinogenic risks	chem specific	chem specific
CSF_{TCE-M}	Cancer Slope Factor for Trichloroethylene for mutagenic risks	chem specific	chem specific
ED(0-2)	Exposure Duration - ages 0-2 years	2	years
ED(0-6)	Exposure Duration - ages 0-6 years	6	years
ED(16-30)	Exposure Duration - ages 16-30 years	14	years
ED(2-6)	Exposure Duration - ages 2-6 years	4	years
ED(6-16)	Exposure Duration - ages 6-16 years	10	years
EDa	Exposure Duration - Adult	24	years
EDsw_mf	Exposure Duration site worker residential multifamily	25	years
EFres	Exposure Frequency Residential	365	days/year
EFsw_mf	Exposure Frequency site worker residential multifamily	250	days/year
HI	Hazard Index	1	unitless
TSDmf	Total Soil Dose for children and adults in a Multifamily Residential setting for eposures carcinogens	18,134.0	mg/kg
TSDMmf	Total Soil Dose for children and adults in a Multifamily Residential setting for exposures to mutagens	115,730.9	mg/kg
RfD	Reference Dose	chem specific	mg/kg/d
RL	Risk Level	0.000001	unitless
SIR(0-2)_mf	Soil Ingestion Rate - Residential Multifamily (ages 0 - 2 years)	100	mg/day
SIR(0-6)_mf	Soil Ingestion Rate - (ages 0-6 years) Residential Multifamily	100	mg/day
SIR(16-30)_mf	Soil Ingestion Rate -Residential Multifamily (age 16-30)	50	mg/day
SIR(2-6)_mf	Soil Ingestion Rate - Residential Multifamily (ages 2-6 years)	100	mg/day
SIR(6-16)_mf	Soil Ingestion Rate - (ages 6-16 years)	60	mg/day
SIRa_mf	Soil Ingestion Rate - Adult Residential Multifamily	50	mg/day
SIRsw_mf	Soil Ingestion Rate - Site Worker Residential Multifamily	100	mg/day

(D) Passive Recreation Direct Exposure Criteria shall be calculated using the following equations:

(i) For non-carcinogenic substances:

$DEC_{C\ PRec\ NC}$ (mg/kg) = (RfD x HI x $BW_{(0-6)}$ x $AT_{c\ PRec}$) / ($SIR_{(0-6)\ PRec}$ x EF_{PRec} x $ED_{(0-6)}$ x CF_{soil})

(ii) For substances (except Trichloroethylene) that are carcinogenic, but not mutagenic:

$DEC_{PRrec\ Cnm}$ (mg/kg) = (RL x AT)/(CSF x CF_{soil} x TSD_{PRec})

Where:

TSD_{PRec} (mg/kg) = $SD_{0\text{-}6PRec}$ + SD_{aPRec}

$SD_{0\text{-}6PRec}$ (mg/kg) = ($SIR_{(0-6)\ PRec}$ x $ED_{(0-6)}$ x EF_{PRec}) / $BW_{(0-6)}$

SD_{aPRec} (mg/kg) = (SIR_{aPRec} x ED_a x EF_{PRec}) / BW_a

(iii) For substances (except Trichloroethylene) that are carcinogenic and mutagenic:

$DEC_{PRec\ Cm}$ = (RL x AT) / (CSF x CF x $TSDM_{PRec}$)

Where:

$TSDM_{PRec}$ (mg/kg) = $SD_{0\text{-}2PRec}$ + $SD_{2\text{-}6PRec}$ + $SD_{6\text{-}16PRec}$ + $SD_{16\text{-}30PRec}$

$SD_{0\text{-}2PRec}$ (mg/kg) = ($SIR_{(0-2)\ PRec}$ x $ADAF_{(0-2)}$ x $ED_{(0-2)}$ x EF_{PRec}) / $BW_{(0-2)}$

$SD_{2\text{-}6PRec}$ (mg/kg) = ($SIR_{(2-6)\ PRec}$ x $ADAF_{(2-6)}$ x $ED_{(2-6)}$ x EF_{PRec}) / $BW_{(2-6)}$

$SD_{6\text{-}16PRec}$ (mg/kg) = ($SIR_{(6-16)\ PRec}$ x $ADAF_{(6-16)}$ x $ED_{(6-16)}$ x EF_{PRec}) / $BW_{(6-16)}$

$SD_{16\text{-}30PRec}$ (mg/kg) = ($SIR_{(16-30)\ Prec}$ x $ADAF_{(16-30)}$ x $ED_{(16-30)}$ x EF_{PRec}) / $BW_{(16-30)}$

(iv) For Trichlorethylene

$DEC_{PRecTCE}$ = (RL x AT) / (($CSF_{TCE\text{-}M}$ x CF_{soil} x $TSDM_{PRec}$) + ($CSF_{TCE\text{-}C}$ x CF_{soil} x TSD_{PRec}))

Where:

$TSDM_{PRec}$ (mg/kg) = $SD_{0\text{-}2PRec}$ + $SD_{2\text{-}6PRec}$ + $SD_{6\text{-}16PRec}$ + $SD_{16\text{-}30PRec}$

$SD_{0\text{-}2PRec}$ (mg/kg) = ($SIR_{(0-2)\ PRec}$ x $ADAF_{(0-2)}$ x $ED_{(0-2)}$ x EF_{PRec}) / $BW_{(0-2)}$

$SD_{2\text{-}6PRec}$ (mg/kg) = ($SIR_{(2-6)\ PRec}$ x $ADAF_{(2-6)}$ x $ED_{(2-6)}$ x EF_{PRec}) / $BW_{(2-6)}$

$SD_{6\text{-}16PRec}$ (mg/kg) = ($SIR_{(6-16)\ PRec}$ x $ADAF_{(6-16)}$ x $ED_{(6-16)}$ x EF_{PRec}) / $BW_{(6-16)}$

$SD_{16\text{-}30PRec}$ (mg/kg) = ($SIR_{(16-30)\ Prec}$ x $ADAF_{(16-30)}$ x $ED_{(16-30)}$ x EF_{PRec}) / $BW_{(16-30)}$

TSD_{PRec} (mg/kg) = $SD_{0\text{-}6PRec}$ + SD_{aPRec}

$SD_{0\text{-}6PRec}$ (mg/kg) = ($SIR_{(0\text{-}6)\ PRec}$ x $ED_{(0\text{-}6)}$ x EF_{PRec}) / $BW_{(0\text{-}6)}$

SD_{aPRec} (mg/kg) = (SIR_{aPRec} x ED_a x EF_{PRec}) / BW_a

(iv) The abbreviations in clauses (i) to (iv), inclusive, of this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Exposure Values for Soil Exposures - Passive Recreational			
Terms	Description	Value	Units
Criteria Types			
$DEC_{C\_PRec\_NC}$	Direct Exposure Criteria for Soil Exposures to Children aged 0-6 years in a Passive Recreation Setting (Non Cancer)	Chemical Specific	mg/kg
$DEC_{A\_PRec\_NC}$	Direct Exposure Criteria for Soil Exposures to Adult Residents in a Passive Recreation Setting (Non cancer)	Chemical Specific	mg/kg
DEC_{PRec_Cnm}	Direct Exposure Criteria for Soil Exposures to Children and Adults in a Passive Recreation Setting (carcinogens)	Chemical Specific	mg/kg
DEC_{PRec_Cm}	Direct Exposure Criteria for Soil Exposures to Chidren and Adults in a Passive Recreation Setting (Mutagens)	Chemical Specific	mg/kg
$DECPRec_{TCE}$	Direct Exposure Criteria for Soil Exposures to Children and Adults in a Passive Recreation Setting (Trichloroethylene)	Chemical Specific	mg/kg
Variables			
ADAF(0-2)	Age Dependent Adjustment Factor for mutagenic cancer risk - 0-2 years	10	unitless
ADAF(16-30)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 16-30 years	1	unitless
ADAF(2-6)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 2-6 years	3	unitless
ADAF(6-16)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 6-16 years	3	unitless
SDa_Prec	Soil dose for adult residents in Multifamily Residential setting	4680	mg/kg
SD(0-6)_PRec	Soil dose for ages 0-6 in Multifamily Residential setting	7213.872832	mg/kg

SD(0-2)_PRec	Soil dose for ages 0-2 in Multifamily Residential setting	36,491.23	mg/kg
SD(2-6)_PRec	Soil dose for ages 2-6 in Multifamily Residential setting	14,427.75	mg/kg
SD(6-16)_PRec	Soil dose for ages 6-16 in Multifamily Residential setting	13,081.76	mg/kg
SD(16-30)_PRec	Soil dose for ages 16-30 in Multifamily Residential setting	2,925.00	mg/kg
AT	Averaging Time -Carcinogens	25,550	days
ATa_PRec	Averaging Time - Adult Non-carcinogen (passive recreationexposure)	8,760	days
ATc_PRec	Averaging Time - Child Non-carcinogen (passive recreation exposure)	2,190	days
BW(0-2)	Body Weight - ages 0-2 years	11.4	kg
BW(0-6)	Body Weight - ages 0-6 years	17.3	kg
BW(16-30)	Body Weight - ages 16-30 years	80	kg
BW(2-6)	Body Weight - ages 2-6 years	17.3	kg
BW(6-16)	Body Weight - ages 6-16 years	47.7	kg
BWa	Body Weight - Adult	80	kg
CFsoil	Conversion Factor (kg/mg) for soil	0.000001	kg/mg
CSF	Cancer Slope Factor	chem specific	chem specific
CSF_{TCE-C}	Cancer Slope Fator for Trichloroethylene non-mutagenic risks	chem specific	chem specific
CSF_{TCE-M}	Cancer Slope Fator for Trichloroethylene for mutagenic risks	chem specific	chem specific
ED(0-2)	Exposure Duration - ages 0-2 years	2	years
ED(0-6)	Exposure Duration - ages 0-6 years	6	years
ED(16-30)	Exposure Duration - ages 16-30 years	14	years
ED(2-6)	Exposure Duration - ages 2-6 years	4	years
ED(6-16)	Exposure Duration - ages 6-16 years	10	years
EDa	Exposure Duration - Adult	24	years
EF_PRec	Exposure Frequency Recreation	208	days/year
HI	Hazard Index	1	unitless
TSDMPRec	Total Soil Dose for children and adults in a Passive Recreation setting for exposures to mutagens	66,925.7	mg/kg
$_{TSDPRec}$	Total Soil Dose for children and adults in a Passive Recreation setting for exposures to Carcinogens	11,893.9	mg/kg
RfD	Reference Dose	chem specific	mg/kg/d
RL	Risk Level	0.000001	unitless

$SIR_{(0\text{-}2)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 0-2 years	100	mg/day
$SIR_{(0\text{-}6)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 0-6 years	100	mg/day
$SIR_{(16\text{-}30)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 16-30 years	75	mg/day
$SIR_{(2\text{-}6)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 2-6 years	100	mg/day
SIR_{a_PRec}	Soil Ingestion Rate - Passive Recreation Adult	75	mg/day
$SIRc_{(6\text{-}16)\_PRec}$	Soil Ingestion Rate - Passive Recreation Ages 6-16 years	60	mg/day

(2) Pollutant Mobility Criteria ~~for Additional Polluting Substances~~

(A) Pollutant Mobility Criteria for inorganic substances shall be calculated using the following equations:

(i) For GA area groundwater classification:

$$\mathrm{PMC_{mg/L}} = \mathrm{GWPC} \times \mathrm{CF}$$

(ii) For GB area groundwater classification:

$$\mathrm{PMC_{mg/L}} = \mathrm{GWPC} \times \mathrm{CF} \times \mathrm{DF}$$

(B) Pollutant Mobility Criteria for organic substance shall be calculated using the following equations:

(i) For GA area groundwater classification:

$$\mathrm{PMC_{mg/kg}} = \mathrm{GWPC} \times \mathrm{CF} \times \mathrm{AAF}$$

(ii) For GB area groundwater classification:

$$PMC_{mg/kg} = GWPC \times CF \times AAF \times DF$$

(C) The abbreviations in subparagraphs (A) and (B) of this subdivision shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AAF	Analytical Adjustment Factors	20	unitless
CF	Conversion Factor	0.001	mg/µg
DF	Dilution Factor	10	unitless
GWPC	Groundwater Protection Criteria	substance-specific	µg/L
PMC	Pollutant Mobility Criteria	calculated	mg/kg or mg/L

(3) Groundwater Protection Criteria ~~for Additional Polluting Substances~~

(A) Groundwater Protection Criteria shall be calculated for carcinogenic substances using the following equation:

$$GWPC = \left(\frac{RL}{CSF}\right) \times \left(\frac{BW \times AT}{IR \times EF \times ED \times CF}\right)$$

(B) Groundwater Protection Criteria shall be calculated for non-carcinogenic substances using the following equation:

$$GWPC = \frac{RfD \times HI \times BW \times AT \times SA}{IR \times EF \times ED \times CF}$$

(C) The abbreviations in subparagraphs (A) and (B) of this subdivision shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AT	Averaging Time	25,550	days
BW	Body Weight	70	kg
CSF	Cancer Slope Factor	substance-specific	$(mg/kg\text{-}day)^{-1}$
CF	Conversion Factor	0.001	mg/µg
ED	Exposure Duration	70	years
EF	Exposure Frequency	365	days/year
GWPC	Risk-based Groundwater Protection Criterion	calculated	µg/L
HI	Hazard Index	1.0	unitless
IR	Ingestion Rate	2	L/day
RfD	Reference Dose	substance-specific	mg/kg-day
RL	Target Cancer Risk Level	1.0E-06	unitless
SA	Source Allocation	0.2	unitless

(D) If the Groundwater Protection Criteria calculated pursuant to subparagraph (A) or (B) of this subdivision exceeds the following ceiling values, the ceiling value shall be used in lieu of the calculated value:

Volatile Substances	Semi-volatile Substances	Pesticides, PCBs, and ETPH	Inorganic Substances	Units
1,000	1,000	1,000	50,000	µg/L

(E) The groundwater protection criteria may be adjusted up to the laboratory reporting limit if the commissioner determines that the calculated risk-based groundwater protection criteria is less than the laboratory reporting limit for such substance.

(F) The groundwater protection criteria may be adjusted down to the organoleptic threshold if the commissioner determines that the calculated risk-based groundwater protection criteria is higher than the organoleptic threshold for such substance.

