Good evening,

Thank you for a productive Working Group meeting earlier this week.

I wanted to take moment to reflect on our accomplishment of completing the subcommittee concept paper creation process. Many of you put in significant hours of work and collaboration into developing the framework upon which our future cleanup program will be built. Ten Subcommittee, two Ad Hoc teams, and the Transition Advisory Group have shaped the program that will help Connecticut shape a cleanup program that will benefit Connecticut's economic and environmental future.

While we have just received the last two Subcommittee concept papers, there is still a bit of work to do on this front. Please read these papers and provide any written feedback on these concept papers to the Subcommittee Chair designee or DEEP by March 31, 2023.

Subcommittee Chairs	**Email**
David Melycher (Subcommittee 9)	dmelycher@ekiconsult.com
Emilee Mooney Scott (Subcommittee 10)	EScott@rc.com
DEEP	DEEP.Cleanup.Transform@ct.gov

Again, DEEP will provide detailed comments on the concept papers and has called for public comments on the concept papers too. Then, at our April 11, 2023 Working Group meeting, there will be three question and answer sessions with the Subcommittee representatives and DEEP. After this meeting, the Subcommittees will provide a response to comments that will be shared with the Working Group before our May meeting. At the May meeting, we discussed the Working Group taking action on the concept papers.

DEEP will not provide a substantive topic at the April meeting, but we intend to do so at the May meeting.

Thank you for your continued support, advice, and feedback.

Best,
Graham

CUMULATIVE RISK AND RISK-BASED ALTERNATIVE APPROACHES

Subcommittee 9
Concept Paper
March 1, 2023

Prepared for:

The Working Group established pursuant to Section 19 of Public Act 20-9 and
The Connecticut Department of Energy and Environmental Protection
79 Elm Street Hartford, CT 06106

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Subcommittee 9 Concept Paper
Cumulative Risk and Risk-Based Alternative Approaches

Introduction

This Concept Paper has been prepared by Subcommittee 9 (Cumulative Risk and Risk-Based Alternative Approaches) appointed pursuant to Section 19 of Public Act 20-9. This subcommittee met on a weekly basis starting November 16, 2022 and was formed to assist the Release-Based Working Group to determine which components of cumulative risk assessment can be implemented in Connecticut while maintaining acceptable levels of human health risk at sites that have been remediated and to better evaluate the sources of unacceptable risk to human health to assist in remediation decision making.

The Connecticut Department of Energy and Environmental Protection (DEEP) provided questions for the Subcommittee to review to develop a Concept Paper on this topic. The weekly meetings were regularly attended by DEEP and Connecticut Department of Public Health (DPH) members, who supported and assisted the Subcommittee in the process of answering and evaluating questions posed by DEEP on this topic.

The subcommittee members included Connecticut Licensed Environmental Professionals (LEPs) and Massachusetts Licensed Site Professionals (LSPs), as well as representatives from DEEP and DPH, all of whom have varying degrees of cumulative risk assessment experience. Subcommittee 9 risk assessment experience ranged from being new to the topic of using the cumulative risk approach to evaluate risk to human health posed by environmental contamination at release sites to professional toxicologists with doctorate degrees.

Subcommittee 9 members and staff members from the DEEP and DPH who provided assistance to the Subcommittee are listed in *Appendix A*.

In addition to the topics listed in the following sections, Mr. Andrew Friedman from the Massachusetts Department of Environmental Protection (MassDEP) participated in a Subcommittee meeting that centered around the development, implementation and use of the Massachusetts Method 3 Short Form calculators.

The focus of the Subcommittee's meetings was the charge and eight questions posed by DEEP. The charge and these questions, along with the Subcommittee's evaluations, are provided below. It was the consensus of the Subcommittee that the ability to evaluate potential risk to human health associated with release sites via the cumulative risk approach is a necessary tool for environmental professionals in Connecticut. The Subcommittee also agreed that some form of cumulative risk characterization should be a self-implementing option for LEPs to use on environmental release sites in Connecticut.

Charge

The charge to this Subcommittee is to determine which components of cumulative risk assessment can be implemented without increasing the human health risk on sites that have been remediated.

While the charge of the Subcommittee was directed to sites that have been remediated, the consensus of the Subcommittee was that cumulative risk assessment is a valuable tool for evaluating sites that have been remediated and for determining the source of environmental risk to human health (i.e., the specific compounds that are resulting in unacceptable levels of risk) at release sites for remediation decision

making. Since "release sites" is currently undefined, the Subcommittee proposed a definition of release sites to be locations where contamination resulting from a release has come to be located. Because multiple release sites may exist on a single parcel, the use of the cumulative risk approach under the release-based program will require the incorporation of data from all release sites that may be encountered by human receptors at contaminated properties.

If the proposed cumulative risk limits of an excess lifetime cancer risk (ELCR) of $1x10^{-5}$ and the hazard index (HI) of 1 are adopted, as recommended in the discussion for Question 3, the use of the cumulative risk approach for evaluating human health risk associated with environmental release sites will not result in unacceptable risk to human receptors. The preceding conclusion is based upon the assumption that all compounds of concern associated with a release site are evaluated as part of the cumulative risk assessment.

Question 1: What components of a cumulative risk assessment are LEPs qualified to perform under existing Connecticut law?

LEPs may prepare and complete cumulative risk assessments in accordance with their experience and expertise but will likely need to reach out to risk assessment professionals when faced with components of risk assessments outside their experience or expertise. Similar to an LEP's utilization of any specialist for investigation, evaluation, and/or remediation of a release site, it is incumbent upon the LEP to ensure that an individual or individuals utilized for risk assessment activities have the requisite qualifications and competency.

Question 2: Are there alternative exposure scenarios that may warrant evaluation and integration into the cleanup standards and what, if any, institutional controls would be necessary to keep these scenarios valid?

The subcommittee recommended that the following exposure scenarios evaluated within the MA Shortforms, along with their supporting exposure equations, be adopted by CT: Residential Soil, Residential Air, Office Worker/School Air. Beyond these exposure scenarios and the Residential and Industrial/Commercial exposure scenarios as currently evaluated within the CT Remediation Standard Regulations (RSRs) to develop default or alternate criteria, the subcommittee recommends that several additional exposure scenarios be included in a cumulative risk assessment framework for demonstrating compliance at a Site. There is general consensus among committee members that evaluation of alternate exposure scenarios may warrant evaluation and integration into the cleanup standards that will allow an exit from the program through the design of site-specific remediation options/technologies potentially combined with cumulative risk characterization. In addition to residential and commercial/industrial scenarios, alternative exposure scenarios such as:

Residential – passive use	Apartment/Condominium Complexes where access to soil is unlikely due to the physical setting. In this case, a No Disturbance/No Dig/No Garden (vegetable) option may allow a risk characterization with a lower exposure frequency for dermal exposure. The existing MassDEP Method 3 Shortforms for Residential Soil and Residential Air could be used to evaluate risk under this modified exposure scenario. The recommendation

	for using these Shortforms under a Residential – Passive exposure scenario would be to adjust the depth of soil to which these equations are applicable (i.e. 0-4' vs. 0-15') and/or exempt the use of these equations if an Engineered Control preventing direct contact is in place, rather than adjustments to the equations or exposure factors. This practice would be in line with guidance of Massachusetts and California. See Appendix C for the MassDEP Method 3 Residential Soil and Residential Air Shortforms. Note: Table RS-7 "Homegrown Produce Ingestion Rate" in Shortform sf12rs would not be applicable for this exposure scenario and would be eliminated in the characterization of risk.
Park visitor – passive use	Paved or unpaved walking and hiking trails and other open spaces where access to soil is unlikely or limited due to the physical setting and length of exposure. Note: this type of exposure scenario would not include sports or recreation fields. In this case, a risk characterization with a lower exposure frequency for dermal or inhalation exposure may be a viable option. See Appendix C for a recommended example based on an existing MassDEP Method 3 Shortform for Park Visitors.
Indoor Facility worker	Stores or factories where access to soil is unlikely due to the physical setting, which is typically paved/concrete. In this case, a risk characterization with a lower exposure frequency for dermal exposure may be a viable option. This exposure scenario would also capture exposure from the air inhalation exposure route, which would include exposure via vapor intrusion. See Equations C-3 in Appendix C for recommended examples of how to assess risk associated with this exposure scenario, based on equations United States Environmental Protection Agency (USEPA) uses to derive Regional Screening Levels.
Construction worker	Locations where access to soil is likely; however, the length of exposure may be for shorter period. According to the USEPA, "This is a short-term receptor exposed during the workday working around heavy vehicles suspending dust in the air. The activities for this receptor (e.g., dozing, grading, tilling, dumping, and excavating) typically involve on-site exposure to surface soils." See Equations C-4 in Appendix C for recommended examples of how to assess risk associated with this exposure scenario, based on equations USEPA uses to derive Regional Screening Levels.
Utility worker	Locations where access to soil is likely; however, the length of exposure may be for a limited period. The activities for this receptor (e.g., trenching, excavating) typically involve on-site exposure to surface soils. See Equations C-5 in Appendix C for recommended examples of how to assess risk associated with this exposure scenario, based on equations USEPA uses to derive Regional Screening Levels.

Best management practices (BMP), Environmental Use Restrictions (EURs), and activity use limitations may be needed to enforce the exposure scenarios. Additional options within the EUR may need to be developed in order to apply the exposure scenarios discussed above. In most cases, simple signage may be sufficient to alert receptors to potential hazards. In apartment/condominium complexes, language may also be included in lease agreement/association guidelines. For commercial/industrial settings, the facility health & safety officer can alert employees to potential hazards and apply administrative controls or the use of personal protective equipment as part of a written policy.