(4) Surface Water Protection Criteria ~~for Additional Polluting Substances~~

(A) Determining Water Quality Criteria

For substances that have no water quality criteria in the water quality standards, such criteria shall be determined using EPA's national recommended water quality criteria and, if no such criteria are available, then by using the following:

(i) Determining the Water Quality Criteria for Chronic Aquatic Life

(I) In accordance with title 40 CFR 132 Appendix A (Great Lakes Water Quality Initiative Methodologies for Development of Aquatic Life Criteria and Values);

(II) Using the Tier 1 protocols for calculating a Criterion Continuous Concentration; or

(III) If insufficient information is available to use the Tier 1 Criterion Continuous Concentration procedure, using the Tier 2 protocols for calculating a Secondary Continuous Concentration.

(ii) Calculating the Water Quality Criteria for Human Health for Fish Consumption:

(I) For carcinogenic substances:

$$\mathrm{WQC} = \frac{\mathrm{RL} \times \mathrm{BW} \times \mathrm{CF}}{\mathrm{CSF} \times \mathrm{FC} \times \mathrm{BAF}}$$

(II) For non-carcinogenic substances:

$$\mathrm{WQC} = \frac{\mathrm{RfD} \times \mathrm{BW} \times \mathrm{CF\ x\ RSC}}{\mathrm{FC} \times \mathrm{BAF}}$$

(III) The abbreviations in subclauses (I) and (II) of this clause shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
BAF	Bioaccumulation Factor	substance-specific	unitless
BW	Body Weight	70	kg

CF	Conversion Factor	1,000	µg/mg
CSF	Cancer Slope Factor	substance-specific	$(mg/kg\text{-}day)^{-1}$
FC	Fish Consumption Rate	0.0175	kg/d
RfD	Reference Dose	substance-specific	mg/kg-day
RL	Risk Level	1.00E-06	unitless
WQC	Water Quality Criteria	~~substance-specific~~calculated	µg/L
RSC	Relative Source Contribution	0.2	unitless

(B) Calculating the Surface Water Protection Criteria

The risk-based surface water protection criteria shall be calculated, for the lower of aquatic life or human health water quality criteria:

(i) Water quality criteria for freshwater chronic aquatic life protection as determined using subparagraph (A) of this subdivision, multiplied by ten (10); or

(ii) Water quality criteria for human health for fish consumption calculated using subparagraph (A) of this subdivision, multiplied by the applicable flow factor multiplied by ten (10), using the following values:

Flow Factor	Substance Risk Level
1	For known human carcinogens or substances which may bioaccumulate BCF>100
2	For non-carcinogenic substances
3	For carcinogenic substances

(C) If the Surface Water Protection Criteria calculated pursuant to subparagraph (B) of this subdivision exceeds the following ceiling values, the ceiling value shall be used in lieu of the calculated value:

Volatile Substances	Semi-volatile Substances	Pesticides, PCBs and ETPH	Inorganic Substances	Units
10,000	10,000	10,000	10,000	µg/L

(D) The surface water protection criteria may be adjusted up to the laboratory reporting limit if the commissioner determines that the calculated risk-based surface water protection criteria is less than the laboratory reporting limit for such substance.

(5) Volatilization Criteria ~~for Additional Polluting Substances~~

(A) Residential Target Indoor Air Concentrations shall be calculated using the following equations:

(i) For carcinogenic substances:

$$TAC = \frac{RL \times BW \times AT_c \times CF}{CSF_i \times CexpF \times CsensF \times IR_{air} \times EF \times ED}$$

(ii) For non-carcinogenic substances:

$$TAC = \frac{HQ \times BW \times RfD_i \times AT \times CF}{CexpF \times IR_{air} \times EF \times ED}$$

(iii) The abbreviations in this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AT	Averaging Time – non-carcinogen	10,950	days
AT_c	Averaging Time – carcinogen	25,550	days
BW	Body Weight	70	kg
CexpF	Children's Exposure Factor	2	unitless
CF	Conversion Factor	1,000	µg/mg
CsensF	Children's Sensitivity Factor CsensF = 1 for non-carcinogens and non-mutagenic carcinogens. CsensF = 2 for mutagenic carcinogens	substance-specific	unitless
CSF_i	Cancer Slope Factor – Inhalation	substance-specific	$(mg/kg\text{-}day)^{-1}$
ED	Exposure Duration	30	years
EF	Exposure Frequency	350	days/year
HQ	Hazard Quotient	1	unitless
IR_{air}	Inhalation Rate – air	20	m^3/day
RfD_i	Reference Dose – inhalation	substance-specific	~~mg/m^3~~ mg/kg-day
RL	Risk Level	1.00E-06	unitless
TAC	Target Indoor Air Concentration	~~substance-specific~~ calculated	µg/m^3

(iv) If the residential Target Indoor Air Concentration calculated pursuant to clause (i) or (ii) of this subparagraph exceeds a ceiling value of 500 µg/m^3, the ceiling value shall be used in lieu of the calculated value.

(B) Industrial/Commercial Target Indoor Air Concentrations shall be calculated using the following equations:

(i) For carcinogenic substances:

$$TAC = \frac{RL \times BW \times AT_c \times CF}{CSF_i \times IR_{air} \times EF \times ED}$$

(ii) For non-carcinogenic substances:

$$TAC = \frac{HQ \times BW \times RfD_i \times AT \times CF}{IR_{air} \times EF \times ED}$$

(iii) The abbreviations used in this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
AT	Averaging Time – non-carcinogen	9,125	days
AT_c	Averaging Time – carcinogen	25,550	days
BW	Body Weight	70	kg
CF	Conversion Factor	1,000	µg/mg
CSF_i	Cancer Slope Factor – inhalation	substance-specific	$(mg/kg\text{-}day)^{-1}$
ED	Exposure Duration	25	years
EF	Exposure Frequency	250	days/year
HQ	Hazard Quotient	1	unitless
IR_{air}	Inhalation Rate – air	10	m^3/day
RfD_i	Reference Dose – inhalation	substance-specific	~~mg/m³~~ mg/kg-day
RL	Risk Level	1.00E-06	unitless
TAC	Target Indoor Air Concentration	substance-specific	µg/m^3

(iv) If the industrial/commercial Target Indoor Air Concentration calculated pursuant to clause (i) or (ii) of this subparagraph exceeds a ceiling value of ~~five hundred (~~500~~)~~ µg/m^3, the ceiling value shall be used in lieu of the calculated value.

(C) Volatilization Criteria shall be calculated using the following equations:

(i) For Volatilization Criteria for Groundwater:

$$GWVC = \frac{TAC}{CF \times \alpha \times H}$$

(ii) If the groundwater volatilization criteria calculated pursuant to (i) this subparagraph exceeds a ceiling value of ~~fifty thousand (~~50,000~~)~~ µg/L, the ceiling value shall be used in lieu of the calculated value.

(iii) For Volatilization Criteria for Soil Vapor:

$$SVVC_{mg/m^3} = \frac{TAC}{CF \times \alpha}$$

$$SVVC_{ppmv} = SVVC_{mg/m^3} \times \left(\frac{MV}{MW}\right)$$

(iv) The attenuation factor for diffusion and advection (α) shall be calculated using the following equations:

$$\alpha = \frac{A \times e^{B}}{e^{B} + A + (A/C) \times (e^{B} - 1)}$$

$$A = \frac{D^{eff}_{T} \times A_B}{Q_B \times L_T} \quad \textbf{or} \quad A = \frac{D^{eff}_{T}}{E_B \times (V_B/A_B) \times L_T}$$

$$B = \frac{Q_{soil} \times L_{crack}}{D^{eff}_{crack} \times \eta \times A_B} \quad \textbf{or} \quad B = \left(\left(\frac{Q_{soil}}{Q_B}\right) \times E_B \times \left(\frac{V_B}{A_B}\right) \times L_{crack}\right) / \left(D^{eff}_{crack} \times \eta\right)$$

$$C = \frac{Q_{soil}}{Q_B}$$

$$D^{eff}_{T} = \frac{L_T}{\left(L_{vadose}/D^{eff}_{vadose}\right) + \left(L_{cap}/D^{eff}_{cap}\right)}$$

$$D^{eff}{}_{crack} = D^{air} \times \left(\frac{\theta_{V-crack}{}^{3.33}}{\theta_{T-cra}{}^{2}}\right) + \left(\frac{D^{water}}{H}\right) \times \left(\frac{\theta_{m-crack}{}^{3.33}}{\theta_{T-crack}{}^{2}}\right)$$

$$D^{eff}{}_{vadose} = D^{air} \times \left(\frac{\theta_{V-vadose}{}^{3.33}}{\theta_{T-vadose}{}^{2}}\right) + \left(\frac{D^{water}}{H}\right) \times \left(\frac{\theta_{m-vadose}{}^{3.33}}{\theta_{T-vadose}{}^{2}}\right)$$

$$D^{eff}{}_{cap} = D^{air} \times \left(\frac{\theta_{V-cap}{}^{3.33}}{\theta_{T-cap}{}^{2}}\right) + \left(\frac{D^{water}}{H}\right) \times \left(\frac{\theta_{m-cap}{}^{3.33}}{\theta_{T-cap}{}^{2}}\right)$$

(v) The abbreviations used in this subparagraph shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
α	Attenuation Factor for Diffusion and Advection	calculated	unitless
A_B	Surface Area of the Enclosed Space in Contact with Soil	site-specific	m^2
CF	Conversion Factor	1,000	L/m^3 or µg/mg
D^{air}	Molecular Diffusion Coefficient in Air	substance-specific	m^2/d
$D^{eff}{}_T$	Total Effective Diffusion	calculated	~~cm^2/s~~ m^2/d
$D^{eff}{}_{crack}$	Effective Diffusion Through Foundation Cracks	calculated	~~cm^2/s~~ m^2/d
$D^{eff}{}_{cap}$	Effective Diffusion Through Capillary Fringe	calculated	~~cm^2/s~~ m^2/d
$D^{eff}{}_{vadose}$	Effective Diffusion Through Vadose Zone	calculated	~~cm^2/s~~ m^2/d
D^{water}	Molecular Diffusion Coefficient in Water	substance-specific	m^2/d
D^{water}/D^{air}	Ratio of Molecular Diffusion in Water to Air = D^{water}/D^{air}	calculated	unitless
E_B	Enclosed Space Air Exchange Rate	site-specific	1/day
GWVC	Groundwater Volatilization Criteria	calculated	µg/L
H	Henry's Law Constant	substance-specific	unitless
k	Soil Vapor Permeability	site-specific	cm^2
L_T	Depth from foundation to source	site-specific	m
L_{cap}	Thickness of Capillary Fringe	site-specific	m
L_{crack}	Foundation Thickness	site-specific	m
L_{vadose}	Thickness of Vadose Zone = $L_T - L_{cap}$	calculated	m
MV	Molar Volume (at standard conditions)	24.45	L
MW	Molecular Weight	substance-specific	g/mol
η	Fraction of Enclosed Space Area Open for Vapor Intrusion	site-specific	~~m^2/d~~ m^2/m^2

Terms	Description	Value	Units
$\theta_{m\text{-}cap}$	Volumetric Moisture Content in Cracks in Capillary Fringe	site-specific	unitless
$\theta_{T\text{-}cap}$	Total Porosity in Capillary Fringe	site-specific	unitless
$\theta_{V\text{-}cap}$	Volumetric Vapor Constant in Capillary Fringe	calculated	unitless
$\theta_{m\text{-}crack}$	Volumetric Moisture Content in Cracks	site-specific	unitless
$\theta_{T\text{-}crack}$	Total Porosity in Crack	site-specific	unitless
$\theta_{V\text{-}crack}$	Volumetric Vapor Content in Cracks	calculated	unitless
$\theta_{m\text{-}vadose}$	Volumetric Moisture Content in Vadose Zone	site-specific	unitless
$\theta_{T\text{-}vadose}$	Total Porosity in Vadose Zone	site-specific	unitless
$\theta_{V\text{-}vadose}$	Volumetric Vapor Content in Vadose Zone	calculated	unitless
ΔP	Indoor-Outdoor Air Pressure Difference	site-specific	g/ms^2
Q_B	Enclosed Space Volumetric Air Flow Rate	site-specific	m^3/d
Q_{soil}	Pressure Driven Soil Gas Flow Rate from the subsurface into the enclosed space	site-specific	m^3/d
Q_{soil}/Q_B	Ratio of Soil Gas Intrusion Rate to Building Ventilation Rate = Q_{soil}/Q_B	calculated	unitless
R_{crack}	Effective Crack Radius or Width = $\eta A_B/X_{crack}$	calculated	m
SVVC	Soil Vapor Volatilization Criteria	calculated	mg/m^3
TAC	Target Indoor Air Concentration calculated using subparagraph (A) or (B), as applicable	substance-specific	$\mu g/m^3$
μ	Viscosity of Air	calculated	g/ms
VB	Enclosed Space Volume	site-specific	m^3
V_B/V_A	Ratio of Enclosed Space Volume to Exposed Surface Area = V_B/V_A	calculated	m
X_{crack}	Total Length of Cracks through which Soil Gas Vapors are Flowing	calculated	m
Z_{crack}	Crack Opening Depth Below Grade	calculated	m

Appendix 9H to the RSRsRBCRs

Equations, Terms, and Values for Calculating Release-Specific Alternative Pollutant Mobility Criteria

(1) Release-Specific Pollutant Mobility Criteria shall be calculated using the following equation:

$$\text{Alt PMC} = \text{GWC} \times \text{DF}\left(\text{K}_\text{d} + \frac{(\theta_\text{w} + \theta_\text{a}\text{H}')}{\rho_\text{b}}\right)$$

(2) The abbreviations in subdivision (1) of this Appendix H of the RSRs, shall be interpreted in accordance with the following table and shall be assigned the values specified therein:

Terms	Description	Value	Units
Alt PMC	Alternative Pollutant Mobility Criteria	calculated	mg/kg
GWC	Groundwater Criteria Goal	substance-specific (lowest of groundwater criteria applicable to release area*)	mg/L
DF	Dilution Factor	20 or calculated in accordance with section 22a-133k-2(c)(2)(E)(ii)22a-134tt-9(c)(3)(B)(iv) of the RSRs with F_{adj} = 0	unitless
K_d	Distribution Coefficient (for oOrganic cContaminants may be approximated by: K_{oc}*f_{oc})	substance-specific (see table below for inorganic substances)	L/kg
K_{oc}	Soil Organic Carbon-water Partition Coefficient	substance-specific (see table below for organic substances)	L/kg
f_{oc}	Soil Fraction of Organic Carbon	0.001 or tested for site-specific value (max value = 0.006)	kg/kg
θ_w	Water-filled Soil Porosity	0.28 or tested for site-specific value	L_{water}/L_{soil}
θ_a	Air-filled Soil Porosity	0.15 or tested for site-specific value	L_{air}/L_{soil}
H'	Henry's Law Constant	substance-specific (see tables below)	unitless
ρ_b	Dry Soil Bulk Density	1.5 or tested for site-specific value	kg/L