In addition to BMPs, activity use limitations can also be instituted such as EURs, as deed controls. These controls are already part of current regulations.

Question 3: Are there certain clean up standard risk adjustments that can be made by LEPs using a process similar to the "short forms" used in the Massachusetts Method 3 Risk Characterization process without the advice of a risk assessor or toxicologist?

The general consensus of the Subcommittee is that certain types of cumulative risk assessments, such as Short Form calculators, should be able to be used as a self-implementing option under the proposed regulations. The Subcommittee recommends that either:

1. Shortform calculators be developed for use in Connecticut; or
2. The use of the most current version of the Massachusetts Method 3 Shortforms be allowed as a LEP implementing option under the new regulations.

The Subcommittee recognizes that the exposure scenarios evaluated within the Massachusetts Method 3 Shortforms do not encompass all of the exposure scenarios recommended by the Subcommittee (ex. Facility Worker, Utility Worker, Residential – Passive). In these cases, if existing Method 3 Shortforms were used as frameworks they would need to be modified with equations and exposure parameters appropriate to those exposure scenarios.

The Subcommittee also recognized that for the implementation of a cumulative risk approach for assessing human health in Connecticut, cumulative risk limits will need to be established for use throughout the State. While the current version of the RSRs includes a Commissioner approved alternative method for compliance with the Direct Exposure Criteria (DEC) that includes an ELCR limit of $1x10^{-5}$ (when 10 or more carcinogenic compounds are present at a release site) and $1x10^{-6}$ (when less than 10 carcinogenic compounds are present) and a non-cancer, hazard index (HI) of 1.0, the RSRs do not currently include information regarding acceptable ELCR or HI limits under a cumulative risk assessment process.

The USEPA defines an acceptable risk range to be an excess lifetime cancer risk (ELCR) between one (1) in ten-thousand (1.0E-4) and one (1) in one-million (1.0E-6) exposed. The subcommittee recommends establishing a cumulative ELCR of $1 x10^{-5}$ for exposure to multiple carcinogens, an ELCR of $1 x 10^{-6}$ for exposure to an individual carcinogen, and a cumulative HI of 1 (allowing for summation of non-cancer risk by target organ) within the RSRs to support a cumulative risk approach. These cumulative risk thresholds are consistent with those within the frameworks of Massachusetts as well as other states including Oregon, Pennsylvania, and New Hampshire.

This cumulative risk approach would apply to the summation of risk from all potential exposure pathways able to be evaluated under a cumulative risk process, including exposure via soil and soil vapor/indoor air media. The subcommittee expects that a cumulative risk assessment would include assessment of all appropriate exposure pathways via a risk assessment approach and would not allow for use of RSR criteria to evaluate compliance with respect to one media and risk assessment to evaluate compliance with respect to a different media. For example, if at a given site a receptor may be exposed to contaminants in both soil and soil vapor via vapor intrusion, compliance would need to be demonstrated via either a cumulative risk assessment evaluating risk from both media, or via compliance with individual RSR criteria for soil and soil vapor. The subcommittee acknowledges that evaluation of risk associated with exposure to groundwater via ingestion of drinking water will need to remain an evaluation via application of the groundwater protection criteria (GWPC), as many of these criteria are derived from USEPA Maximum Contaminant Levels (MCLs).

Question 4: Which parameters can be altered and what is a reasonable range of values that can be adjusted within the confines of a short form process? Would any of these parameters require consultation with professions with expertise beyond the expertise required of LEPs? What guidance is needed to support the use of such short forms?

The Massachusetts Method 3 Short Form is a calculator created with set parameters for exposures and toxicity. In Massachusetts a Method 3 risk characterization that uses only un-modified Short Forms is known as a Short Form Method 3 and is not subject to additional review by MassDEP staff. If the form is modified, MassDEP will review the modifications at a higher level. The Subcommittee recommends a similar approach should Connecticut adopt cumulative risk via a Shortform calculator.

Site-specific information that should be considered for modification in the Short Form include:

- Exposure scenarios to match current and reasonably foreseeable future site exposures;
- Likely Human Receptors
- Time spent on-site by individual receptors

The Subcommittee recommends that parameters needing consultation beyond LEP include: LEP work outside of their areas of experience and expertise and this is dependent on the qualifications of the LEP – some changes might need to involve a Risk Assessment specialist. Guidance needed to standardize approach to use of the Short Forms / Cumulative Risk process and should include: instructions/guidance on the specific use of the short form(s); general data requirements, exposure pathways and receptors and recommendations for exposure factors; and Exposure Point Concentration (EPC) calculation (maximum concentration, 95% Upper Confidence Limit (UCL), or arithmetic mean).

Currently, under the RSRs, default, "Method 3 Short Form-style risk characterizations" could only be completed for Residential and Commercial/Industrial soil in areas of GA and GB groundwater. Comparatively, in Massachusetts, the three different soil categories (S-1, S-2, and S-3) and three different groundwater categories (GW-1, GW-2, GW-3) allow "levels" of exposure risk.

In Connecticut, with all soil between the surface and 15 feet treated equally, there can only be risk characterizations for Residential and Commercial/Industrial for GA and GB groundwater. A Deed Restriction (EUR) is needed to eliminate Residential as a risk scenario in future use.

- The Subcommittee recommends variations for specific site conditions (Park Visitor, Trespasser, Indoor Facility Worker, Construction Work, Utility Worker etc. within the soil exposure scenarios, such that small sites or sites with a limited suite of constituents of concern (COCs) could achieve self-implementing closure/Verification.

Question 5: How should fees to support DEEP and DPH review of cumulative risk assessments be structured?

The fee structure should follow the current outline provided by DEEP for LEP Form filing for the Property Transfer Program. This will allow DEEP to provide funding to audit self-implemented short form risk-based and cumulative risk assessments without additional changes to the fee structure.

DEEP and DPH will have to determine level of effort on their end for reviewing non-self-implemented risk assessment submittals and fee structure.

Question 6: If a short form process is utilized in a release verification, what percentage of those verifications should be audited? What level of documentation is necessary to support those verifications?

The DEEP currently has an audit program in place for reviewing LEP Verifications for the Property Transfer and Voluntary Remediation Programs. This process allows DEEP to quickly identify Sites that would require additional justification for final Verification. This same process and **timeframe** in which DEEP is required to audit current Verifications is recommended to be used to audit Verifications under a Release-Based program where Short Forms are utilized.

With that said, the Subcommittee assumes that releases subject to the RCRA regulations would automatically be audited by the DEEP.

Per the level of documentation to support Verification, the LEP Verification Report and its supporting documents should be sufficient to support the Verification with a short form under a Released-Based program.

The Subcommittee recommends that guidance documents be prepared for Cumulative Risk Reporting to assist the environmental professional in obtaining a higher likelihood of DEEP and DPH approval of their assessments. We also recommend that an iterative approval process be formulated to allow for interim approvals prior to assessments being audited.

Question 7: Outside of short form process, is there an intermediary process for risk assessments that can be completed more expeditiously by the regulated community than the current process and reviewed by the state agencies?

The subcommittee discussed existing intermediary frameworks in other states such as Massachusetts and Rhode Island and considered existing resources within the RSRs as well. Several suggestions for a more expeditious review of risk assessments came from this discussion:

First, the subcommittee recommended publishing allowable Modifications to Shortforms. For example, preapproved equations, exposure parameters, and guidance provided by DEEP and DPH that could be used to modify the Shortforms outside of the default exposure parameters on the short form. In addition, the subcommittee recommends DEEP and DPH provide guidance on how to appropriately modify exposure parameters using a hierarchy of guidance. For example, DEEP and DPH could require that modifications are done in line with either the values provided in USEPA's Exposure Factors Handbook, by other states, or by the parameters used in the generation of USEPA's Regional Screening Levels, and that these published exposure parameters may be used under a shortform modification process.

Second, the subcommittee recommended DEEP and DPH allow derivation of risk-based criteria, based on site specific information, again using pre-approved and provided equations and guidance to modify default exposure parameters. The subcommittee notes that this would be similar to the MassDEP Method 2 process, as well as the CT RSR alternative soil DEC process.

Question 8: The Massachusetts Method 3 Risk Characterization includes the assessment of risk to the environment. How should ecological risk be considered under a release-based program?

The subcommittee considered existing frameworks within Massachusetts, Connecticut, and the USEPA when developing the following recommendations. Several suggestions came from this discussion, as follows:

The subcommittee acknowledged that ecological risk must be a component of any risk assessment. The subcommittee further recommended that the pending regulations be developed to reflect the use of several "stages" of ecological risk assessment as part of each site investigation. The first step would be a scoping level/stage 1 screening. For example, the Scoping Level / Stage 1 Ecological Risk Screening for each site would answer the defined questions below:

- Are ecological receptors present at the release area or site?
- Does a complete exposure pathway exist between the release area and the ecological receptor?
- Is there evidence of adverse environmental impact from the release present in the ecological receptor (i.e., sheens on surface water, non-aqueous phase liquid (NAPL) on surface water or deposited in sediment, stressed or dead biota…etc.)?

If it can be documented that there are ecological receptors and complete exposure pathways based on the Stage I screening, ecological risk would proceed to the following stages, which would involve more comprehensive screening evaluations, ranging from collection of appropriate media and evaluation of compounds of potential ecological concern via a Screening Level Ecological Risk Assessment (SLERA) to performance of a Baseline Ecological Risk Assessment (BERA). Conversely, if there are no ecological receptors or completed exposure pathways at a release site, it can be concluded that environmental risk does not exist at the release site. (Evidence of adverse environmental impact would be indicative of the presence of unacceptable environmental risk requiring a remedy.)

The benefits of this staged and phased ecological risk assessment process include reducing the need to evaluate ecological risk further in developed areas/areas with small releases.

Other Considerations

Following the guidance similar to AULs in Massachusetts, below are ideas to simplify EURs and Verifications in Connecticut:

- The use of Best Management Practices for non-commercial gardening in a residential setting to minimize and control potential risk in lieu of an EUR;
- No EUR required if the concentrations of COCs at a site are consistent with Anthropogenic Background levels (but above RSRs);
- No EUR if the residual contamination is located within a public way or within a rail right-of-way;
- No EUR required (maybe just notice) if contamination located within a utility right-of-way.
- No EUR required if No Significant Risk can be demonstrated under an unrestricted exposure scenario (i.e.: residential).

To address issues currently considered as potentially hindering utilization of the EUR process provided below are some additional ideas:

- Waive subordination requirements from utilities.
- Waive subordination requirements from additional easements.
- Remove annual inspections, require inspections every five years and eliminate LEP Reporting every five years.
- Simplify Application process by reducing the Metes and Bounds of the property and not every subject area.
- Develop a Notice of Activity and Use Limitation (NAUL) "lite" that would simplify the application and potentially reduce provisions required.
- Tie in fees with EUR, Expedited Closure (same time frame). Waive EUR fees if EUR within one year of release discovery and remediation.
- Establish a framework and guidance where utilization of financial assurance can be accepted in lieu of an EUR to maintain applicable exposure scenario restrictions.
- Make financial assurance guidance more prescriptive (i.e.: excel spreadsheet examples).
- If State park – exempt from Financial Assurance, still need EUR, inspections. Ex. If there is another mechanism on the land records such as a land trust or use of the area as a park that equals maintenance of the exposure scenario.

- Need to develop additional standard EUR types to match the exposure scenarios evaluated within the Shortforms (i.e., beyond residential restriction).

The subcommittee recommends that the DEEP should consider a subcommittee specific to the EUR process.

Conclusions

The consensus of the Subcommittee is that the ability to evaluate potential risk to human health associated with release sites via the cumulative risk approach is a necessary tool for environmental professionals in Connecticut. The Subcommittee also agreed that some form of cumulative risk characterization should be a self-implementing option for LEPs to use on environmental release sites in Connecticut.

The following specific conclusions were made by the Subcommittee:

1. Subcommittee 9 was formed to determine which components of cumulative risk assessment can be implemented in Connecticut while maintaining an acceptable level human health risk at environmental release sites.
    a. The initial charge was limited to the evaluation to "sites that have been remediated" however the consensus of the Subcommittee is that cumulative risk assessment should also be available for use prior to remediation to determine sources of risk at a release and therefore drive future remediation. Cumulative risk assessment may also be used to determine that unacceptable risk is not present at a release site and therefore remediation is not required.

2. The consensus of the Subcommittee is that cumulative risk assessment is an important tool for evaluating potential risk to human health from environmental contamination and should be available to the regulated community and LEPs for use in Connecticut.
    a. The consensus of the Subcommittee is that the current LEP regulations are sufficient to allow LEPs to prepare cumulative risk assessments.
        i. LEPs may prepare and complete cumulative risk assessments in accordance with their experience and expertise but may need to reach out to other professionals when outside their experience or expertise.
        ii. It is incumbent upon the LEP to ensure that an individual or individuals utilized for risk assessment activities have the requisite qualifications and competency.

3. The general consensus of the Subcommittee is that certain types of cumulative risk assessments, such as Short Form calculators, should be able to be used as a self-implementing option under the future regulations.
    a. The Subcommittee recommends that either:
        i. Shortform calculators be developed for use in Connecticut; or
        ii. The use of the most current version of the Massachusetts Method 3 Shortforms be allowed as a LEP implementing option under the new regulations.

1. If existing Method 3 Shortforms were used as frameworks they would need to be modified with equations and exposure parameters appropriate to those exposure scenarios.

b. The use of either CT specific or Massachusetts Short Form Risk calculators would require the promulgation of cumulative risk limits in Connecticut.
    i. The Subcommittee recommends the establishment of a cumulative ELCR of 1 x10^{-5} for exposure to multiple carcinogens, an ELCR of 1 x 10^{-6} for exposure to an individual carcinogen, and a cumulative HI of 1 (allowing for summation of non-cancer risk by target organ) within the future regulations to support a cumulative risk approach.

4. The consensus of the Subcommittee is that sites where cumulative risk assessment is employed should be subject to the same level of audit as sites where cumulative risk assessment has not been used.

5. The Subcommittee also recognized that cumulative risk assessments, either performed with a default short form, modified short form, or via a site-specific risk assessment will require more guidance for implementation.
    a. Types of guidance may include:
        i. Development of Exposure Point Concentrations, including evaluating soil exposure, calculating an appropriate dust inhalation concentration, and evaluating predicted indoor air concentrations from sub-slab soil gas concentrations via vapor intrusion. ii. Exposure assumptions for scenarios, including guidance on exposure equations, exposure parameters and how to evaluate sources of these values using a hierarchy process.
        ii. Toxicity data resources for compounds not included in the Short Forms
            1. CT values
            2. EPA values
            3. Hierarchy of sources beyond CT and EPA.

6. The focus of the Subcommittee was the use of cumulative risk assessments to determine human health risk. The Subcommittee recognizes that human health risk is not the only component of risk evaluations in Connecticut. Incorporation of the other components is necessary for a complete evaluation of risk posed by contamination at a release. The other items that should be incorporated include:
    a. Ecological risk considerations; and
    b. Maximum allowable contaminant levels (see charge for Subcommittee 7).

Appendix A

Subcommittee 9 Member List

Name	Company	Representing
Eric Boswell	Avangrid	Any other interested member of the public
George Gurney	Weston Solutions	Licensed Environmental Professionals
Marilee Gonzalez	Fuss & O'Neill, Inc	Licensed Environmental Professionals
W. Scott Burrus	Sovereign Consulting Inc.	Licensed Environmental Professionals
Philip Warner	Verdantas	Licensed Environmental Professionals
Gary Iadarola	Eversource Energy	Licensed Environmental Professionals
Malcolm Beeler	Weston & Sampson	Licensed Environmental Professionals
Kevin King	SLR Consulting	Licensed Environmental Professionals
Kate Engler*, PhD, LEP, DABT	Loureiro Engineering Associates, Inc.	Licensed Environmental Professionals
David Melycher*	EKI Environment & Water, Inc.	Licensed Environmental Professionals
Nelson Walter*	WSP	Licensed Environmental Professionals
Amber Trahan	DEEP	Agency Resource
Alessandra Alling	DEEP	Agency Resource
Peter Zaidel	DEEP	Agency Resource
Carl Gruszczak	DEEP	Agency Resource
Meg Harvey	DPH	Agency Resource
* = Subcommittee Co-Chair		

Appendix B

Mass Method 3 Shortform Guidance

MassDEP Shortforms for Human Health Risk Assessment under the MCP

USER'S GUIDE

In this User's Guide

Shortform Applicability

The Shortforms are designed to streamline the Method 3 risk assessment and review process. While Method 3 risk assessments are site-specific, some exposure scenarios are sufficiently standardized for a template approach. MassDEP has assembled recommended exposure assumptions and toxicity information into the Shortform spreadsheets to calculate risk for each of these standard scenarios.

The Shortforms have important limitations. These include, but are not limited to:

1. Exposure Assumptions - It is the risk assessor's responsibility to verify that the exposure assumptions in each Shortform are appropriate for use at their site.
2. Exposure Pathways - The Shortforms may not cover all exposure pathways present at a site. For example, the Park Visitor Shortform for contaminated soil does not assess risks associated with inhalation of volatile compounds. At sites where this pathway might be of concern (e.g., athletic fields or parks established over former landfills), additional assessment would be needed.
3. EPC Development - Development of appropriate Exposure Point Concentrations (EPCs) for each exposure pathway is vital to ensuring that the results of the Method 3 Risk Assessment are valid. Regulations and guidance describing the development of EPCs can be found in 310 CMR 40.0900 and MassDEP's 1995 *Guidance for Disposal Site Risk Characterization*. If these requirements are not met, results from the Shortform are invalid.
4. Generic IH Calculations - The Shortforms use a generic approach to evaluating imminent hazards (IH). However, MassDEP's regulations at 310 CMR 40.0955(2)(c) call for chemical-specific approaches for certain hazardous materials. While some chemicals have reminders that pop up about a chemical-specific IH hazard quotient, it is the Shortform user's responsibility to identify contaminants that require a chemical-specific approach and evaluate them accordingly.
5. Non-Calculated Risks - Some risks are not included in the Shortforms. For instance, chromium(VI) in soils poses an imminent hazard due to contact dermatitis at a level of 200 mg/kg (rounded from 170 mg/kg), though the residential Shortform yields a hazard quotient of less than one for that concentration. All calculations should be reviewed to ensure that they comply with the MCP.