** The "lowest of groundwater criteria applicable to release area" is intended to be the criteria in Appendices C, D, and E.*

Soil Organic Carbon-Water Partition Coefficient (K_{oc}) and Henry's Law Constant (H') Values for Organic Substances

Substance	K_{oc} (L/kg)	H' (Dimensionless)
Acenaphthylene	6,800	4.51E-03
Acetone	0.575	1.75E-03
Acrylonitrile	2	4.10E-03
Alachlor	310	4.30E-07
Aldicarb	24.6	5.89E-08
Anthracene	23,500	2.67E-03
Atrazine	360	1.21E-07
Benzene	62	2.26E-01
Benzo(*a*)anthracene	358,000	1.37E-04
Benzo(*a*)pyrene	969,000	4.63E-05
Benzo(*b*)fluoranthene	1,230,000	4.55E-03
Benzo(*k*)fluoranthene	1,230,000	3.40E-05
Bis(2-chloroethyl)ether	76	7.38E-04
Bis(2-chloroisopropyl)ether	360	3.03E-03
Bis(2-ethylhexyl)phthalate	111,000	4.18E-06
Bromoform	126	2.18E-02
2-Butanone (MEK)	10	1.12E-03
Butyl benzyl phthalate	13,700	5.17E-05
Carbon tetrachloride	152	1.20E+00
Chlordane	51,300	1.99E-03
Chlorobenzene	224	1.61E-01
Chloroform	53	1.39E-01
2-Chlorophenol	398	1.60E-02

Substance	K_{oc} (L/kg)	H' (Dimensionless)
Dibromochloromethane (Chlorodibromomethane)	63.1	3.21E-02
1,2-Dichlorobenzene (*o*)	379	7.95E-02
1,3-Dichlorobenzene (*m*)	700	1.08E-01
1,4-Dichlorobenzene (*p*)	616	1.12E-01
1,1-Dichloroethane	53	2.23E-01
1,2-Dichloroethane	38	4.51E-02
1,1-Dichloroethylene	65	6.11E-01
cis-1,2-Dichloroethylene	35.5	1.70E-01
trans-1,2-Dichloroethylene	38	3.80E-01
2,4-Dichlorophenol	159	1.30E-04
2,4-Dichlorophenoxyacetic acid (2,4-D)	29.6	1.45E-06
1,2-Dichloropropane	47	1.16E-01
1,3-Dichloropropene	27	1.44E-01
Dieldrin	25,500	6.19E-04
Di-*n*-butyl phthalate	1,570	3.85E-08
Di-*n*-octyl phthalate	140,000	2.74E-03
Ethylbenzene	204	1.41E-01
Ethylene dibromide (EDB)	66	2.76E-02
Fluoranthene	49,100	6.60E-04
Fluorene	7,710	2.61E-03
Heptachlor	9,530	4.47E-02
Heptachlor epoxide	83,200	3.90E-04
Hexachlorobenzene	80,000	5.41E-02
□-HCH (Lindane)	1,350	5.74E-04
Hexachloroethane	1,780	1.59E-01

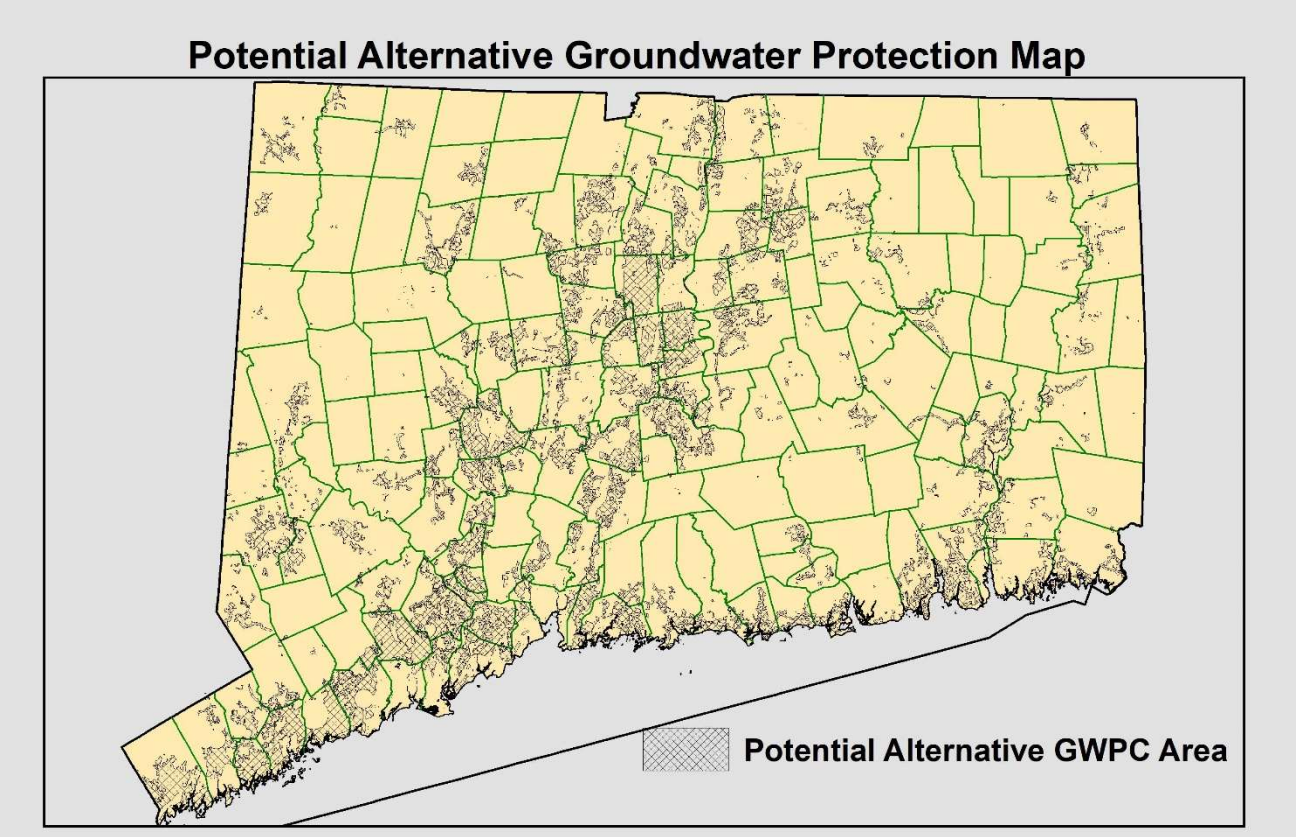
Substance	K_{oc} (L/kg)	H' (Dimensionless)
Methoxychlor	80,000	6.48E-04
Methyl isobutyl ketone	65	5.33E-03
Methyl-tert-butyl-ether (MTBE)	34	2.42E-02
Methylene chloride	10	1.31E-01
Naphthalene	1,190	1.98E-02
Pentachlorobenzene	32,100	2.87E-02
Pentachlorophenol	7,960	1.00E-06
Phenanthrene	21,200	9.43E-04
Phenol	28.8	1.63E-05
Pyrene	68,000	4.51E-04
Simazine	147	3.85E-08
Styrene	912	1.07E-01
1,1,1,2-Tetrachloroethane	86	4.51E-01
1,1,2,2-Tetrachloroethane	79	1.56E-02
Tetrachloroethylene	265	8.36E-02
Toluene	140	2.74E-01
Toxaphene	95,800	2.46E-04
1,1,1-Trichloroethane	135	9.47E-01
1,1,2-Trichloroethane	75	3.73E-02
Trichloroethylene	94	3.74E-01
Vinyl chloride	18.6	1.14E+00
Xylenes	1,700	2.16E-01

Distribution Coefficient (K_d) and Henry's Law Constant (H') Values for Inorganic Substances

Substance	K_d (L/kg)	H' (Dimensionless)
Antimony	45	-
Arsenic	25	-
Barium	12	-
Beryllium	26	-
Cadmium	17	-
Chromium (hexavalent or total)	31	-
Chromium (trivalent only)	1,900	-
Copper	35	-
Cyanide	9.9	-
Lead	900	-
Mercury	0.06	4.67E-01
Nickel	18	-
Silver	0.13	-
Selenium	17	-
Thallium	45	-
Vanadium	1,000	-
Zinc	18	-

Appendix 10I of the ~~RSRs~~ RBCRs

Potential Alternative Groundwater Protection Criteria Map, dated December 22, 2020



The map in this Appendix is for use in accordance with section ~~22a-133k-3(d)(2) of the RSRs~~22a-134tt-10(d)(2) of the RBCRs. The department shall make this map, titled "Potential Alternative Groundwater Protection Criteria Map" dated December 22, 2020, as provided in this Appendix, available on the department's Internet website and shall also make such map available during regular business hours at the Department of Energy and Environmental Protection, Division of Water Protection and Land Reuse, 79 Elm Street, 2nd floor, Hartford, Connecticut.

If a reader is viewing said map in hard copy or on the DEEP website, any such area shaded in the color or using a similar designation is an area where a potential alternative groundwater protection area has been identified. If a reader is viewing such map on the eRegs system, any area shaded in a cross-hatched pattern is an area where a potential alternative groundwater protection area has been identified.

Appendix 11 to the RBCRs

Managed Multifamily Residential Direct Exposure Criteria for Soil

Substance	Multifamily DEC (mg/kg)
Acenaphthylene	1,000
Acetone	500
Acrylonitrile	0.41
Alachlor	87
Aldicarb	173
Anthracene	1,000
Antimony	35
Arsenic	10
Atrazine	52
Barium	34,600
Benzene	4
Benzo(a)anthracene	2.2
Benzo(a)pyrene	0.22
Benzo(b)fluoranthene	2.2
Benzo(k)fluoranthene	22
Beryllium	35
Bis(2-chloroethyl)ether	1.3
Oxybis, 2,2'- (1-chloropropane) (Bis(2-Chloroisopropyl)ether)	1,000
Bis(2-ethyl hexyl)phthalate	101
Bromoform	28
Butanone, 2-	500
Butyl benzyl phthalate	1,000
Cadmium	17
Carbon tetrachloride	20
Chlordane	4
Chlorobenzene	500
Chloroform	500
Chlorophenol, 2-	865
Chromium, hexavalent	0
Chromium, trivalent	50,000
Copper	519
Cyanide	109
D, 2,4-	173
Dibromochloromethane	2.6

Substance	Multifamily DEC (MG/KG)
Dichlorobenzene, 1,2-	500
Dichlorobenzene, 1,3-	346
Dichlorobenzene, 1,4-	261
Dichloroethane, 1,1-	500
Dichloroethane, 1,2-	2.4
Dichloroethylene, 1,1-	500
Dichloroethylene, cis-1,2-	346
Dichloroethylene, trans-1,2-	500
Dichlorophenol, 2,4-	519
Dichloropropane, 1,2-	39
Dichloropropene, 1,3-	2.2
Dieldrin	0.09
Di-n-butyl phthalate	260
Di-n-octyl phthalate	1,000
Endrin	52
Ethylbenzene	128
Ethylene dibromide	0.11
Fluoranthene	1,000
Fluorene	1,000
Heptachlor epoxide	0.31
Heptachlor	0.15
Hexachlorobenzene	0.88
Hexachloroethane	35
Lead	400
Lindane	1.3
Mercury - inorganic	52
Methoxychlor	346
Methyl isobutyl ketone	500
Methyl tert butyl ether	500
Methylene chloride	110
Naphthalene	1,000
Nickel	346
Pentachlorophenol	0.55
Phenanthrene	1,000
Phenol	7.3
Polychlorinated biphenyls (PCBs)	0.71
Pyrene	1,000

Substance	Multifamily DEC(mg/kg)
Selenium	865
Silver	865
Simazine	500
Styrene	3.1
Tetrachloroethane, 1,1,1,2-	8.5
Tetrachloroethane, 1,1,2,2-	1.1
Tetrachloroethylene	500
Thallium	1.7
Toluene	346
Toxaphene	0.20
Trichloroethane, 1,1,1-	500
Trichloroethane, 1,1,2-	24.7
Trichloroethylene	14.6
Vanadium	156
Vinyl chloride	0.31
Xylenes	500
Zinc	50,000
Extractable TPH by ETPH Analysis	500

Appendix 12 to the RBCRs

Passive Recreation Direct Exposure Criteria for Soil

Substance	Passive Rec DEC (mg/kg)
Acenaphthylene	1,000
Acetone	500
Acrylonitrile	0.70
Alachlor	152
Aldicarb	304
Anthracene	1,000
Antimony	61
Arsenic	10
Atrazine	91
Barium	50,000
Benzene	7
Benzo(a)anthracene	3.8
Benzo(a)pyrene	0.38
Benzo(b)fluoranthene	3.8
Benzo(k)fluoranthene	38
Beryllium	61
Bis(2-chloroethyl)ether	2
Oxybis, 2,2'- (1-chloropropane) (Bis(2-Chloroisopropyl)ether)	1,000
Bis(2-ethyl hexyl)phthalate	154
Bromoform	48
Butanone, 2-	500
Butyl benzyl phthalate	1,000
Cadmium	30
Carbon tetrachloride	31
Chlordane	6
Chlorobenzene	500
Chloroform	500
Chlorophenol, 2-	1,000
Chromium, hexavalent	1
Chromium, trivalent	50,000
Copper	911
Cyanide	191
D, 2,4-	304
Dibromochloromethane	4.5

Substance	Passive Rec DEC (mg/kg)
Dichlorobenzene, 1,2-	500
Dichlorobenzene, 1,3-	500
Dichlorobenzene, 1,4-	398
Dichloroethane, 1,1-	500
Dichloroethane, 1,2-	4.2
Dichloroethylene, 1,1-	500
Dichloroethylene, cis-1,2-	500
Dichloroethylene, trans-1,2-	500
Dichlorophenol, 2,4-	911
Dichloropropane, 1,2-	60
Dichloropropene, 1,3-	3.8
Dieldrin	0.13
Di-n-butyl phthalate	455
Di-n-octyl phthalate	1,000
Endrin	91
Ethylbenzene	195
Ethylene dibromide	0.19
Fluoranthene	1,000
Fluorene	1,000
Heptachlor epoxide	0.48
Heptachlor	0.24
Hexachlorobenzene	1.34
Hexachloroethane	54
Lead	400
Lindane	2.0
Mercury - inorganic	91
Methoxychlor	500
Methyl isobutyl ketone	500
Methyl tert butyl ether	500
Methylene chloride	190
Naphthalene	1,000
Nickel	607
Pentachlorophenol	0.95
Phenanthrene	1,000
Phenol	12.7
Polychlorinated biphenyls (PCBs)	1.1
Pyrene	1,000

Substance	Passive Rec DEC (mg/kg)
Selenium	1,518
Silver	1,518
Simazine	500
Styrene	5.4
Tetrachloroethane, 1,1,1,2-	14.6
Tetrachloroethane, 1,1,2,2-	1.9
Tetrachloroethylene	500
Thallium	3.0
Toluene	500
Toxaphene	0.35
Trichloroethane, 1,1,1-	500
Trichloroethane, 1,1,2-	37.7
Trichloroethylene	24.7
Vanadium	273
Vinyl chloride	0.53
Xylenes	500
Zinc	50,000
Extractable TPH by ETPH Analysis	500

DEEP Proposal for Risk Based Cleanup Standard Calculators

DEEP is proposing to develop a Cumulative Risk Calculator in response to requests from various stakeholders. We are also proposing to develop three additional calculators that will provide a fast-track approval approach for additional polluting substance criteria and alternative criteria. All these optional calculators are supplemental to and do not supplant the current review and approval process available under the cleanup standards.