Shortform Set-Up

The Shortforms are comprised of Excel workbooks, each of which addresses a specific receptor (e.g., resident, trespasser, construction worker, etc.) exposed to oil or hazardous materials (OHM) in soil, indoor air, drinking water, or surface water. Each Shortform workbook contains several worksheets, the first of which is an index with a short description of each of the subsequent worksheets. The following worksheets provide information on Exposure Point Concentration (EPCs), equations to calculate cancer and noncancer risk ("C Eq" and "N Eq"), exposure assumptions ("Exp"), and chemical-specific information ("Chem") drawn from the Vlookup workbook. Tables in the worksheets are designed to be self-explanatory and compliment a written risk assessment report.

All Shortforms are linked to the same Vlookup workbook that contains chemical-specific information such as dose-response values and physical constants. The Shortforms and the Vlookup file are intimately linked. To keep this relationship intact and the Shortforms functional, anytime a new file is available, it's best to download all of the files again.

Using the Shortforms

The Shortforms and Vlookup files should be extracted to the same folder before being opened. In order to ensure that the workbooks link correctly, the Vlookup file should be opened first. Shortforms can then be opened subsequently.

Using each Shortform is a simple two-step process:

1. Select Contaminants of Concern (COCs) in the first column of the EPCs worksheet. COCs can be added using a drop-down menu that appears when a cell in that first column is selected.
2. Enter site-specific EPCs in the cell immediately to the right of each COC. Check to be sure the units of your data match those in the Shortform. Risks associated with each COC/EPC combination are calculated automatically and displayed in the cells to the right of the EPC. Risks are only displayed for pathways that might contribute significantly to overall risk.

The total site cancer (Excess Lifetime Cancer Risk, ELCR) and noncancer (Hazard Index, HI) risks for all of the COCs are summed at the top right of the EPC spreadsheet. If there is exposure to more than one medium (soil and groundwater, for example), the total risk must be calculated by adding the HIs and ELCRs from all of the applicable Shortform files.

Notes of caution: **Under no circumstances should columns or rows be deleted or inserted between existing ones in the Shortforms.** Doing so could disrupt the intra- and inter-worksheet links, thus compromising the validity of the risk calculations. Similarly, do not change the name of the Vlookup. The risk assessor is responsible for ensuring that the most recent versions of the Shortform and Vlookup files are downloaded from the MassDEP website when used to support a risk characterization report.

If the Shortform is submitted to fulfill a Method 3 Risk Assessment requirement, it must be submitted as a component of a report that includes a comprehensive site description, hazard identification, description of site activities and uses, identification of receptors and exposure points, discussion of the applicability of any Activity and Use Limitations (AULs), EPC estimation, risk characterization summary, and an uncertainty section. The Shortform is a risk calculation tool, intended for use by risk assessors in the context of a complete risk assessment.

Adding Non-listed Chemicals to the Shortforms

Risk assessors comfortable with Excel can use the Shortforms to include additional chemicals of concern. Other than adding COCs and their respective properties and EPCs, the spreadsheets must not be modified in any way if they are to be submitted as Shortforms. If toxicity values or exposures factors for listed chemicals are altered, any **modifications should be highlighted** through the use of bold text, changed titles, and text description that clarifies that the workbooks are no longer the standard MassDEP Shortforms. The risk assessor should also describe and provide technical justification for the changes in the accompanying text.

Risk assessors may add chemicals to the COC list, provided they have the required physical and toxicological information for that chemical. The instructions below are for use with MS Excel version 2007.

1. Open the applicable Shortform and the VlookUp file.

2. Add the chemical to the COC dropdown in the Shortform:
    a. Unhide Column A by dragging the column marker left of Column B to the right until chemical names show.

b. Add the chemical to the *bottom* of the dropdown list, adding "zz" before the name to protect the VlookUp alphabetizing, eg "zzEthylMethylTop".
c. Click in column B under Oil or Hazardous Material to select the dropdown.
d. Go to the Data tab, choose Data Validation
e. Under Settings, change Source to include the new row, ie $A$126 instead of $A$125. Add more if adding more chemical rows, ending with $A$127 or $A$128 as applicable.
f. Check the box "Apply these changes to all other cells with the same settings"

3. Add the zz chemical to the Vlookup: in the last row of column A in tabs v1, v2, v3, and v4.

4. Add the necessary data for each tab. Only chemical data that is required for the media and exposures used in the Shortform that is being modified must be added.

5. Change the Vlookup named ranges used in the equations to include the new chemical info:
   a. In the Vlookup, select the Formulas Tab -> Name Manager.
   b. Select named range "physical_prop" -> edit.
   c. Change the "refers to" box from "='V4'!$A$2:$F$118" to "='V4'!$A$2:$F$119"
      - This includes the new row. Add more if adding more chemical rows, ending with $F$120 or $F$121 as applicable.
   d. Click "ok"
   e. Repeat steps b. through d. to expand the "refers to" for these other named ranges:
      - RAFs
      - toxicity
      - V4Constants
      - WaterPUF

6. Hide column A in the Shortform again. Select column A, right click, and select Hide.

7. Add COCs and EPCs as usual.

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Appendix C

Example Alternative Exposure Scenario Equations

C-1 Residential – Passive
Source: MassDEP Method 3 Shortforms sf12rs and sf12ra

Note: The existing MassDEP Method 3 Shortforms for Residential Soil and Residential Air could be used to evaluate risk under this modified exposure scenario. The recommendation for using these Shortforms under a Residential – Passive exposure scenario would be to adjust the depth of soil to which these equations are applicable (i.e. 0-4' vs. 0-15') and/or exempt the use of these equations if an Engineered Control preventing direct contact is in place, rather than adjustments to the equations or exposure factors. This practice would be in line with guidance of Massachusetts and California. Note: Table RS-7 "Homegrown Produce Ingestion Rate" in Shortform sf12rs would not be applicable for this exposure scenario and would be eliminated in the characterization of risk.

Method 3 Risk Assessment for Resident Exposed to Chemicals in Soil - Shortform 2012 (sf12rs)

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Resident - Soil: Table RS-1
Exposure Point Concentration (EPC)
Based on Resident Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ELCR (all chemicals) =
Chronic HI (all chemicals) =
Subchronic HI (all chemicals) =

Do not insert or delete any rows
Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	$ELCR_{ingestion}$	$ELCR_{dermal}$	Derm & Ing $ELCR_{total}$	Chronic HQ_{ing}	Chronic HQ_{derm}	Derm & Ing HQ_{total}	Subchronic HQ_{ing}	Subchronic HQ_{derm}	Derm & Ing HQ_{total}

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Resident - Soil: Table RS-2
Exposure Point Concentration (EPC)
Based on Resident Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ELCR (all chemicals) =
Chronic HI (all chemicals) =
Subchronic HI (all chemicals) =

*Vegetable uptake is informational only and NOT included in totals on EPC tab.

Do not insert or delete any rows

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	Chronic		Subchronic
		$ELCR_{vegetable*}$	$HQ_{vegetable*}$	$HQ_{vegetable*}$

Resident - Soil: Table RS-3

Equations to Calculate Cancer Risk for Resident (Age 1-31 years)

Cancer Risk from Ingestion

$$ELCR_{ing} = LADD_{ing(1\text{-}31)} * CSF$$

$$LADD_{ing\ (1\text{-}31)} = LADD_{ing\ (1\text{-}8)} + LADD_{ing\ (8\text{-}15)} + LADD_{ing\ (15\text{-}31)}$$

$$LADD_{ing\ (age\ group\ x)} = \frac{[OHM]_{soil} * IR_x * RAF_{c\text{-}ing} * EF_{ing} * ED * EP_x * C}{BW_x * AP_{lifetime}}$$

Cancer Risk from Dermal Absorption

$$ELCR_{derm} = LADD_{derm} * CSF$$

$$LADD_{derm\ (1\text{-}31)} = LADD_{derm\ (1\text{-}8)} + LADD_{derm\ (8\text{-}15)} + LADD_{derm\ (15\text{-}31)}$$

$$LADD_{derm(age\ group\ x)} = \frac{[OHM]_{soil} * SA_x * RAF_{c\text{-}derm} * SAF_x * EF_{derm} * ED * EP_x * C}{BW_x * AP_{lifetime}}$$

Cancer Risk from Homegrown Produce

$$ELCR_{produce} = LADD_{produce(1\text{-}31)} * CSF$$

$$LADD_{produce(1\text{-}31)} = LADD_{produce(1\text{-}8)} + LADD_{produce(8\text{-}15)} + LADD_{produce(15\text{-}31)}$$

$$LADD_{produce(age\ x)} = \frac{[OHM_{soil}] * PUF * PIR_x * RAF_{produce} * EF_{produce} * ED * EP_x * C}{BW_x * AP_{lifetime}}$$