Cumulative Risk Calculator

Purpose: To provide a spreadsheet-based tool for the purpose of calculating cumulative, site-wide risk in support of alternative DEC calculations to implement LEP calculated, risk-based alternative direct exposure criteria pursuant to section 22a-134tt-9(d)(5).

Approach:

- A spreadsheet-based tool will be developed to calculate cumulative site cancer and non-cancer risks. The cumulative risk calculator must consider all releases at a parcel, all chemicals present in the environment (whether or not they are from the release), and all potential current and future exposure pathways associated with the parcel.
- Although this calculator will output alternative DEC within the context of cumulative site risks, it will require an evaluation of all potential exposure pathways in generating that output. The calculator will permit use of criteria for Additional Polluting Substances (APS) and permit consideration of site-specific risk scenarios.
- Risks will be calculated for each chemical present in the environment at the site with chemical exposures representing either site conditions (for parameters present at concentrations less than cleanup criteria) or at approved remediation criteria concentrations.
- Total cancer risk and non-cancer hazards for each target organ will be calculated.
- Remediation to the default criteria in the cleanup standards is acceptable, regardless of the output of a cumulative risk evaluation using this calculator.
- This calculator will not be intended to be used for other alternative criteria or APS criteria generation.

Additional Polluting Substances Calculator

Purpose: To provide a spreadsheet-based tool for the purpose of calculating criteria for substances for which criteria are not included in the cleanup standards or the Additional Polluting Substances (APS) fast-track approval form.

Approach:

- Chemical-specific inputs will be provided through a data entry worksheet.
- The tool will calculate values for all criteria types included within the cleanup standards using the default equations and exposure assumptions and the chemical-specific user inputs.

- Output from this calculator would provide supporting documentation for any requests for APS criteria to be submitted to DEEP for review and approval.

Alternate Criteria Calculator: Additional Exposure Scenarios

Purpose: To provide a spreadsheet-based tool for the purpose of calculating criteria for exposure scenarios not included within the cleanup standards (e.g., trespasser, construction worker), for either substances included in the cleanup standards or for substances that would require an APS criteria.

Approach:

- Exposure-specific inputs (e.g., exposure duration, exposure frequency, ingestion rates, etc.) will be provided through a data entry worksheet. Additional chemical-specific inputs will be provided for APS substances.
- Adjustments to exposure inputs for defined criteria types within the cleanup standards are not allowed. This calculator is for novel, site-specific exposure scenarios. This recommendation will allow for site-specific flexibility for certain site-specific exposure scenarios acceptable to the Connecticut Department of Public Health (DPH) and DEEP.
- If appropriate, defined ranges for values that can be customized will be provided within the tool. Some level justification will be required for the selected value.
- This spreadsheet will be populated with updated toxicity values recommended by DPH, updated analytical levels, and general risk estimation formulas acceptable to DPH and DEEP.
- Chemical- and exposure-specific inputs will be used to calculate criteria for exposure scenarios not included within the cleanup standards.
- Output from this calculator would provide supporting documentation for any requests for alternative criteria submitted to DEEP for review and approval.
- Alternative exposure scenarios may require an environmental use restriction.

Alternate Criteria Calculator: Site-specific fate and transport conditions

Purpose: To provide a spreadsheet-based tool for the purpose of calculating volatilization criteria using site-specific fate and transport considerations, for either substances included in the cleanup standards or for substances that would require an APS criteria.

Approach:

- This calculator is expected only to address site-specific adjustments for Volatilization Criteria.
- Site-specific inputs will be provided through a data entry worksheet.
- Defined ranges for values that can be customized will be provided within the tool. Some level justification will be required for the selected value.
- This spreadsheet will be populated with Target Indoor Air Concentrations associated with cleanup standard criteria and associated physical constants for each chemical.
- Provision can be made for inclusion of APS chemicals, if appropriate.
- Output from this calculator would provide supporting documentation for any requests for Alternative Criteria submitted to DEEP for review and approval.

I. Release Reporting Regulations

Regs., Conn. State Agencies § 22a-450-3

(d) (1) For the purposes of sections 22a-450-1 to 22a-450-6, inclusive, of the Regulations of Connecticut State Agencies, a release shall be considered to have been otherwise properly mitigated when such release has been mitigated in accordance with best management practices specified by the commissioner and posted on the department's Internet website.

(2) Notwithstanding the definition of waters of the state, for the purposes of the reporting of releases pursuant to sections 22a-450-1 to 22a-450-6, inclusive, of the Regulations of Connecticut State Agencies, a release to soil above the saturated zone shall not be considered a release to the waters of the state.

(3) Any release required to be reported pursuant to the release reporting regulations shall be considered to have been discovered pursuant to section 22a-134rr of the Connecticut General Statutes and shall be an emergent reportable release subject to the release based cleanup regulations, as such terms are defined at section 22a-134tt-1 of the Regulations of Connecticut State Agencies, including the requirement to perform immediate action pursuant to section 22a-134tt-5 of the Regulations of Connecticut State Agencies.

II. Remediation Standards Regulations

Section 22a-133k-1 of the Regulations of Connecticut State Agencies – General Provisions

Remediation Standards

The remediation standards adopted pursuant to section 22a-133k of the Connecticut General Statutes shall be those standards adopted at sections 22a-134tt-1(a) to 22a-134tt-(d), inclusive of the Regulations of Connecticut State Agencies, sections 22a-134tt-7 to 22a-134tt-10, inclusive, of the Regulations of Connecticut State Agencies; and sections 22a-134tt-app2 to 22a-134tt-app12 of the Regulations of Connecticut State Agencies.

Section 22a-133k-2 of the Regulations of Connecticut State Agencies – Remediation Standards for Soil

The remediation standards for soil adopted pursuant to this section 22a-133k of the Connecticut General Statutes shall be those standards adopted at sections 22a-134tt-8 to 22a-134tt-9, inclusive, of the Regulations of Connecticut State Agencies, and sections 22a-134tt-App2 to 22a-134tt-App3, inclusive, of the Regulations of Connecticut State Agencies, section 22a-134tt-App7 to App9, inclusive, of the Regulations of Connecticut State Agencies, and sections 22a-134tt-App11 to 22a-134tt-App12of the Regulations of Connecticut State Agencies.

Section 22a-133k-3 of the Regulations of Connecticut State Agencies – Remediation Standards for Groundwater

The remediation standards for groundwater adopted pursuant to this section 22a-133k of the Connecticut General Statutes shall be those standards adopted at sections 22a-134tt-10 of the Regulations of Connecticut State Agencies, and sections 22a-134tt-App3 to section 22a-134tt-App6,

inclusive, of the Regulations of Connecticut State Agencies, and sections 22a-134tt-App8 to App10, inclusive, of the Regulations of Connecticut State Agencies.

III. Administrative Civil Penalty Regulations

Section 22a-6b-8(c) of the Regulations of Connecticut State Agencies

(5) Release-Based Cleanup Violations.

For each distinct violation of chapter 445b of the Connecticut General Statutes, or of any regulation, order or permit administered or issued thereunder, the gravity-based penalty component shall be determined using Table 5A.

Table 5A
Penalty Schedule for Release-Based Cleanup Violations

Type of Violation	Penalty
Failure to report the discovery of an existing release in violation of section 22a-134tt-3 of the Regulations of Connecticut State Agencies	$1,000
Failure to report a significant existing release in the time required by section 22a-134tt-3 of the Regulations of Connecticut State Agencies	$1,000
Failure to perform an immediate action as directed by the commissioner or in the necessary timeframe to protect human health and the environment for emergencies or exigent conditions caused by a release in violation of section 22a-134tt-5(b) of the Regulations of Connecticut State Agencies	$2,000
Failure to begin performing an immediate action within the time frame specified in violation of section 22a-134tt-5(c) of the Regulations of Connecticut State Agencies	$1,000
Failure to submit an immediate action plan in violation of 22a-134tt-5(f) of the Regulations of Connecticut State Agencies	$1,000
Failure to submit an immediate action report in violation of 22a-134tt-5(e) of the Regulations of Connecticut State Agencies	$1,000
Failure to submit a tier assignment not later than one year after discovery of a release in violation of 22a-134tt-6 of the Regulations of Connecticut State Agencies	$2,000
Failure to submit a release remediation closure report in violation of section 22a-134tt-12 of the Regulations of Connecticut State Agencies in the time required by section 22a-134tt-6 of the Regulations of Connecticut State Agencies.	$1,000

Connecticut Release Based Cleanup Regulations: DRAFT Proposal for New Risk-based Remediation Criteria for Managed Multifamily Residential and Passive Recreational Exposure Scenarios

December 29, 2023

Contents

Table of Tables:

Overview: Problem Formulation

Two new exposure scenarios are being proposed for inclusion in updated Release Based Cleanup Regulations (RBCRs) that contain cleanup standards based off of the Connecticut Remediation Standard Regulations (RSRs). These scenarios are Managed Multifamily Residential Soil Exposures and Passive Recreational Soil Exposures. This document describes the derivation of risk-based criteria to support application of these scenarios within the RBCRs.

Derivation of these two proposed risk-based criteria will be based on updated toxicity values for existing substances listed in the RSRs, a consideration of the mutagenicity of each substance, updated exposure estimates and updated criteria formulas. Changes to the remaining exposure scenarios contained in the regulations are not being proposed at this time.

Managed Multifamily Residential Scenario

Scenario

A new exposure scenario applicable to a managed multifamily residential setting is being proposed for inclusion within the cleanup standards section of the RBCRs. This scenario will be available for use at certain managed multifamily housing settings such as apartment buildings or condominiums where rules and practices will be in place to limit access to soils by site residents. It is expected that these sites will be actively managed to support these provisions. Such management measures may include:

- Leasing agreements or condominium declarations and bylaws that will limit residents' access to soil by restricting active recreation only to areas with impervious cover, clearly prohibiting any activities that involve frequent and/or intense direct contact with soil, such as digging in the soil, gardening or activities that result in disturbing the dirt. These prohibitions do not apply to raised bed gardening as long as the soils being used are not from the property and that soils used within the raised beds are not contaminated from other sources. Guidance on how to properly use and construct raised bed gardens is available in the CTDPH Growing and Eating Fruits and Vegetables Safely Fact Sheet.
- The property and grounds will be actively managed by an association or a professional property management company to make sure that open exposure areas of soil are repaired through maintenance activities such as making sure garden beds are properly mulched, maintaining lawns to ensure a dense grass cover of the soil is maintained, and general property maintenance tasks. Property maintenance workers would not engage in major construction or excavation activities that could result in significant soil exposures for an extended time period.
- Residents would be allowed to use well maintained lawn areas at the facility, other paved areas designated for activities (basketball, tennis, playgrounds, etc.)

Under this scenario, soil may be remediated to the Managed Multifamily Residential Direct Exposure Criteria instead of the Residential Direct Exposure Criteria. An Environmental Use Restriction would be required that prohibits: 1. Activities that would result in frequent and/or intense direct contact with soil by residents and 2. Active recreation on areas without impervious cover. There will be no requirements for a cover layer of clean fill or a barrier between contamination and upper soil layers.

Criteria Development

Derivation of the Managed Multifamily Direct Exposure Criteria are based on reduced exposure frequency and intensity of activity at the site, supporting reduced exposures to soils.
This scenario is supported by requirements to reduce soil exposures to residents within a managed setting. However, this management approach may also result in additional soil exposures to groundskeepers and maintenance personnel at the site, as compared with the existing Industrial/Commercial Direct Exposure Criteria, which is based on exposures to indoor workers. As such, the proposed Direct Exposure Criteria for Managed Multifamily Residential sites will consider risks and exposure rates for both child residents, adult residents, and site workers. To support criteria development for this scenario, risks to all three exposure groups (child resident, adult resident, and site worker) are evaluated and are documented below.

Passive Recreation Scenario

Scenario

A new exposure scenario applicable to sites designated for passive recreational activities is being proposed for inclusion within the cleanup standards section of the RBCRs. This scenario will be available for use at certain sites designated solely for passive recreational uses. The following conditions form the basis for this exposure scenario:

- Passive recreation includes hiking, running, walking, and related activities, such as observing and photographing nature, geocaching, letterboxing, mobile app gaming, wildlife viewing, or other activities that do not involve active recreation requiring a dedicated playfield or activities that can result in more direct contact with soil or ground surfaces.
- Passive recreation does not include mountain biking, All Terrain Vehicle (ATV) use, sports activities on athletic fields, picnic areas, swimming areas, or any other recreational activities that may significantly increase a recreator's direct contact with soil.
- Signage is recommended to indicate acceptable and prohibited activities at the location.
- Activities at these locations may be monitored periodically (not required) but active management of on-site activities is not expected
- An Environmental Use Restriction or conservation easement held by a state, local or federal government would be used to limit activity on the parcel as described here.

In these settings, soil may be remediated to the Passive Recreation Exposure Criteria instead of the Residential Direct Exposure Criteria. There will be no requirements for a cover layer of clean fill or a barrier between contamination and upper soil layers.

Criteria Development

Derivation of the Passive Recreation Exposure Criteria are based on reduced exposure frequency and intensity of activity at the site, supporting reduced exposures to soils. This scenario is supported by restricting activities at a site through administrative processes such as Environmental Land Use Restrictions or Conversation Easements. Both children and adults are expected to participate in passive recreational activities, so the derivation of this criteria type will be based on the formulas for the existing Residential Direct Exposure Criteria. Limited maintenance of trails by adults is anticipated as part of this exposure scenario and is factored into derivation of the criteria.

Hazard Identification and Dose Response

Toxicity Values

Toxicity values used in criteria derivation were provided by the Connecticut Department of Public Health (CTDPH). CTDPH staff reviewed toxicity information from multiple sources, including the U.S. Environmental Protection Agency Integrated Risk Information System (IRIS), the Agency for Toxic Substances and Disease Registry, and the California Environmental Protection Agency Office of Environmental Health Hazard. The majority of the selected toxicity values (~75%) were taken from the IRIS database. The remaining values were taken from other sources.

Toxicity values used in calculating the risk-based criteria and supporting documentation is provided in Table 1.

Mutagenicity

EPA recommends considering the potential mutagenicity of each carcinogenic substance in risk analyses. Procedures recommended by EPA in the Guidelines for Carcinogen Risk Assessment (EPA 2005a) and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (EPA 2005b) were used to incorporate consideration of mutagenicity in criteria derivation. Age dependent adjustment factors (ADAFs) recommended by EPA, and identified below, are used along with substance-specific cancer slope factors to account for mutagenicity as appropriate for each substance.

- An ADAF value of 10 is used for exposures during ages 0-2 years;
- An ADAF value of 3 is used for exposures during ages 2-6 years;
- An ADAF value of 3 is used for exposures during ages 6-16 years; and
- An ADAF value of 1 is used for exposure during ages beyond 16 years.

Trichloroethylene

Trichloroethylene causes toxicity to the liver and is associated with Non-Hodgkin's Lymphoma via a carcinogenic pathway. It also causes toxicity to the kidney through a mutagenic pathway. EPA recommends that analyses of the health impacts of trichloroethylene be conducted to account for both the carcinogenic and mutagenic modes of action (EPA 2011a).

Criteria Formulas: Analysis Plan

Criteria formulas for exposures to noncarcinogens are based on exposures to single population groups, such as child residents, adult residents, site workers, child recreators, and adult recreators. Risks to each group are evaluated separately and the exposure group/equation that is protective of all potential exposure groups within a scenario is selected as the basis for the proposed new criteria for noncarcinogens.

Criteria formulas for children and adult exposures to carcinogens within these new scenarios are evaluated using equations that calculate values over a combined exposure period. Criteria formulas for site worker exposures to carcinogens are calculated separately from exposure to residents in the Managed Multifamily Residential scenario.

The various formulas for each scenario are provided in Appendices A and B.

Exposure Assessment

Body Weight

Existing RSR criteria use body weights of 70 kilograms (kg) for adults and 15 kg for children (≤ 6 years). These values were based on the Standard Default Exposure Factors contained in Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual. (USEPA, 1991)

Subsequent to that guidance, EPA provided updated body weight data in the 2011 Exposure Factors Handbook (EFH) (USEPA 2011). The updated body weight recommendations are based on EPA's analysis of the National Health and Nutrition Examination Survey (NHANES) data collected for 1999-2006. This dataset contains newer information than was available when the original risk-based criteria for the RSRs were developed.

Based on data from the 2011 EFH, EPA recommends using 80 kg as the body weight for adults (Table 8-1, included as Table 2 in Appendix D of this document). This value is based on the various mean body weights for adults (male and female combined) and is consistent with the weight data reported for adult age groups from 21 to 80 years, which range from 76.4 kg to 83.6 kg, as presented in Table 8-3 in the report. EPA has incorporated this updated body

weight into the derivation of recommended national water quality criteria for the compounds updated in 2015. (USEPA 2015). Additionally, EPA uses this updated adult bodyweight in the Regional Screening Levels – Generic Tables (USEPA 2023). The Agency for Toxic Substances and Disease Registry (ATSDR) has also issued guidance recommending the use of 80 kg as the body weight for adults (ATSDR 2023). The updated adult body weight of 80 kg is selected for use in deriving risk-based criteria for the additional RSR exposure scenarios.

The 2011 EFH also provides updated body weight data for children. Table 8-25 (included as Table 3 in Appendix D of this document) presents the results from a study by Porter *et al,* presented in the 2011 EFH. That study re-analyzed the data from several NHANES studies and calculated the weight information for typical age ranges used in EPA risk assessment for each NHANES study. The most current data in that presentation is based on NHANES IV (1999-2002). The overall mean weight of 17.3 kg for children ages 1–6 from the Porter analysis (Table 8-25) is selected for use in deriving risk-based criteria for children ages 0–6 years within the additional RSR exposure scenarios.

These same sources are used to derive body weights for other age ranges, as follows:

Age Range	Body Weight (kilogram)	Basis
Adults	80	EPA EFH & ATSDR
Children (0–6 years)	17.3	EPA EFH Table 8-25, overall mean, ages 1–6
Children (0–2 years)	11.4	EPA EFH Table 8-1, value for 1–2-year-olds
Children (2–6 years)	17.3	EPA EFH Table 8-25, overall mean, ages 1–6
Children (6–16 years)	47.7	EPA EFH Table 8-25, overall mean, ages 7–16
People (16–30 years)	80	EPA EFH & ATSDR

Soil Ingestion Rates

Soil Ingestion Rates – Managed Multifamily Residential Scenario

Current RSR values for soil ingestion are 200 milligrams per day (mg/d) for children and 100 mg/d for adults in a residential setting. The current Industrial/Commercial setting includes a soil ingestion rate of 50 mg/d. These rates are consistent with the EPA Risk Assessment Guidance for Superfund (USEPA 1991). The 50 mg/d value is specified for the soil ingestion rate for an office worker.

Reduced soil ingestion rates for adult and child residents are proposed based on the 2017 updated recommendations for soil and dust ingestion in the EFH (EPA 2017). The data is presented in EFH Table 5-1 for total ingestion of soil and dust (included as Table 4 in Appendix D of this document). Total soil and dust ingestion rates include exposures to outdoor soil and dust and indoor dust. This total exposure is recommended since indoor dust is affected by outdoor soil and dust quality. The upper range of the mean exposure was selected for use in deriving exposures for this scenario, providing a central tendency-based exposure value. The use of the upper range of the central tendency distribution was selected since the proposed

criteria derivation does not take into consideration other soil-based exposures, such as dermal or inhalation exposures to soils or behaviors such as soil pica or geophagy, which can substantially increase soil ingestion rates. Soil pica is the recurrent ingestion of high amounts of soil and geophagy is the intentional ingestion of soil, often associated with cultural practices. Considering the soil ingestion rate data in the EFH Table 5-1 for age groups 1 to <2 years, 2 to <6 years and 6 to<12 years, a soil ingestion rate of 100 mg/d for a child of 1 to 6 years is recommended for use in deriving criteria for this scenario. Considering the data in Table 5-1 for age groups 6 to<12 years and 12 years through adult, a soil ingestion rate of 50 mg/d is recommended for use in deriving criteria for this scenario.

The 2017 update to the EFH does not have data on soil ingestion rates for worker scenarios. The EPA Risk Assessment Guidance for Superfund (EPA 1991) provides several soil recommendations: 50 mg/d (indoor workers), 100 mg/d (adult agricultural workers), and 480 mg/d (construction and landscape workers). A value of 100 mg/d is proposed for evaluating risks to maintenance workers within the managed residential setting based on the EPA 1991 estimates for agricultural workers. This value is also consistent with ATSDR's recommended soil ingestion rate of 100 mg/d for outdoor workers with low intensity soil contact (e.g., lawn maintenance workers; ATSDR Exposure Dose Guidance for Soil and Sediment Ingestion, 2018).

Soil Ingestion Rates – Passive Recreation Scenario

Adjustments to soil ingestion rates are proposed for this scenario. For children within the various age groups, the soil ingestion rates selected for the Managed Multifamily Residential Scenario are also proposed for the Passive Recreation Scenario.

For adults and people aged 16–30 years, a soil ingestion rate of 75 mg/d is recommended, based on the average of 50 mg/d (general adult exposures) and 100 mg/d (site-worker adult exposures), recognizing that some adults and older adolescents may participate in trail maintenance activities.

Exposure Frequency

Exposure Frequency – Managed Multifamily Residential Scenario

Exposure frequency is set at 365 days/year for residential settings, consistent with the exposure frequency for the Residential Direct Exposure Criteria within the current RSRs.

Exposure Frequency – Passive Recreation Scenario

To determine appropriate exposure frequency at passive recreational settings, the 2017–2022 Statewide Comprehensive Outdoor Recreation Plan Data (Cohen et al. 2017) for Connecticut was reviewed. This study is based on a three-part survey of municipal officials, general population, and avid recreational enthusiasts. Respondents were asked to identify activities

they participate in and the frequency of that participation. Responses related to frequency did not include an option to indicate daily participation in the activity. The highest frequency for participation was set at several times per week. The results for the general public indicate that a majority of respondents participate in passive recreational activities, with 20% to 44% of respondents indicating they participated in common passive recreational activities several times a week.

Table 1: Passive Recreational Activities and Frequency for CT General Population

Responses Representative of CT General Population			
Activity	**Percentage of respondents that participate in the activity**	**Percentage of respondents that participate several times per week**	**Percentage of respondents that participate a few times per month**
Walking/hiking	65	44	30
Geocaching, letterboxing, mobile gaming	18	41	20
Running	30	34	30
Bird Watching	26	26	29
Road biking	26	20	34

For avid outdoor enthusiasts who reported walking and hiking as their first-choice activity, 61% indicated that they engaged in that activity several times/week.

Based on this data, an Exposure Frequency of 4 days/week x 52 weeks/year, equal to 208 days/year is selected for calculating risk-based criteria for passive recreational exposures.

Exposure Duration & Averaging Time

A total exposure duration of 30 years is used for both the Managed Multifamily Residential Scenario and the Passive Recreation Scenario. For Site Workers, the exposure duration of 25 years is used.

Exposure Durations and Averaging Times used in the calculations are provided in the table below. Note the averaging time is equal to the exposure duration multiplied by 365 days/year.

Age Ranges	**Exposure Duration (years)**	**Averaging Time (days)**
For Exposures to Carcinogens and Mutagens:		
Lifetime Total Exposure	70	25,550
Children (0–2 years)	2	
Children (2–6 years)	4	
Children (6–16 years)	10	
People (16–30 years)	14	

For Exposures to Non-Carcinogens:		
Adults	24	8,760
Children (0–6 years)	6	2,190
Site Worker (Managed Multifamily Setting)	25	9125

Criteria Derivation: Analysis

Criteria calculated using the scenarios, equations, and inputs described above are presented in tables in Appendix D.

Condensed Equations for Derivation of Managed Residential Direct Exposure Criteria

Using the risk-based equations for each scenario and the associated exposure parameters, the equations can be condensed to the following equations to simplify calculations:

Abbreviations:

RfD = Reference Dose
CSF = Cancer Slope Factor
$CSF_{tce\text{-}m}$ = CSF for mutagenic effects for Trichoroethylene
$CSF_{tce\text{-}c}$ = CSF for carcinogenic effects for Trichoroethylene

Noncarcinogens:

Child Residents: RfD x 173,000
Adult Residents: RfD x 1,600,000
Site Workers: RfD x 1,168,000

Carcinogens (Not mutagenic):

Child & Adult: 1.41 / CSF
Site Workers: 3.27 / CSF

Mutagens:

Child & Adult: 0.24

Trichloroethylene:

Child & Adult: $0.02555 / ((CSF_{tce\text{-}m} \times 0.106320) + (CSF_{tce\text{-}c} \times 0.018134))$

Condensed Equations for Derivation of Passive Recreation Direct Exposure Criteria

RfD = Reference Dose
CSF = Cancer Slope Factor
$CSF_{tce\text{-}m}$ = CSF for mutagenic effects for Trichoroethylene
$CSF_{tce\text{-}c}$ = CSF for carcinogenic effects for Trichoroethylene

<u>Noncarcinogens:</u>

Child Recreators: RfD x 303,581.73
Adult Recreators: RfD x 1,871,794.87

<u>Carcinogens (Not mutagenic):</u>

Child & Adult: 2.15 / CSF

<u>Mutagens:</u>

Child & Adult: 0.42

<u>Trichloroethylene:</u>

Child & Adult: $0.02555 / ((CSF_{tce\text{-}m} \times 0.061498) + (CSF_{tce\text{-}c} \times 0.011894))$

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Tables

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
208968	Acenaphthylene		6.0E-02	surrogate	see note	none	none		**RfD** is based on analogy to acenaphthene (IRIS 1990) and listed in CT DEEP (2018). **CSF:** Acenaphthylene has not been classified as a carcinogen by EPA, NTP or IARC at this time.
67641	Acetone		9.0E-01	IRIS	2003	none	none		**CSF**: Acetone has not been classified as a carcinogen by EPA and has not be reviewed for carcinogenicity by NTP or IARC.
107131	Acrylonitrile	Yes	9.0E-05	ATSDR	2023	0.54	IRIS	1987	**RfD** from draft ATSDR (2023) provisional chronic MRL for GI affects in lifetime drinking water study in rats is selected over RfD of 1E-03 from HEAST (1993) for testicular effects in short-term (60-d) gavage study in mice.
15972608	Alachlor		5.0E-04	Cal-OEHHA	1997	see note			**RfD** from Cal PHG for alachlor (Cal EPA 1997) is protective of cancer and non-cancer effects and similar to IRIS RfD modified by additional UF of 10 for possible cancer (RfD: 0.001 mg/kg-d). A CSF is available from (Cal EPA1997) but was not