Vlookup Versionv0315

Parameter	Value	Units
CSF	OHM specific	$(mg/kg\text{-}day)^{-1}$
LADD	age/OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
$IR_{(1\text{-}8)}$	100	mg/day
$IR_{(8\text{-}15)}$	50	mg/day
$IR_{(15\text{-}31)}$	50	mg/day
$PIR_{(1\text{-}8)}$	12,099	mg/day
$PIR_{(8\text{-}15)}$	17,809	mg/day
$PIR_{(15\text{-}31)}$	24,420	mg/day
$RAF_{c\text{-}ing}$	OHM specific	dimensionless
$RAF_{c\text{-}derm}$	OHM specific	dimensionless
$RAF_{c\text{-}produce}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.412	event/day
$EF_{produce}$	1.00	event/day
ED	1	day/event
$EP_{(1\text{-}8)}$	7	years
$EP_{(8\text{-}15)}$	7	years
$EP_{(15\text{-}31)}$	16	years
C	0.000001	kg/mg
$BW_{(1\text{-}8)}$	17.0	kg
$BW_{(8\text{-}15)}$	39.9	kg
$BW_{(15\text{-}31)}$	58.7	kg
$AP_{(lifetime)}$	70	years
$SA_{(1\text{-}8)}$	2431	cm^2 / day
$SA_{(8\text{-}15)}$	4427	cm^2 / day
$SA_{(15\text{-}31)}$	5653	cm^2 / day
$SAF_{(1\text{-}8)}$	0.35	mg/cm^2
$SAF_{(8\text{-}15)}$	0.14	mg/cm^2
$SAF_{(15\text{-}31)}$	0.13	mg/cm^2
PUF	OHM specific	$(mg/mg)(mg/mg)^{-1}$

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Resident - Soil: Table RS-4
Equations to Calculate Chronic Noncancer Risk for Resident Child (Age 1-8 years)

Vlookup Versionv0315

Chronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc\text{-}ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Chronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{ing,derm}}{RfD}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc\text{-}derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Chronic Noncancer Risk from Homegrown Produce

$$HQ_{produce} = \frac{ADD_{produce}}{RfD}$$

$$ADD_{produce} = \frac{[OHM_{soil}] * PUF * PIR * RAF_{produce} * EF_{produce} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
IR	100	mg/day
PIR	12,099	mg/day
$RAF_{nc\text{-}ing}$	OHM specific	dimensionless
$RAF_{nc\text{-}derm}$	OHM specific	dimensionless
$RAF_{nc\text{-}produce}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.412	event/day
$EF_{produce}$	1.00	event/day
ED	1	day/event
EP	7	years
C	0.000001	kg/mg
BW	17.0	kg
AP	7	year
SA	2431	cm^2 / day
SAF	0.35	mg/cm^2
PUF	OHM specific	$(mg/mg)(mg/mg)^{-1}$

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Resident - Soil: Table RS-5

Equations to Calculate Subchronic Noncancer Risk for Resident Child (Age 1-2 years)

Vlookup Versionv0315

Subchronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD_{subchronic}}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc\text{-}ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Subchronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{derm}}{RfD_{subchronic}}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc\text{-}derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Subchronic Noncancer Risk from Homegrown Produce

$$HQ_{produce} = \frac{ADD_{produce}}{RfD_{subchronic}}$$

$$ADD_{produce} = \frac{[OHM_{soil}] * PUF * PIR * RAF_{produce} * EF_{produce} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
IR	100	mg/day
PIR	10,900	mg/day
$RAF_{nc\text{-}ing}$	OHM specific	dimensionless
$RAF_{nc\text{-}derm}$	OHM specific	dimensionless
$RAF_{nc\text{-}produce}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.714	event/day
$EF_{produce}$	1.00	event/day
ED	1	day/event
EP	0.577	years
C	0.000001	kg/mg
BW	10.7	kg
AP	0.577	year
SA	1670	cm^2 / day
SAF	0.35	mg/cm^2
PUF	OHM specific	$(mg/mg)(mg/mg)^{-1}$

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Resident - Soil: Table RS-6
Definitions and Exposure Factors

Vlookup Versionv0315

Parameter	Value	Units	Notes
ELCR - Excess Lifetime Cancer Risk	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
CSF - Cancer Slope Factor	chemical specific	$(mg/kg\text{-}day)^{-1}$	see Table RS-7
LADD - Lifetime Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
LADE - Lifetime Average Daily Exposure	chemical specific	$\mu g/m^3$	
HQ - Hazard Quotient	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
RfD - Reference Dose	chemical specific	mg/kg-day	see Table RS-7
ADD - Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
ADE - Average Daily Exposure	chemical specific	mg/m^3	
EPC - Exposure Point Concentration	chemical specific	mg/kg	
PUF - Plant Uptake Factor	chemical specific	$(mg/mg)(mg/mg)^{-1}$	See Table RS-7; $(mg_{OHM}/mg_{plant})/(mg_{OHM}/mg_{soil})^{-1}$
$IR_{(1-2)}$ - Soil Ingestion Rate for age group 1-2	100	mg/day	MADEP. 2002. Technical Update: Calculation of an Enhanced Soil Ingestion Rate. (http://www.mass.gov/dep/ors/orspubs.htm)
$IR_{(1-8)}$ - Soil Ingestion Rate for age group 1-8	100	mg/day	Ibid
$IR_{(8-15)}$ - Soil Ingestion Rate for age group 8-15	50	mg/day	Ibid
$IR_{(15-31)}$ - Soil Ingestion Rate for age group 15-31	50	mg/day	Ibid
$PIR_{(1-2)}$ = Produce Ingestion Rate for age group 1-2	10,900	mg/day	see Table RS-6
$PIR_{(1-8)}$ = Produce Ingestion Rate for age group 1-8	12,099	mg/day	see Table RS-6
$PIR_{(8-15)}$ = Produce Ingestion Rate for age group 8-15	17,809	mg/day	Ibid
$PIR_{(15-31)}$ = Produce Ingestion Rate for age group 15-31	24,420	mg/day	Ibid
RAF_c - Relative Absorption Factor for Cancer Effects	chemical specific	dimensionless	
$EF_{subchronic}$ - Exposure Frequency for subchronic ingestion or dermal exposure	0.714	event/day	5 days/week
$EF_{chronic}$ - Exposure Frequency for chronic ingestion or dermal exposure	0.412	event/day	5 days/week, 30 weeks/year
EF_{cancer} - Exposure Frequency for cancer, ingestion or dermal exposure	0.412	event/day	5 days/week, 30 weeks/year
$EF_{produce}$ - Exposure Frequency for produce ingestion, cancer and noncancer	1.00	event/day	
ED - Exposure Duration	1	day/event	
$EP_{(1-2)}$ - Exposure Period for age group 1-2	0.577	years	30 weeks
$EP_{(1-8)}$ - Exposure Period for age group 1-8	7	years	
$EP_{(8-15)}$ - Exposure Period for age group 8-15	7	years	
$EP_{(15-31)}$ - Exposure Period for age group 15-31	16	years	
$BW_{(1-2)}$ - Body Weight for age group 1-2	10.7	kg	U.S. EPA. 1997. Exposure Factors Handbook. Table 7-7, females.
$BW_{(1-8)}$ - Body Weight for age group 1-8	17.0	kg	Ibid
$BW_{(8-15)}$ - Body Weight for age group 8-15	39.9	kg	Ibid
$BW_{(15-31)}$ - Body Weight for age group 15-31	58.7	kg	Ibid
$AP_{subchronic}$ - Averaging Period for subchronic noncancer	0.577	years	30 weeks
$AP_{chronic}$ - Averaging Period for chronic noncancer	7	years	
AP_{cancer} - Averaging Period for lifetime	70	years	
$SA_{(1-2)}$ - Surface Area for age group 1-2	1670	cm^2 / day	50th percentile of face (1/3 head), forearms, hands, lower legs, and feet for females MADEP. 1995. Guidance for Disposal Site Risk Characterization. Appendix Table B-2.
$SA_{(1-8)}$ - Surface Area for age group 1-8	2431	cm^2 / day	Ibid
$SA_{(8-15)}$ - Surface Area for age group 8-15	4427	cm^2 / day	Ibid
$SA_{(15-31)}$ - Surface Area for age group 15-31	5653	cm^2 / day	Ibid
$SAF_{(1-2)}$ - Surface Adherence Factor for age group 1-2	0.35	mg/cm^2	All SAFs developed for ShortForm according to procedure outlined in MA DEP Technical
$SAF_{(1-8)}$ - Surface Adherence Factor for age group 1-8	0.35	mg/cm^2	Update:Weighted Skin-Soil Adherence Factors, April 2002
$SAF_{(8-15)}$ - Surface Adherence Factor for age group 8-15	0.14	mg/cm^2	
$SAF_{(15-31)}$ - Surface Adherence Factor for age group 15-31	0.13	mg/cm^2	

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Resident - Soil: Table RS-7
Homegrown Produce Ingestion Rate

Vlookup Versionv0315

Data on mean produce ingestion rates (wet weight, ww) in the Northeast was obtained from the 1994-1996 Continuing Survey of Food Intakes by Individuals (USDA). Data for both genders were used for children under 6, while data for males was used for individuals 6 and older. The mean ingestion rates presented in the survey represent the arithmetic average of all individuals surveyed, regardless of whether or not they had consumed the produce item (e.g., an individual that did not consume the produce item was assigned a rate of 0 g/day). To determine the mean ingestion rate for individuals who ate each produce item, the ingestion rate for all individuals (consumers and nonconsumers) was divided by the percentage of individuals who ate the item (Table RS-7A). These mean ingestion rates for the produce consumers were summed to determine the total produce ingestion rate for each age-group and converted to dry weight assuming the produce items were all 90% water.

To convert mean ingestion rates for the age-groups studied in the survey to age-groups used in risk calculations, each age-group ingestion rate from the survey (i.e., 1 - 2 year olds, 3 - 5 year olds, 6 - 11 year olds, 12 - 19 year olds, and 20 - 39 year olds) was weighted according to the number of years spent in the risk calculation age group (i.e., 1 - 8 year olds, 8 - 15 year olds, and 15 - 31 year olds) (Table RS-7B). It was assumed that 25% of produce ingested was home-grown (Table RS-7C).

Table RS-7

	White Potatoes			Dark-green vegetables			Deep-yellow vegetables		
Age-groups studied in survey	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)
1-2	28	40.3	69.5	6	10.1	59.4	5	12.7	39.4
3-5	30	37.1	80.9	5	6.5	76.9	7	12.7	55.1
6-11	47	44.2	106.3	6	9.1	65.9	2	8.5	23.5
12-19	59	40.3	146.4	2	2.3	87.0	11	15.8	69.6
20-39	76	45.1	168.5	25	14.7	170.1	4	5.7	70.2

	Tomatoes			Lettuce			Green Beans		
Age-groups studied in survey	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)
1-2	10	27.9	35.8	1	6	16.7	7	12.1	57.9
3-5	10	37.1	27.0	4	14	28.6	3	5.7	52.6
6-11	20	42	47.6	8	14.9	53.7	1	2	50.0
12-19	29	45.2	64.2	19	28.7	66.2	2	2.4	83.3
20-39	48	50.9	94.3	18	29.6	60.8	4	3.7	108.1

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Table RS-7a (continued)

Age-groups studied in survey	Corn, Green peas, Lima beans: Ingestion Rate for All g/d (ww)	Corn, Green peas, Lima beans: % of individuals that consumed item.	Corn, Green peas, Lima beans: Ingestion Rate for Consumers g/d (ww)	Melons, berries: Ingestion Rate for All g/d (ww)	Melons, berries: % of individuals that consumed item.	Melons, berries: Ingestion Rate for Consumers g/d (ww)	Totals Wet Weight WWI g/day	Totals Dry Weight DWI g/day
1-2	12	15	80.0	7	9	77.8	436.4	43.6
3-5	14	21.7	64.5	14	11.6	120.7	506.3	50.6
6-11	9	13.6	66.2	5	5.9	84.7	498.0	49.8
12-19	14	9.9	141.4	17	5	340.0	998.1	99.8
20-39	12	7.3	164.4	6	4.5	133.3	969.7	97.0

Table RS-7B

Age-groups studied in survey	Years spent in age-group 1-8 year old	Years spent in age-group 8-15 year old	Years spent in age-group 15-31 year old
1-2	2		
3-5	3		
6-11	2	4	
12-19		3	4
20-39			12
	7	7	16

Table RS-7C

	Produce Intake, dry weight: Child 1-2 years g/day	Child 1-8 years g/day	Child 8-15 years g/day	Adult 15-31 g/day
All Produce:	43.6	48.4	71.2	97.7
Homegrown:	10.9	12.1	17.8	24.4

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Resident - Soil: Table RS-8
Chemical-Specific Data

Vlookup Versionv0315

Oil or Hazardous Material	CSF $(mg/kg\text{-}day)^{-1}$	$RAF_{c\text{-}ing}$	$RAF_{c\text{-}derm}$	$RAF_{c\text{-}prod}$	Chronic RfD mg/kg-day	Subchronic RfD mg/kg-day	Chronic $RAF_{nc\text{-}ing}$	Chronic $RAF_{nc\text{-}derm}$	Subchronic $RAF_{nc\text{-}ing}$	Subchronic $RAF_{nc\text{-}derm}$	$RAF_{nc\text{-}prod}$	PUF

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Resident - Soil: Table RS-9
Cyanide Calculations

The soil cyanide concentration limit set to protect a child resident against an acute, potentially lethal one-time dose of cyanide from incidental ingestion of contaminated soil is 100 mg/kg soil. This is the concentration of available cyanide in soil below which acute human health effects would not be expected following a one-time exposure. This soil concentration is calculated using the equation below with a pica-type soil ingestion of 1000 mg_{soil} and an available cyanide dose limit of 0.01 $mg/kg_{body\ weight}$.

MassDEP's guidance on evaluating the risk from a one-time cyanide dose considers cyanide's potentially lethal effects as well as information on cyanide metabolism:

> Cyanides are detoxified rapidly by the body, and a large acute dose which overwhelms the detoxification mechanism is potentially more toxic than the same dose distributed over a period of hours. (MassDEP *Background Documentation for the Development of an Available Cyanide Benchmark Concentration* , originally dated October 1992, Modified August 1998)

Assessment of a potential one-time dose requires an estimate of the maximum soil concentration the receptor could contact at any one time. The average soil concentration within a typical exposure area will underestimate the potential one-time dose. Therefore, to assess the acute risk of a one-time potentially lethal dose, the EPC for cyanide should be a conservative estimate of the maximum soil concentration.

The residential soil concentration limit to protect against adverse effects from an acute (one-time) exposure to cyanide is 100 mg/kg.

Concentration Calculation for Cyanide

$$\text{Concentration} = \frac{\text{HQ x Acute Dose Limit x BW}}{\text{IR x RAF x Conversion Factor}}$$

Parameter	Value	Units
HQ (Hazard Quotient)	1	(unitless)
Acute Dose Limit	0.01	mg avail. CN/ kg BW
BW (Body Weight) 1-2	10.7	kg
IR (1-time reasonable max)	1000	mg
Conversion Factor	1.0E-06	kg soil / mg soil
RAF	1	(unitless)

The toxicological basis for estimating an allowable one-time dose is documented in MassDEP's 1992 *Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration,* which is published at: http://www.mass.gov/eea/docs/dep/toxics/stypes/dscyanide.pdf

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Method 3 Risk Assessment for Resident Exposed to Chemicals in Indoor Air - Shortform 2012 (sf12ra)

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NC Eq	Table RA-3: Equations to calculate noncancer risks.
Exp	Table RA-4: Definitions and exposure factors.
Chem	Table RA-5: Chemical-specific data.

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Resident - Indoor Air: Table RA-1
Exposure Point Concentration (EPC)
Based on Resident Ages 1-31 (Cancer) and 1-8 (Noncancer)

ShortForm Version 10-12

Vlookup Versionv0315

ELCR (all chemicals) =

HI (all chemicals) =

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC ($\mu g/m^3$)	$ELCR_{air}$	HQ_{air}

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Resident - Indoor Air: Table RA-2

Equations to Calculate Cancer Risk for Resident (Age 1-31 years)

Cancer Risk from Inhalation

$$ELCR_{air} = LADE_{(1\text{-}31)} * URF$$

$$LADE = \frac{[OHM]_{air} * EF * ED * EP}{AP_{lifetime}}$$

Vlookup Versionv0315

Parameter	Value	Units
URF	OHM specific	$(\mu g/m^3)^{-1}$
LADE	age/OHM specific	$\mu g/m^3$
$[OHM]_{air}$	OHM specific	$\mu g/m^3$
EF	1.00	event/day
ED	1	day/event
EP	30	years
$AP_{lifetime}$	70	years

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Resident - Indoor Air: Table RA-3

Equations to Calculate Noncancer Risk for Resident Child (Age 1-8 years)

Vlookup Versionv0315

Noncancer Risk from Inhalation

$$HQ_{air} = \frac{ADE}{RfC}$$

$$ADE = \frac{[OHM]_{air} * EF * ED * EP * C}{AP}$$

Parameter	Value	Units
RfC	OHM specific	mg/m^3
ADE	OHM specific	mg/m^3
$[OHM]_{soil}$	OHM specific	$\mu g/m^3$
EF	1.00	event/day
ED	1	day/event
EP	7	years
C	0.001	mg/ug
AP	7	year

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Resident - Indoor Air: Table RA-4
Definitions and Exposure Factors

Vlookup Versionv0315

Parameter	Value	Units	Notes
ELCR - Excess Lifetime Cancer Risk	chemical specific	dimensionless	
URF - Unit Risk Factor	chemical specific	$(\mu g/m^3)^{-1}$	see Table RA-5
LADE - Lifetime Average Daily Exposure	chemical specific	$\mu g/m^3$	see Table RA-2
HQ - Hazard Quotient	chemical specific	dimensionless	
RfC - Reference Concentration	chemical specific	mg/m^3	see Table RA-5
ADE - Average Daily Exposure	chemical specific	mg/m^3	see Table RA-3
EPC - Exposure Point Concentration	chemical specific	$\mu g/m^3$	see Table RA-1
EF - Exposure Frequency	1.00	event/day	
ED - Exposure Duration	1	day/event	
$EP_{(1-8)}$ - Exposure Period age group 1-8 (noncancer)	7	years	
$EP_{(1-31)}$ - Exposure Period for age group 1-31 (cancer)	30	years	
$AP_{(noncancer)}$ - Averaging Period for noncancer	7	years	
$AP_{(lifetime)}$ - Averaging Period for lifetime	70	years	

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Resident - Indoor Air: Table RA-5
Chemical-Specific Data

Vlookup Versionv0315

Oil or Hazardous Material	URF $(ug/m^3)^{-1}$	RfC mg/m^3

C-2 Park Visitor – Passive
Source: MassDEP Shortform sf12ps.xls

Method 3 Risk Assessment for Park Visitor Exposed to Chemicals in Soil - Shortform 2012 (sf12ps)

Index

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Park Visitor - Soil: Table PS-1
Exposure Point Concentration (EPC)
Based on Visitor Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ShortForm Version 10-12

Vlookup Version v0315

ELCR (all chemicals) =

Chronic HI (all chemicals) =

Subchronic HI (all chemicals) =

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	$ELCR_{ingestion}$	$ELCR_{dermal}$	$ELCR_{total}$	Chronic HQ_{ing}	Chronic HQ_{derm}	Chronic HQ_{total}	Subchronic HQ_{ing}	Subchronic HQ_{derm}	Subchronic HQ_{total}