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
									used for PHG because it was derived using a linear approach that is not supported by animal toxicity data which indicate cancer induced by threshold mechanism.
116063	Aldicarb		1.0E-03	IRIS	1993	none	none		**CSF**: Aldicarb has not been classified as a carcinogen by EPA, NTP or IARC.
120127	Anthracene		3.0E-01	IRIS	1990	none	none		IARC (2023) classified anthracene as possible human carcinogen (2B). There is no CSF and IRIS RfD based on total UF of 3,000 precludes adding additional UF to address possible carcinogenicity. Use ATSDR intermediate MRL with mod for chronic (UF 10) and possible cancer (UF 3) would result in RfD of 0.3 that is identical to IRIS value. EPA and NTP have not classified anthracene as a carcinogen by EPA or NTP as of 12/2023.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
7440360	Antimony		2.0E-04	ATSDR w/mod	2019	none	none		**RfD:** derived from ATSDR intermediate MRL of 0.0006 with the addition of UF √10 (i.e., 3) for chronic exposure. The RfD from modified MRL is similar to the non-cancer tox value from Cal OEHHA (1.4E-04) based on different effect but derived from the same study (Cal OEHHA, 2016). **CSF**: Antimony has not been classified as a carcinogen by EPA, NTP or IARC.
7440382	Arsenic	Yes	3.0E-04	IRIS	1991	1.5E+00	IRIS	1995	
1912249	Atrazine		3.0E-04	ATSDR w/mod	2003	See note			**RfD** from ATSDR intermediate MRL lowered by 3x for chronic and 3x for possible carcinogenicity; a CSF of 0.23/mg-kg-d from Cal EPA (1999) exists but relevance of mammary tumors has been questioned by EPA, ATSDR and other researchers. Atrazine has not been classified as a carcinogen by EPA, NTP or IARC.
7440393	Barium		2.0E-01	IRIS	2005	none	none		**CSF**: Barium has not been classified as a carcinogen by EPA, NTP or IARC.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
71432	Benzene	Yes	4.0E-03	IRIS	2003	5.5E-02	IRIS	2000	Lower tox values are available but not recommended because findings may not be generalizable to U.S. general population and may overstate risk from benzene due to co-exposures to other VOCs in addition to benzene
56553	Benzo[a]anthracene	Yes	3.0E-02	DPH	2018	1.0E-01	RPF, see note	2017; 1993	**RfD:** Use 0.03 mg/kg-d as per DPH PAH memo to DEEP dated 4.4.2018. **CSF** based on EPA IRIS (2017) value for BAP; adjusted to RPF for benzo(a)anthracene (EPA 1993).
50328	Benzo(a)pyrene	Yes	3.0E-04	IRIS	2017	1.0E+00	IRIS	2017	
205992	Benzo(b)fluoranthene	Yes	3.0E-02	DPH	2018	1.0E-01	RPF, see note	2017; 1993	**RfD**: Use 0.03 mg/kg-d as per DPH PAH memo to DEEP dated 4.4.2018. **CSF** is based EPA IRIS (2017) value for BAP; adjusted to RPF for benzo(b)fluoranthene (EPA 1993).
207089	Benzo(k)fluoranthene	Yes	3.0E-02	DPH	2018	1.0E-02	RPF, see note	2017; 1993	**RfD:** Use 0.03 mg/kg-d as per DPH PAH memo to DEEP dated 4.4.2018. **CSF** is based EPA IRIS (2017) value for BAP; adjusted to RPF for benzo(k)fluoranthene (EPA 1993)

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
7440417	Beryllium		2.0E-04	IRIS w/mod	1998	none	none		IRIS RfD modified by additional UF of 10 for possible sensitization via dermal exposure (ATSDR 2023). **CSF:** none. NTP and IARC have classified Beryllium as a human carcinogen based on lung cancer via inhalation; evidence is limited for cancer following ingestion (EPA Group D carcinogen by oral route), therefore DPH did not modify oral RfD for possible carcinogenicity.
111444	Bis(2-chloroethyl)ether [BCEE]		none	none		1.1E+00	IRIS	1987	**RfD**: no appropriate toxicological data available
108601	Bis(2-Chloroisopropyl)ether [BCMEE]		1.0E-02	IRIS w/mod	1989	none	none		**RfD:** IRIS RfD with additional UF of 3 for possible carcinogenicity as per DPH memo to DEEP dated 5.8.18. **CSF:** No appropriate toxicological data are available; former HEAST cancer toxicity values are obsolete (EPA PPRTV 2011)
117817	Bis(2-ethylhexyl)phthalate [DEHP]		1.0E-04	ATSDR	2022	1.4E-02	IRIS	1988	
75252	Bromoform	Yes	2.0E-02	IRIS	1987	7.9E-03	IRIS	1990	Tox values are from DPH Memo (5.8.2018) to DEEP

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
78933	Butanone, 2- [MEK]		6.0E-01	IRIS	2003	none	none		
85687	Benzyl butyl phthalate		5.0E-02	IRIS w/mod	1989	none	none		**RfD** is modified by additional UF of 3 to address the possible carcinogenicity of BBP; A provisional CSF exists from PPRTV (2002) that is based on limited evidence and a linear approach that likely overestimates cancer risk as experimental data suggest a threshold mechanism
7440439	Cadmium		1.0E-04	ATSDR	2012	none	none		No CSF is available b/c evidence is insufficient for cancer from exposure to cadmium via ingestion (ATSDR 2012; EPA 1989). DPH did not modify RfD for potential carcinogenicity because Cd does not appear to be carcinogenic by the oral route.
56235	Carbon Tetrachloride		4.0E-03	IRIS	2010	7.0E-02	IRIS	2010	
12789036	Chlordane		5.0E-04	IRIS	1998	3.5E-01	IRIS	1998	
108907	Chlorobenzene		2.0E-02	IRIS	1989	none	none		**CSF**: chlorobenzene has not been classified as a carcinogen by EPA, NTP or IARC.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
67663	Chloroform		1.0E-02	IRIS	2001	none	none		**CSF**: EPA considers the RfD of 0.01mg/kg/d adequately protective against cancer effect.
95578	Chlorophenol, 2-		5.0E-03	IRIS	1988	none	none		**CSF:** 2-Chlorophenol has not been classified as a carcinogen by EPA, NTP or IARC.
18540299	Chromium, hexavalent	Yes	9.0E-04	ATSDR	2012	5.0E-01	OEHHA	2011	
16065831	Chromium, trivalent		1.5E+00	IRIS	1998	none	none		**CSF**: trivalent chromium has not been classified as a carcinogen by EPA, NTP or IARC.
7440508	Copper		3.0E-03	ATSDR w/mod	2004	none	none		**RfD**: based on ATSDR (2004) intermediate MRL of 0.01 with an additional UF=3 to account for chronic duration. **CSF**: copper has not been classified as a carcinogen by EPA, NTP or IARC.
57125	Cyanide, free		6.3E-04	IRIS	2010	none	none		**CSF**: cyanide has not been classified as a carcinogen by EPA, NTP or IARC.
94757	Dichlorophenoxyacetic Acid, 2,4- [D, 2,4-]		1.0E-03	IRIS w/mod	1987	none	none		**RfD**: IRIS RfD with additional UF of 10 to account for possible carcinogenicity
124481	Dibromochloromethane	Yes	2.0E-02	IRIS	1987	8.4E-02	IRIS	1987; rev1992	
95501	Dichlorobenzene, 1,2-		9.0E-02	IRIS	1989	none	none		**CSF**: 1,2-dichlorobenzene has not been classified as a carcinogen by EPA, NTP or IARC.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
541731	Dichlorobenzene, 1,3-		2.0E-03	ATSDR w/mod	2006	none	none		**RfD** is ATSDR intermediate oral MRL with additional UF=10 to account for exposure duration
106467	Dichlorobenzene, 1,4-		7.0E-02	ATSDR	2006	5.4E-03	OEHHA	1997	
75343	Dichloroethane, 1,1-		1.0E-02	HEAST w/mod	1997	none	none		
107062	Dichloroethane, 1,2-	Yes	2.0E-02	ATSDR w/mod	2022	9.1E-02	IRIS	1987	**RfD** is ATSDR draft int MRL with additional UF=10 to account for duration, also supported by PPRTV subchronic RfD
75354	Dichloroethylene, 1,1-		5.0E-03	IRIS w/mod	2002	none	none		**RfD**: IRIS RfD with additional UF of 10 to account for possible carcinogenicity
156592	Dichloroethylene, cis-1,2-		2.0E-03	IRIS	2010	none	none		**CSF:** Cis-1,2-dichloroethylene has not been classified as a carcinogen by EPA, IARC, or NTP
156605	Dichloroethylene, trans-1,2-		2.0E-02	IRIS	2010	none	none		**CSF:** Trans-1,2-DCE has not been classified as a carcinogen by EPA, IARC, or NTP.
120832	Dichlorophenol, 2,4-		3.0E-03	IRIS	1987	none	none		**CSF**: 2.4-dichlorophenol has not been classified as a carcinogen by EPA, NTP or IARC.
78875	Dichloropropane, 1,2-		2.0E-02	ATSDR w/mod	2021	3.6E-02	OEHHA	1999	**RfD** is based on ATSDR intermediate oral MRL with additional UF=3 (instead of 10 because cumulative UF would be 10000) to account for exposure duration

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
542756	Dichloropropene, 1,3-	Yes	3.0E-02	IRIS	2000	1.0E-01	IRIS	2000	
60571	Dieldrin		5.0E-05	IRIS	1988	1.6E+01	IRIS	1988	
84742	Di-n-butyl phthalate		1.5E-03	DPH	2018	none	none		**RfD** is from CalEPA Proposition 65 (MADL 2007) as per DPH memo to DEEP dated 5.8.18. **CSF**: Di-n-butyl phthalate has not been classified as a carcinogen by EPA, NTP or IARC.
117840	Di-n-octyl phthalate		1.0E-02	ATSDR w/mod	1997	none	none		**RfD** is from ATSDR intermediate MRL (1997) with additional UF of 10 for chronic exposure and UF of 3 for antiandrogenic effect of phthalates; **CSF**: Di-n-octyl phthalate has not been classified as a carcinogen by EPA, NTP or IARC.
72208	Endrin		3.0E-04	IRIS	1988	none	none		**CSF**: endrin has not been classified as a carcinogen by EPA, NTP or IARC.
100414	Ethylbenzene		1.0E-01	IRIS	1987	1.1E-02	OEHHA	2007	
106934	Ethylene dibromide	Yes	9.0E-03	IRIS	2004	2.0E+00	IRIS	2004	
206440	Fluoranthene		4.0E-02	IRIS	1990	none	none		**CSF**: fluoranthene has not been classified as a carcinogen by EPA, NTP or IARC.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
86737	Fluorene		4.0E-02	IRIS	1990	none	none		**CSF**: fluorene has not been classified as a carcinogen by EPA, NTP or IARC.
76448	Heptachlor		5.0E-04	IRIS	1987	4.5E+00	IRIS	1987	
1024573	Heptachlor epoxide		1.3E-05	IRIS	1987	9.1E+00	IRIS	1987	
118741	Hexachlorobenzene		1.0E-05	DPH	2018	1.6E+00	IRIS	1991	**RfD** from DPH memo (5.8.2018) sent to DEEP.
67721	Hexachloroethane		7.0E-04	IRIS	2011	4.0E-02	IRIS	2011	
7439921	Lead		none			none			There is no RfD or CSF available. There is no threshold of effect for lead, therefore no RfD can be calculated. Lead exposure and health effects are assessed using EPA's toxicokinetic models (EPA 2003).
58899	Lindane		3.0E-04	IRIS	1987	1.1	OEHHA	2005	
7487947	Mercury - inorganic		3.0E-04	IRIS	1995	none	none		**CSF**: mercury has not been classified as a carcinogen by EPA, NTP or IARC.
72435	Methoxychlor		2.0E-03	IRIS w/mod	1990	none	none		**RfD** from IRIS with additional UF of 3 to address possible carcinogenicity.
108101	Methyl isobutyl ketone		8.6E-02	IRIS w/mod	2003	none	none		**RfD** from R-2-R extrapolation IRIS RfC based on systemic

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
									effects and modified by UF of 10 for possible carcinogenicity.
1634044	Methyl tert butyl ether		1.0E-02	ATSDR w/mod	2023	none	none		**RfD** is ATSDR intermediate oral MRL with additional UF=10 to account for exposure duration and UF of 3 for possible carcinogenicity. A CSF from Cal OEHHA exists based on low-dose linear extrapolation
75092	Methylene chloride	Yes	6.0E-03	IRIS	2011	2.0E-03	IRIS	2011	
91203	Naphthalene		2.0E-02	IRIS	1998	none	none		**RfD** value from DPH 4.4.2018 memo to DEEP.
7440020	Nickel		2.0E-03	IRIS w/mod	1991	none	none		IRIS **RfD** (1996) with additional UF of 10 to account for allergic sensitization potential which may cause low doses to be a risk for dermal reactions after initial exposure, and due to potential for more sensitive reproductive toxicity and possible oral cancer.
87865	Pentachlorophenol	Yes	2.5E-03	DPH	2018	4.0E-01	IRIS	2010	**RfD** value from DPH 5.8.2018 memo to DEEP.
85018	Phenanthrene		3.0E-02	DPH	2018	none	none		**RfD** value from DPH 4.4.2018 memo to DEEP; **CSF**: Phenanthrene has not been classified as a carcinogen by EPA, NTP or IARC.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
108952	Phenol	Yes	3.0E-02	IRIS w/mod	2002	none	none		**RfD** is from IRIS (2002) with additional UF=10 to account for evidence on positive mutagenicity but limited evidence on carcinogenicity as per DPH memo to DEEP dated 5.8.18.
1336363	Polychlorinated biphenyls		2.0E-05	IRIS	1994	2	IRIS	1996	**RfD** from IRIS (1994) for Aroclor 1254 (11097-69-1) is most health protective value; **CSF** from IRIS (1996) for higher chlorinated "high risk" congeners. Evaluation on congener profile is recommended if criterion is exceeded.
129000	Pyrene		3.0E-02	IRIS	1990	none	none		**CSF**: pyrene has not been classified as a carcinogen by EPA, NTP or IARC.
7782492	Selenium		5.0E-03	IRIS	1991	none	none		**CSF**: selenium has not been classified as a carcinogen by EPA, NTP or IARC.
7440224	Silver		5.0E-03	IRIS	1991	none	none		**CSF**: silver has not been classified as a carcinogen by EPA, NTP or IARC.
122349	Simazine		5.0E-03	IRIS w/mod	1993	none	none		**RfD** from IRIS with additional UF of 10 for possible carcinogenicity - mammary tumors in rats; mixed genotoxic results (IARC, Vol 73, 1999).