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Park Visitor - Soil: Table PS-2

Equations to Calculate Cancer Risk for Visitor (Age 1-31 years)

Cancer Risk from Ingestion

$$ELCR_{ing} = LADD_{ing(1\text{-}31)} * CSF$$

$$LADD_{ing\ (1\text{-}31)} = LADD_{ing\ (1\text{-}8)} + LADD_{ing\ (8\text{-}15)} + LADD_{ing\ (15\text{-}31)}$$

$$LADD_{ing\ (age\ group\ x)} = \frac{[OHM]_{soil} * IR_x * RAF_{c\text{-}ing} * EF_{ing} * ED * EP_x * C}{BW_x * AP_{lifetime}}$$

Cancer Risk from Dermal Absorption

$$ELCR_{derm} = LADD_{derm} * CSF$$

$$LADD_{derm\ (1\text{-}31)} = LADD_{derm\ (1\text{-}8)} + LADD_{derm\ (8\text{-}15)} + LADD_{derm\ (15\text{-}31)}$$

$$LADD_{derm(age\ group\ x)} = \frac{[OHM]_{soil} * SA_x * RAF_{c\text{-}derm} * SAF_x * EF_{derm} * ED * EP_x * C}{BW_x * AP_{lifetime}}$$

Vlookup Version v0315

Parameter	Value	Units
CSF	OHM specific	$(mg/kg\text{-}day)^{-1}$
LADD	age/OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
$IR_{(1\text{-}8)}$	100	mg/day
$IR_{(8\text{-}15)}$	50	mg/day
$IR_{(15\text{-}31)}$	50	mg/day
$RAF_{c\text{-}ing}$	OHM specific	dimensionless
$RAF_{c\text{-}derm}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.247	event/day
ED	1	day/event
$EP_{(1\text{-}8)}$	7	years
$EP_{(8\text{-}15)}$	7	years
$EP_{(15\text{-}31)}$	16	years
C	0.000001	kg/mg
$BW_{(1\text{-}8)}$	17.0	kg
$BW_{(8\text{-}15)}$	39.9	kg
$BW_{(15\text{-}31)}$	58.7	kg
$AP_{(lifetime)}$	70	years
$SA_{(1\text{-}8)}$	2431	cm^2/day
$SA_{(8\text{-}15)}$	4427	cm^2/day
$SA_{(15\text{-}31)}$	5653	cm^2/day
$SAF_{(1\text{-}8)}$	0.35	mg/cm^2
$SAF_{(8\text{-}15)}$	0.14	mg/cm^2
$SAF_{(15\text{-}31)}$	0.13	mg/cm^2

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Park Visitor - Soil: Table PS-3
Equations to Calculate Chronic Noncancer Risk for Visitor (Age 1-8 years)

Vlookup Version v0315

Chronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc\text{-}ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Chronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{ing,derm}}{RfD}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc\text{-}derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
IR	100	mg/day
$RAF_{nc\text{-}ing}$	OHM specific	dimensionless
$RAF_{nc\text{-}derm}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.247	event/day
ED	1	day/event
EP	7	years
C	0.000001	kg/mg
BW	17.0	kg
AP	7	year
SA	2431	cm^2/day
SAF	0.35	mg/cm^2

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Park Visitor - Soil: Table PS-4
Equations to Calculate Subchronic Noncancer Risk for Visitor (Age 1-2 years)

Vlookup Version v0315

Subchronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD_{subchronic}}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc\text{-}ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Subchronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{derm}}{RfD_{subchronic}}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc\text{-}derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
$[OHM]_{soil}$	OHM specific	mg/kg
IR	100	mg/day
$RAF_{nc\text{-}ing}$	OHM specific	dimensionless
$RAF_{nc\text{-}derm}$	OHM specific	dimensionless
$EF_{ing,derm}$	0.428	event/day
ED	1	day/event
EP	0.577	years
C	0.000001	kg/mg
BW	10.7	kg
AP	0.577	year
SA	1670	cm^2/day
SAF	0.35	mg/cm^2

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Park Visitor - Soil: Table PS-5
Definitions and Exposure Factors

Vlookup Version v0315

Parameter	Value	Units	Notes
ELCR - Excess Lifetime Cancer Risk	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal)
CSF - Cancer Slope Factor	chemical specific	$(mg/kg\text{-}day)^{-1}$	see Table PS-6
LADD - Lifetime Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
HQ - Hazard Quotient	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal)
RfD - Reference Dose	chemical specific	mg/kg-day	see Table PS-6
ADD - Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
EPC - Exposure Point Concentration	chemical specific	mg/kg	
$IR_{(1-2)}$ - Soil Ingestion Rate for age group 1-2	100	mg/day	MADEP. 1995. Guidance for Disposal Site Risk Characterization. Appendix Table B-3.
$IR_{(1-8)}$ - Soil Ingestion Rate for age group 1-8	100	mg/day	Ibid
$IR_{(8-15)}$ - Soil Ingestion Rate for age group 8-15	50	mg/day	Ibid
$IR_{(15-31)}$ - Soil Ingestion Rate for age group 15-31	50	mg/day	Ibid
RAF_c - Relative Absorption Factor for Cancer Effects	chemical specific	dimensionless	Adjusts estimated dose to conform to the revelant CSF. See Table PS-6
RAF_{NC} - Relative Absorption Factor for non-Cancer Effects	chemical specific	dimensionless	Adjusts estimated dose to conform to the revelant RfD. See Table PS-6
$EF_{subchronic}$ - Exposure Frequency for subchronic exposure	0.428	event/day	3 events/week
$EF_{chronic,lifetime}$ - Exposure Frequency for chronic or lifetime exposure	0.247	event/day	3 events/week, 30 weeks/year
ED - Exposure Duration	1	day/event	
$EP_{(1-2)}$ - Exposure Period for age group 1-2	0.577	years	30 weeks
$EP_{(1-8)}$ - Exposure Period for age group 1-8	7	years	
$EP_{(8-15)}$ - Exposure Period for age group 8-15	7	years	
$EP_{(15-31)}$ - Exposure Period for age group 15-31	16	years	
$BW_{(1-2)}$ - Body Weight for age group 1-2, subchronic	10.7	kg	U.S. EPA. 1997. Exposure Factors Handbook. Table 7-7, females.
$BW_{(1-8)}$ - Body Weight for age group 1-8	17.0	kg	Ibid
$BW_{(8-15)}$ - Body Weight for age group 8-15	39.9	kg	Ibid
$BW_{(15-31)}$ - Body Weight for age group 15-31	58.7	kg	Ibid
$AP_{subchronic}$ - Averaging Period for subchronic noncancer	0.577	years	30 weeks
$AP_{chronic}$ - Averaging Period for chronic noncancer	7	years	
$AP_{lifetime}$ - Averaging Period for cancer/lifetime	70	years	
$SA_{(1-2)}$ - Surface Area for age group 1-2	1670	cm^2/day	50th percentile of face (1/3 head), forearms, hands, lower legs, and feet for females. MADEP 1995 Guidance for Disposal Site Risk Characterization, Appendix Table B-2.
$SA_{(1-8)}$ - Surface Area for age group 1-8	2431	cm^2 / day	Ibid
$SA_{(8-15)}$ - Surface Area for age group 8-15	4427	cm^2 / day	Ibid
$SA_{(15-31)}$ - Surface Area for age group 15-31	5653	cm^2 / day	Ibid
$SAF_{(1-2)}$ - Surface Adherence Factor for age group 1-2	0.35	mg_{soil} / cm^2	All SAFs developed for ShortForm according to procedure outlined in MADEP Technical
$SAF_{(1-8)}$ - Surface Adherence Factor for age group 1-8	0.35	mg_{soil} / cm^2	Update: Weighted Skin-Soil Adherence Factors, April 2002
$SAF_{(8-15)}$ - Surface Adherence Factor for age group 8-15	0.14	mg_{soil} / cm^2	
$SAF_{(15-31)}$ - Surface Adherence Factor for age group 15-31	0.13	mg_{soil} / cm^2	

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Park Visitor - Soil: Table PS-6
Chemical-Specific Data

Vlookup Version v0315

Oil or Hazardous Material	CSF $(mg/kg\text{-}day)^{-1}$	$RAF_{c\text{-}ing}$	$RAF_{c\text{-}derm}$	Chronic RfD mg/kg-day	Subchronic RfD mg/kg-day	Chronic $RAF_{nc\text{-}ing}$	Chronic $RAF_{nc\text{-}derm}$	Subchronic $RAF_{nc\text{-}ing}$	Subchronic $RAF_{nc\text{-}derm}$

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Park Visitor - Soil: Table PS-7
Cyanide Calculations

The soil cyanide concentration limit set to protect a child park visitor against an acute, potentially lethal one-time dose of cyanide from incidental ingestion of contaminated soil is 100 mg/kg_{soil}. This is the concentration of available cyanide in soil below which acute human health effects would not be expected following a one-time exposure. This soil concentration is calculated using the equation below with a pica-type soil ingestion of 1000 mg_{soil} and an available cyanide dose limit of 0.01 $mg/kg_{body\ weight}$.