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
100425	Styrene	Yes	7.0E-02	IRIS w/mod	1987	none	none		**RfD** from IRIS with additional UF of 3 to account for possible carcinogenicity (total UF =3000)
630206	Tetrachloroethane, 1,1,1,2-	Yes	3.0E-02	IRIS	1987	2.6E-02	IRIS	1987	
79345	Tetrachloroethane, 1,1,2,2-	Yes	2.0E-02	IRIS	2010	2.0E-01	IRIS	2010	
127184	Tetrachloroethylene		6.0E-03	IRIS	2012	2.1E-03	IRIS	2012	
7791120	Thallium		1.0E-05	Cal OEHHA	2004	none	none		**RfD** is from Cal OEHHA PHG (1999, update 2004)
108883	Toluene		2.0E-03	ATSDR	2017	none	none		
8001352	Toxaphene	Yes	2.0E-04	ATSDR w/mod	2014	1.1	IRIS	1988	**RfD** is ATSDR intermediate MRL (2014) with additional UF of 10 to account for chronic exposure.
71556	Trichloroethane, 1,1,1-		7.6E-02	CalPHG	2006	none	none		**CSF**: 1,1,1-Trichloroethane has not been classified as a carcinogen by EPA, NTP or IARC.
79005	Trichloroethane, 1,1,2-		4.0E-03	IRIS	1988	5.7E-02	IRIS	1987	
79016	Trichloroethylene	Yes	5.0E-04	IRIS	2011	9.3E-03 (kidney); 3.7E-02 (NHL + Liver)	IRIS	2011	CSFs are presented separately for kidney (which occurs through a known mutagenic MOA), and for liver and NHL combined (MOA unknown). Thus, ADAFs are only applied to the CSF for kidney cancer.

CASRN	Chemical Name	Mutagen	RfD (mg/kg-d)	Source of RfD Toxicity Value	RfD Date	Cancer Slope Factor (mg/kg/d)^-1)	Source of CSF Toxicity Value	CSF Date	Comment
1314621	Vanadium		9.0E-04	IRIS w/mod	1988	none	none		IRIS RfD modified by additional UF of 10 for potential increased toxicity from vanadium compounds other than vanadium pentoxide (PPRTV 2009)
75014	Vinyl chloride	Yes	3.0E-03	IRIS	2000	0.72	IRIS	2000	**CSF** is IRIS (2000) CSF for continuous lifetime exposure during adulthood using LMS method.
1330207	Xylenes		2.0E-01	IRIS	2003	none	none		
7440666	Zinc		3.0E-01	IRIS	2005	none	none		

Appendix A: Equations for Soil Exposure within a Managed Multifamily Residential Setting

Managed Multifamily Direct Exposure Criteria Formulas for Soil Exposures to Residents

Note: Default RSR criteria for non-carcinogens for this exposure scenario will be based on the Child Managed Multifamily Residential Exposures. The other equations are included for use in the TSD.

Equations for carcinogens, mutagens and Trichloroethylene also need to be provided within RSRs.

For Non-carcinogenic substances:

Child Resident Exposures

$DEC_{C\_MF\_NC}$ (mg/kg) = (RfD x HI x $BW_{(0-6)}$ x AT_{c_res}) / ($SIR_{(0-6)\_mf}$ x EF_{res} x $ED_{(0-6)}$ x CF_{soil})

Adult Resident Exposures (not needed in RSRs)

$DEC_{A\_MF\_NC}$ (mg/kg) = (RfD x HI x BW_a x AT_{a_es}) / (SIR_{a_mf} x EF_{res} x ED_a x CF_{soil})

Site Worker Exposures (not needed in RSRs)

$DEC_{SW\_MF\_NC}$ (mg/kg) = (RfD x HI x BW_a x AT_{sw_mf}) / (SIR_{sw_mf} x EF_{sw_mf} x ED_{sw_mf} x CF_{soil})

For substances that are carcinogenic:

Exposure to Site Workers: (not needed in RSRs)

$DEC_{SW\_MF\_C}$ (mg/kg) = (RL x BW_a x AT) / (CSF x SIR_{sw_mf} x EF_{sw_mf} x ED_{sw_mf} x CF_{soil})

Exposure to Child and Adult Residents:

DEC_{MFres_Cnm} (mg/kg) = (RL x AT)/(CSF x CF_{soil} x TSD_{mf})

TSD_{mf} (mg/kg) = SD_{0-6mf} + SD_{amf}

SD_{0-6mf} (mg/kg) = ($SIR_{(0-6)mf}$ x $ED_{(0-6)}$ x EF_{res}) / $BW_{(0-6)}$

SD_{amf} (mg/kg) = (SIR_{amf} x ED_a x EF_{res}) / BW_a

For mutagenic substances:

Exposure to Child and Adult Residents:

DEC_{MFres_Cm} = (RL x AT) / (CSF x CF_{soil} x $TSDM_{mf}$)

Where:

$TSDM_{mf}$ (mg/kg) = $SD_{0\text{-}2mf}$ + $SD_{2\text{-}6mf}$ + $SD_{6\text{-}16mf}$ + $SD_{16\text{-}30mf}$

$SD_{0\text{-}2mf}$ (mg/kg) = ($SIR_{(0\text{-}2)\_mf}$ x $ADAF_{(0\text{-}2)}$ x $ED_{(0\text{-}2)}$ x EF_{res}) / $BW_{(0\text{-}2)}$

$SD_{2\text{-}6mf}$ (mg/kg) = ($SIR_{(2\text{-}6)}$ x $ADAF_{(2\text{-}6)}$ x $ED_{(2\text{-}6)}$ x EF_{res}) / $BW_{(2\text{-}6)}$

$SD_{6\text{-}16mf}$ (mg/kg) = ($IR_{(6\text{-}16)}$ x $ADAF_{(6\text{-}16)}$ x $ED_{(6\text{-}16)}$ x EF_{res}) / $BW_{(6\text{-}16)}$

$SD_{16\text{-}30mf}$ (mg/kg) = ($IR_{(16\text{-}30)}$ x $ADAF_{(16\text{-}30)}$ x $ED_{(16\text{-}30)}$ x EF_{res}) / $BW_{(16\text{-}30)}$

For Trichloroethylene

Exposure to Child and Adult Residents:

$DEC_{mf\text{-}TCE}$ = (RL x AT) / (($CSF_{TCE\text{-}M}$ x CF_{soil} x $TSDM_{mf}$) + ($CSF_{TCE\text{-}C}$ x CF_{soil} x TSD_{mf}))

$TSDM_{mf}$ (mg/kg) = $SD_{0\text{-}2mf}$ + $SD_{2\text{-}6mf}$ + $SD_{6\text{-}16mf}$ + $SD_{16\text{-}30mf}$

$SD_{0\text{-}2mf}$ (mg/kg) = ($SIR_{(0\text{-}2)\_mf}$ x $ADAF_{(0\text{-}2)}$ x $ED_{(0\text{-}2)}$ x EF_{res}) / $BW_{(0\text{-}2)}$

$SD_{2\text{-}6mf}$ (mg/kg) = ($SIR_{(2\text{-}6)}$ x $ADAF_{(2\text{-}6)}$ x $ED_{(2\text{-}6)}$ x EF_{res}) / $BW_{(2\text{-}6)}$

$SD_{6\text{-}16mf}$ (mg/kg) = ($IR_{(6\text{-}16)}$ x $ADAF_{(6\text{-}16)}$ x $ED_{(6\text{-}16)}$ x EF_{res}) / $BW_{(6\text{-}16)}$

$SD_{16\text{-}30mf}$ (mg/kg) = ($IR_{(16\text{-}30)}$ x $ADAF_{(16\text{-}30)}$ x $ED_{(16\text{-}30)}$ x EF_{res}) / $BW_{(16\text{-}30)}$

TSD_{mf} (mg/kg) = $SD_{0\text{-}6mf}$ + SD_{amf}

$SD_{0\text{-}6mf}$ (mg/kg) = ($SIR_{(0\text{-}6)\_mf}$ x $ED_{(0\text{-}6)}$ x EF_{res}) / $BW_{(0\text{-}6)}$

SD_{amf} (mg/kg) = (SIR_a x ED_a x EF_{res}) / BW_a

Exposure Values for Soil Exposures at Managed Multifamily Residential Sites			
Terms	Description	Value	Units
Criteria Types			
$DEC_{C\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Child Residents in a Managed Multifamily Residential Setting	Chemical Specific	mg/kg
$DEC_{A\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Adult Residents in a Managed Multifamily Residential Setting	Chemical Specific	mg/kg
$DEC_{SW\_MF\_NC}$	Direct Exposure Criteria for Soil Exposures to Site Workers in a Managed Multifamily Residential Setting Non Cancer	Chemical Specific	mg/kg
$DEC_{SW\_MF\_C}$	Direct Exposure Criteria for Soil Exposures to Site Workers in a Managed Multifamily Residential Setting (Carcinogen)	Chemical Specific	mg/kg
DEC_{MFres_Cnm}	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Carcinogens)	Chemical Specific	mg/kg
DEC_{MFres_Cm}	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Mutagens)	Chemical Specific	mg/kg
$DECmf_{\text{-}TCE}$	Direct Exposure Criteria for Soil Exposures to Child and Adult Residents in a Managed Multifamily Residential Setting (Trichloroethylene)	Chemical Specific	mg/kg
Variables			
ADAF(0-2)	Age Dependent Adjustment Factor for mutagenic cancer risk - 0–2 years	10	unitless
ADAF(16-30)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 16–30 years	1	unitless

ADAF(2-6)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 2–6 years	3	unitless
ADAF(6-16)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 6–16 years	3	unitless
SDa_mf	Soil dose for adult residents in Multifamily Residential setting	5475	mg/kg
SD(0-6)_mf	Soil dose for ages 0–6 in Multifamily Residential setting	12658.95954	mg/kg
SD(0-2)_mf	Soil dose for ages 0–2 in Multifamily Residential setting	64,035.09	mg/kg
SD(2-6)_mf	Soil dose for ages 2–6 in Multifamily Residential setting	25,317.92	mg/kg
SD(6-16)_mf	Soil dose for ages 6–16 in Multifamily Residential setting	22,955.97	mg/kg
SD(16-30)_mf	Soil dose for ages 16–30 in Multifamily Residential setting	3,421.88	mg/kg
AT	Averaging Time - Carcinogens	25,550	days
ATa_PRec	Averaging Time - Adult Non-carcinogen (passive recreation exposure)	8,760	days
ATa_res	Averaging Time - Adult Non-carcinogen (residential exposure)	8,760	days
ATc_PRec	Averaging Time - Child Non-carcinogen (passive recreation exposure)	2,190	days
ATc_res	Averaging Time - Child Non-carcinogen (residential exposure)	2,190	days
ATsw_mf	Averaging Time Adult site worker non-carcinogen Multi-Family Residential Exposure Scenario	9,125	days
BW(0-2)	Body Weight - ages 0–2 years	11.4	kg
BW(0-6)	Body Weight - ages 0–6 years	17.3	kg
BW(16-30)	Body Weight - ages 16–30 years	80	kg
BW(2-6)	Body Weight - ages 2–6 years	17.3	kg
BW(6-16)	Body Weight - ages 6–16 years	47.7	kg
BWa	Body Weight - Adult	80	kg
CFsoil	Conversion Factor (kg/mg) for soil	0.000001	kg/mg
CSF	Cancer Slope Factor	chem specific	chem specific
CSF_{TCE-C}	Cancer Slope Factor for Trichloroethylene carcinogenic risks	chem specific	chem specific
CSF_{TCE-M}	Cancer Slope Factor for Trichloroethylene for mutagenic risks	chem specific	chem specific
ED(0-2)	Exposure Duration - ages 0–2 years	2	years
ED(0-6)	Exposure Duration - ages 0–6 years	6	years
ED(16-30)	Exposure Duration - ages 16–30 years	15	years

ED(2-6)	Exposure Duration - ages 2–6 years	4	years
ED(6-16)	Exposure Duration - ages 6–16 years	10	years
EDa	Exposure Duration - Adult	24	years
EDsw_mf	Exposure Duration site worker residential multifamily	25	years
EFres	Exposure Frequency Residential	365	days/year
EFsw_mf	Exposure Frequency site worker residential multifamily	250	days/year
HI	Hazard Index	1	unitless
TSDmf	Total Soil Dose for children and adults in a Multifamily Residential setting for exposures carcinogens	18,134.0	mg/kg
TSDMmf	Total Soil Dose for children and adults in a Multifamily Residential setting for exposures to mutagens	115,730.9	mg/kg
RfD	Reference Dose	chem specific	mg/kg/d
RL	Risk Level	0.000001	unitless
SIR(0-2)_mf	Soil Ingestion Rate - Residential Multifamily (ages 0–2 years)	100	mg/day
SIR(0-6)_mf	Soil Ingestion Rate - (ages 0–6 years) Residential Multifamily	100	mg/day
SIR(16-30)_mf	Soil Ingestion Rate -Residential Multifamily (age 16–30)	50	mg/day
SIR(2-6)_mf	Soil Ingestion Rate - Residential Multifamily (ages 2–6 years)	100	mg/day
SIR(6-16)_mf	Soil Ingestion Rate - (ages 6–16 years)	100	mg/day
SIRa_mf	Soil Ingestion Rate - Adult Residential Multifamily	50	mg/day
SIRsw_mf	Soil Ingestion Rate - Site Worker Residential Multifamily	100	mg/day

Appendix B: Equations for Soil Exposure within a Passive Recreation Setting

Note: Default RSR criteria for non-carcinogens for this exposure scenario will be based on the Child Passive Recreation Exposures. The adult non-cancer equation is included for use in the TSD.

Equations for carcinogens, mutagens and Trichloroethylene also need to be provided within RSRs.

For non-carcinogenic substances:

Child Passive Recreation Exposures

$DEC_{C\_PRec\_NC}$ (mg/kg) = (RfD x HI x $BW_{(0-6)}$ x AT_{c_PRec}) / ($SIR_{(0-6)\_PRec}$ x EF_{PRec} x $ED_{(0-6)}$ x CF_{soil})

Adult Resident Exposures (not needed in RSRs)

$DEC_{A\_PRec\_NC}$ (mg/kg) = (RfD x HI x BW_a x $AT_{a\text{-}PRec}$) / (SIR_{a_PRec} x EF_{PRec} x ED_a x CF_{soil})

For Carcinogenic substances:

Exposure to Child and Adult Passive Recreators:

DEC_{PRrec_Cnm} (mg/kg) = (RL x AT)/(CSF x CF_{soil} x TSD_{PRec})

TSD_{PRec} (mg/kg) = $SD_{0\text{-}6PRec}$ + SD_{aPRec}

$SD_{0\text{-}6PRec}$ (mg/kg) = ($SIR_{(0-6)\_PRec}$ x $ED_{(0-6)}$ x EF_{PRec}) / $BW_{(0-6)}$

SD_{aPRec} (mg/kg) = (SIR_{aPRec} x ED_a x EF_{PRec}) / BW_a

For Mutagenic substances:

Exposure to Child and Adult Passive Recreators:

$DEC_{PRec\_Cm} =$ $(RL \times AT) / (CSF \times CF \times TSDM_{PRec})$

Where:

$TSDM_{PRec}$ (mg/kg) = $SD_{0\text{-}2PRec} + SD_{2\text{-}6PRec} + SD_{6\text{-}16PRec} + SD_{16\text{-}30PRec}$

$SD_{0\text{-}2PRec}$ (mg/kg) = $(SIR_{(0\text{-}2)\_PRec} \times ADAF_{(0\text{-}2)} \times ED_{(0\text{-}2)} \times EF_{PRec}) / BW_{(0\text{-}2)}$

$SD_{2\text{-}6PRec}$ (mg/kg) = $(SIR_{(2\text{-}6)\_PRec} \times ADAF_{(2\text{-}6)} \times ED_{(2\text{-}6)} \times EF_{PRec}) / BW_{(2\text{-}6)}$

$SD_{6\text{-}16PRec}$ (mg/kg) = $(SIR_{(6\text{-}16)\_PRec} \times ADAF_{(6\text{-}16)} \times ED_{(6\text{-}16)} \times EF_{PRec}) / BW_{(6\text{-}16)}$

$SD_{16\text{-}30PRec}$ (mg/kg) = $(SIR_{(16\text{-}30)\_Prec} \times ADAF_{(16\text{-}30)} \times ED_{(16\text{-}30)} \times EF_{PRec}) / BW_{(16\text{-}30)}$

For Trichloroethylene – Carcinogenic and Mutagenic Risks

Exposure to Child and Adult Residents:

$$DEC_{PRecTCE} = (RL \times AT) / ((CSF_{TCE\text{-}M} \times CF_{soil} \times TSDM_{PRec}) + (CSF_{TCE\text{-}C} \times CF_{soil} \times TSD_{PRec}))$$

$$TSDM_{PRec}\ (mg/kg) = SD_{0\text{-}2PRec} + SD_{2\text{-}6PRec} + SD_{6\text{-}16PRec} + SD_{16\text{-}30PRec}$$

$$SD_{0\text{-}2PRec}\ (mg/kg) = (SIR_{(0\text{-}2)\_PRec} \times ADAF_{(0\text{-}2)} \times ED_{(0\text{-}2)} \times EF_{PRec}) / BW_{(0\text{-}2)}$$

$$SD_{2\text{-}6PRec}\ (mg/kg) = (SIR_{(2\text{-}6)\_PRec} \times ADAF_{(2\text{-}6)} \times ED_{(2\text{-}6)} \times EF_{PRec}) / BW_{(2\text{-}6)}$$

$$SD_{6\text{-}16PRec}\ (mg/kg) = (SIR_{(6\text{-}16)\_PRec} \times ADAF_{(6\text{-}16)} \times ED_{(6\text{-}16)} \times EF_{PRec}) / BW_{(6\text{-}16)}$$

$$SD_{16\text{-}30PRec}\ (mg/kg) = (SIR_{(16\text{-}30)\_Prec} \times ADAF_{(16\text{-}30)} \times ED_{(16\text{-}30)} \times EF_{PRec}) / BW_{(16\text{-}30)}$$

$$TSD_{PRec}\ (mg/kg) = SD_{0\text{-}6PRec} + SD_{aPRec}$$

$$SD_{0\text{-}6PRec}\ (mg/kg) = (SIR_{(0\text{-}6)\_PRec} \times ED_{(0\text{-}6)} \times EF_{PRec}) / BW_{(0\text{-}6)}$$

$$SD_{aPRec}\ (mg/kg) = (SIR_{aPRec} \times ED_{a} \times EF_{PRec}) / BW_{a}$$

Exposure Values for Soil Exposures at Passive Recreational Sites			
Terms	Description	Value	Units
Criteria Types			
$DEC_{C\_PRec\_NC}$	Direct Exposure Criteria for Soil Exposures to Children aged 0-6 years in a Passive Recreation Setting (Non-cancer)	Chemical Specific	mg/kg
$DEC_{A\_PRec\_NC}$	Direct Exposure Criteria for Soil Exposures to Adult Residents in a Passive Recreation Setting (Non-cancer)	Chemical Specific	mg/kg
DEC_{PRec_Cnm}	Direct Exposure Criteria for Soil Exposures to Children and Adults in a Passive Recreation Setting (carcinogens)	Chemical Specific	mg/kg

DEC_{PRec_Cm}	Direct Exposure Criteria for Soil Exposures to Children and Adults in a Passive Recreation Setting (Mutagens)	Chemical Specific	mg/kg
$DECPRec_{\_TCE}$	Direct Exposure Criteria for Soil Exposures to Children and Adults in a Passive Recreation Setting (Trichloroethylene)	Chemical Specific	mg/kg
Variables			
ADAF(0-2)	Age Dependent Adjustment Factor for mutagenic cancer risk - 0–2 years	10	unitless
ADAF(16-30)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 16–30 years	1	unitless
ADAF(2-6)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 2–6 years	3	unitless
ADAF(6-16)	Age Dependent Adjustment Factor for mutagenic cancer risk - ages 6–16 years	3	unitless
SDa_Prec	Soil dose for adult residents in Multifamily Residential setting	4680	mg/kg
SD(0-6)_PRec	Soil dose for ages 0–6 in Multifamily Residential setting	7213.872832	mg/kg
SD(0-2)_PRec	Soil dose for ages 0–2 in Multifamily Residential setting	36,491.23	mg/kg
SD(2-6)_PRec	Soil dose for ages 2–6 in Multifamily Residential setting	14,427.75	mg/kg
SD(6-16)_PRec	Soil dose for ages 6–16 in Multifamily Residential setting	13,081.76	mg/kg
SD(16-30)_PRec	Soil dose for ages 16–30 in Multifamily Residential setting	2,925.00	mg/kg
AT	Averaging Time - Carcinogens	25,550	days
ATa_PRec	Averaging Time - Adult Non-carcinogen (passive recreation exposure)	8,760	days
ATc_PRec	Averaging Time - Child Non-carcinogen (passive recreation exposure)	2,190	days
BW(0-2)	Body Weight - ages 0–2 years	11.4	kg
BW(0-6)	Body Weight - ages 0–6 years	17.3	kg
BW(16-30)	Body Weight - ages 16–30 years	80	kg
BW(2-6)	Body Weight - ages 2–6 years	17.3	kg
BW(6-16)	Body Weight - ages 6–16 years	47.7	kg
BWa	Body Weight - Adult	80	kg
CFsoil	Conversion Factor (kg/mg) for soil	0.000001	kg/mg
CSF	Cancer Slope Factor	chem specific	chem specific
$CSF_{TCE\text{-}C}$	Cancer Slope Factor for Trichloroethylene non- mutagenic risks	chem specific	chem specific

CSF_{TCE-M}	Cancer Slope Factor for Trichloroethylene for mutagenic risks	chem specific	chem specific
ED(0-2)	Exposure Duration - ages 0–2 years	2	years
ED(0-6)	Exposure Duration - ages 0–6 years	6	years
ED(16-30)	Exposure Duration - ages 16–30 years	15	years
ED(2-6)	Exposure Duration - ages 2–6 years	4	years
ED(6-16)	Exposure Duration - ages 6–16 years	10	years
EDa	Exposure Duration - Adult	24	years
EF_PRec	Exposure Frequency Recreation	208	days/year
HI	Hazard Index	1	unitless
TSDMPRec	Total Soil Dose for children and adults in a Passive Recreation setting for exposures to mutagens	66,925.7	mg/kg
$_{TSDPRec}$	Total Soil Dose for children and adults in a Passive Recreation setting for exposures to Carcinogens	11,893.9	mg/kg
RfD	Reference Dose	chem specific	mg/kg/d
RL	Risk Level	0.000001	unitless
$SIR_{(0-2)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 0–2 years	100	mg/day
$SIR_{(0-6)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 0–6 years	100	mg/day
$SIR_{(16-30)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 16–30 years	75	mg/day
$SIR_{(2-6)\_PRec}$	Soil Ingestion Rate - Passive Recreation ages 2–6 years	100	mg/day
SIR_{a_PRec}	Soil Ingestion Rate - Passive Recreation Adult	75	mg/day
$SIRc_{(6-16)\_PRec}$	Soil Ingestion Rate - Passive Recreation Ages 6–16 years	100	mg/day

Appendix D: Criteria Values

Appendix E: Reference Materials

Body Weight

Table 2: EFH Table 8-1 Recommended Values for Body Weight

Table 8-1. Recommended Values for Body Weight			
Age Group	Mean (kg)	Multiple Percentiles	Source
Birth to <1 month	4.8	Table 8-3 through Table 8-5	U.S. EPA analysis of NHANES, 1999–2006 data
1 to <3 months	5.9		
3 to <6 months	7.4		
6 to <11 months	9.2		
1 to <2 years	11.4		
2 to <3 years	13.8		
3 to <6 years	18.6		
6 to <11 years	31.8		
11 to <16 years	56.8		
16 to <21 years	71.6		
Adults	80.0		

Table 3: EPA EFH Table 8-25 Estimated Body Weight of Typical Age Groups of Interest in U.S.EPA Risk Assessments

Table 8-25. Estimated Body Weights of Typical Age Groups of Interest in U.S. EPA Risk Assessments[a]

Age Group (years)	NHANES	Males (kg)			Females (kg)			Overall (kg)		
		Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*
1 to 6	II	17.0	4.6	2,097	16.3	4.7	1,933	16.7	4.5	4,030
	III	16.9	4.7	3,149	16.5	4.9	3,221	16.8	5.0	6,370
	IV	17.1	4.9	633	17.5	5.0	541	17.3	5.0	1,174
7 to 16	II	45.2	17.6	1,618	43.9	15.9	1,507	44.8	17.5	3,125
	III	49.3	20.9	2,549	46.8	18.0	2,640	47.8	18.4	5,189
	IV	47.9	20.1	1,203	47.9	19.2	1,178	47.7	19.1	2,381
18 to 65	II	78.65	13.23	4,711	65.47	13.77	5,187	71.23	11.97	9,898
	III	82.19	16.18	6,250	69.45	16.55	7,182	75.61	18.02	13,462
	IV	85.47	19.03	1,908	74.55	19.32	2,202	79.96	20.73	4,110
65+	II	74.45	13.05	1,041	66.26	13.25	1,231	69.56	12.20	2,272
	III	79.42	14.66	1,857	66.76	14.52	1,986	72.25	15.71	3,843
	IV	83.50	16.35	547	69.59	14.63	535	75.54	15.88	1,082

[a] Estimates were weighted using the sample weights provided with each survey.
SD = Standard deviation.
N = Number of individuals.

Source: Portier et al. (2007).

Updated Soil Ingestion Rates

Table 4: Recommended Soil and Dust Ingestion Rates from 2011 EFH

Table 5-1. Recommended Values for Daily Soil, Dust, and Soil + Dust Ingestion (mg/day)[a]

Age Group	Soil + Dust		Soil[b]				Dust[c]	
	General Population Central Tendency[d]	General Population Upper Percentile[e]	General Population Central Tendency[f]	General Population Upper Percentile[f]	Soil Pica[g]	Geophagy[h]	General Population Central Tendency[f]	General Population Upper Percentile[f]
<6 months	40	100	20	50			20	60
6 months to <1 year	70 (60-80)	200	30	90			40	100
1 to <2 years	90	200	40	90	1,000	50,000	50	100
2 to <6 years	60	200	30	90	1,000	50,000	30	100
1 to <6 years	80 (60-100)	200	40	90	1,000	50,000	40	100
6 to <12 years	60 (60-60)[i]	200	30	90	1,000	50,000	30	100
12 years through adult	30 (4–50)[j]	100[j]	10	50		50,000	20	60

[a] Ranges are provided in parentheses, when applicable, and represent the range of means from the various studies. Ranges are not provided for age groups for which the recommendations are based on a single study.

[b] Includes soil and outdoor settled dust.

[c] Includes indoor settled dust only.

[d] Based on the average of the central tendency values from the various studies for each of the three methodologies (tracer, biokinetic modeling, activity pattern), averaged over the three methods. Recommendation for <6 months of age based on Wilson et al. (2013) (note that data for 0 to <7 months in Wilson et al. [2013] were used to represent the 0 to <6 months age group). Recommendations for children 6 months to <1 year based on the average of values from Hogan et al. (1998) and von Lindern et al. (2016). Recommendations for 1- to 2 year-olds and 2- to <6-year-olds based on von Lindern et al. (2016). Recommendations for children ages 1 to <6 years based on the average of values from Calabrese et al. (1989) as reanalyzed in Stanek and Calabrese 1995a (mean of the median values for the best 4 tracers for each child); Calabrese et al. (1997a) (average of the best tracer for each child); Calabrese et al. (1997b) (average of aluminum and silicon); Davis et al. (1990) as reanalyzed by Stanek and Calabrese, 1995a (mean of the median values for 3 tracers for each child); Hogan et al. (1998); Özkaynak et al. (2011); von Lindern et al. (2016); and Wilson et al. (2013). The recommendations for ages 12 years to adults are based on the average of data for teens (ages 12 to <20 years), adults, and seniors from Wilson et al. (2013) and on adults from Davis and Mirick (2006). All recommended values were rounded to one significant figure. See Table 5-34 for additional details.

[e] Based on the average of the 95th percentile values from the various studies for each of the three methodologies (tracer, biokinetic modeling, activity pattern), averaged over the three methods. Based on the 95th percentile values for the same studies as used for the central tendency estimates except for age 12 years through adults. Upper percentile recommendation for 12 years of age through adults based on the assumption that the ratio of the 95th percentile to the mean value for adults is the same as the average of the ratios of 95th percentiles to means for all other age groups (i.e., average ratio of the 95th percentile to mean recommendations = 3.2). See Table 5-34 for additional details.

[f] Estimates of soil and dust were derived from the soil + dust values assuming 45% soil and 55% dust, rounded to one significant figure.

[g] Professional judgement based on: ATSDR (2001); Barnes (1990); Calabrese et al. (1997b, 1991, 1989); Stanek et al. (1998).

[h] Vermeer and Frate (1979).

[i] Range based on two studies with estimates of 55 and 56 mg/day; both of these estimates round to 60 mg/day.

[j] Soil + dust ingestion rates may be higher for adults following a traditional rural or wilderness lifestyle. Based on Doyle et al. (2012) and Irvine et al. (2014) the central tendency adult soil + dust ingestion rates is 50 mg/day (20 mg/day soil and 30 mg/day dust) and the upper percentile rate is 200 mg/day (90 mg/day soil and 100 mg/day dust).

— = No data.