MassDEP's guidance on evaluating the risk from a one-time cyanide dose considers cyanide's potentially lethal effects as well as information on cyanide metabolism:

> Cyanides are detoxified rapidly by the body, and a large acute dose which overwhelms the detoxification mechanism is potentially more toxic than the same dose distributed over a period of hours. (MassDEP *Background Documentation for the Development of an Available Cyanide Benchmark Concentration* , originally dated October 1992, Modified August 1998)

Assessment of a potential one-time dose requires an estimate of the maximum soil concentration the receptor could contact at any one time. The average soil concentration within a typical exposure area will underestimate the potential one-time dose. Therefore, to assess the acute risk of a one-time potentially lethal dose, the EPC for cyanide should be a conservative estimate of the maximum soil concentration.

The soil concentration limit to protect park visitors against adverse effects from an acute (one-time) exposure to cyanide is 100 mg/kg.

Concentration Calculation for Cyanide

$$\text{Concentration} = \frac{\text{HQ x Acute Dose Limit x BW}}{\text{IR x RAF x Conversion Factor}}$$

Parameter	Value	Units
HQ (Hazard Quotient)	1	(unitless)
Acute Dose Limit	0.01	mg avail. CN/ kg BW
BW (Body Weight) 1-2	10.7	kg
IR (1-time reasonable max)	1000	mg
Conversion Factor	1.0E-06	kg soil / mg soil
RAF	1	(unitless)

The toxicological basis for estimating an allowable one-time dose is documented in MassDEP's 1992 *Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration,* which is published at: http://www.mass.gov/eea/docs/dep/toxics/stypes/dscyanide.pdf

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C-3 Industrial Commercial Facility Worker
Source: US EPA RSL Equations (2022)

Soil Exposure

Noncarcinogenic

Ingestion

$$SL_{ind\text{-}sol\text{-}ingn}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{ind\text{-}a}\left(\frac{365\ days}{yr} \times ED_{ind}\,(25\ yr)\right) \times BW_{ind}\,(80\ kg)}{\left(\frac{RBA}{RfD_o\left(\frac{mg}{kg-day}\right)}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}\,(25\ yr) \times IRS_{ind}\left(\frac{50\ mg}{day}\right)}$$

Inhalation

$$SL_{ind\text{-}sol\text{-}inhn}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{ind\text{-}a}\left(\frac{365\ days}{yr} \times ED_{ind}\,(25\ yr)\right)}{\left(\frac{1}{RfC\left(\frac{mg}{m^3}\right)}\right) \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}\,(25\ yr) \times ET_{ind}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{ind\text{-}sol\text{-}totn}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{ind\text{-}sol\text{-}ingn}} + \frac{1}{PRG_{ind\text{-}sol\text{-}inhn}}}$$

Carcinogenic

Ingestion

$$SL_{ind-sol-ingc}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{ind}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right) \times BW_{ind}\,(80\ kg)}{CSF_o\left(\frac{mg}{kg-day}\right)^{-1} \times \left(\frac{10^{-6}\ kg}{mg}\right) \times RBA \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}\,(25\ yr) \times IRS_{ind}\left(\frac{50\ mg}{day}\right)}$$

Inhalation

$$SL_{ind-sol-inhc}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{ind}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right)}{IUR\left(\frac{\mu g}{m^3}\right)^{-1} \times \left(\frac{1000\ \mu g}{mg}\right) \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}\,(25\ yr) \times ET_{ind}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{ind-sol-totc}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{ind-sol-ingc}} + \frac{1}{PRG_{ind-sol-inhc}}}$$

Indoor Air Inhalation Exposure

Noncarcinogenic

The air land use equation, presented here, contains the following exposure routes:

Inhalation

$$SL_{ind-air-inhn}\left(\frac{\mu g}{m^3}\right) = \frac{THQ \times AT_{ind-a}\left(\frac{365\ days}{yr} \times ED_{ind}(25\ yr)\right)}{\left(\frac{1}{RfC\left(\frac{mg}{m^3}\right)}\right) \times \left(\frac{mg}{1000\ \mu g}\right) \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}(25\ yr) \times ET_{ind}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right)}$$

Carcinogenic

The air land use equation, presented here, contains the following exposure routes:

Inhalation

$$SL_{ind-air-inhc}\left(\frac{\mu g}{m^3}\right) = \frac{TR \times AT_{ind}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right)}{IUR\left(\frac{\mu g}{m^3}\right)^{-1} \times EF_{ind}\left(\frac{250\ days}{yr}\right) \times ED_{ind}(25\ yr) \times ET_{ind}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right)}$$

C-4 Construction Worker
Source: USEPA RSL Equations (2022)

Note: The exposure equations below assume active and intensive construction activities. According to the USEPA, "This is a short-term receptor exposed during the work day working around heavy vehicles suspending dust in the air. The activities for this receptor (e.g., dozing, grading, tilling, dumping, and excavating) typically involve on-site exposure to surface soils." The exposure length evaluated in this scenario is 1 year (50 weeks).

Soil Exposure

Noncarcinogenic

Ingestion

$$SL_{con\text{-}sol\text{-}ingnsa}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right) \times BW_{con}(80\ kg)}{\left(\frac{RBA}{RfD_o\left(\frac{mg}{kg-day}\right)}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times IRS_{con}\left(\frac{330\ mg}{day}\right)}$$

Dermal

$$SL_{con\text{-}sol\text{-}dernsa}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right) \times BW_{con}(80\ kg)}{\left(\frac{1}{RfD_o\left(\frac{mg}{kg-day}\right) \times GIABS}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times SA_{con}\left(\frac{3{,}527\ cm^2}{day}\right) \times AF_{con}\left(\frac{0.3\ mg}{cm^2}\right) \times ABS_d}$$

Inhalation

$$SL_{con\text{-}sol\text{-}inhnsa}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right)}{\left(\frac{1}{RfC\left(\frac{mg}{m^3}\right)}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times ET_{con}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF'_{sc}\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{con\text{-}sol\text{-}totnsa}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{con\text{-}sol\text{-}ingnsa}} + \frac{1}{PRG_{con\text{-}sol\text{-}inhnsa}} + \frac{1}{PRG_{con\text{-}sol\text{-}dernsa}}}$$

Carcinogenic

Ingestion

$$SL_{con\text{-}sol\text{-}ingcsa}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right) \times BW_{con}(80\ kg)}{CSF_o\left(\frac{mg}{kg-day}\right)^{-1} \times \left(\frac{10^{-6}\ kg}{mg}\right) \times RBA \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times IRS_{con}\left(\frac{330\ mg}{day}\right)}$$

Dermal

$$SL_{con\text{-}sol\text{-}dercsa}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right) \times BW_{con}(80\ kg)}{\left(\frac{CSF_o\left(\frac{mg}{kg-day}\right)^{-1}}{GIABS}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times SA_{con}\left(\frac{3{,}527\ cm^2}{day}\right) \times AF_{con}\left(\frac{0.3\ mg}{cm^2}\right) \times ABS_d}$$

Inhalation

$$SL_{con\text{-}sol\text{-}inhcsa}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right)}{IUR\left(\frac{\mu g}{m^3}\right)^{-1} \times \left(\frac{1000\ \mu g}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times ET_{con}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF'_{sc}\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{con\text{-}sol\text{-}totcsa}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{con\text{-}sol\text{-}ingcsa}} + \frac{1}{PRG_{con\text{-}sol\text{-}inhcsa}} + \frac{1}{PRG_{con\text{-}sol\text{-}dercsa}}}$$

C-5 Utility Worker

Source: USEPA RSL Equations (2022) Construction Worker Soil Exposure to Standard Vehicle Traffic

Note: According to the EPA, the activities for this receptor (e.g., trenching, excavating) typically involve on-site exposure to surface soils. This exposure scenario assumes a standard exposure duration of 1 year (50 weeks) but could be altered according to the length of the project.

Soil Exposure

Noncarcinogenic

The construction worker soil land use equation, presented here, contains the following exposure routes:

Incidental ingestion of soil

$$SL_{con\text{-}sol\text{-}ingn}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right) \times BW_{con}(80\ kg)}{\left(\frac{RBA}{RfD_o\left(\frac{mg}{kg-day}\right)}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times IRS_{con}\left(\frac{330\ mg}{day}\right)}$$

Dermal exposure

$$SL_{con\text{-}sol\text{-}dern}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right) \times BW_{con}(80\ kg)}{\left(\frac{1}{RfD_o\left(\frac{mg}{kg-day}\right) \times GIABS}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times SA_{con}\left(\frac{3{,}527\ cm^2}{day}\right) \times AF_{con}\left(\frac{0.3\ mg}{cm^2}\right) \times ABS_d}$$

Inhalation of volatiles and particulates emitted from soil

$$SL_{con\text{-}sol\text{-}inhn}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{con\text{-}a}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times \left(\frac{7\ days}{wk}\right) \times ED_{con}(1\ yr)\right)}{\left(\frac{1}{RfC\left(\frac{mg}{m^3}\right)}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times ET_{con}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF_{sc}\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{con\text{-}sol\text{-}totn}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{con\text{-}sol\text{-}ingn}} + \frac{1}{PRG_{con\text{-}sol\text{-}inhn}} + \frac{1}{PRG_{con\text{-}sol\text{-}dern}}}$$

Carcinogenic

The construction worker soil land use equation, presented here, contains the following exposure routes:

Incidental ingestion of soil

$$SL_{con\text{-}sol\text{-}ingc}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right) \times BW_{con}(80\ kg)}{CSF_o\left(\frac{mg}{kg-day}\right)^{-1} \times \left(\frac{10^{-6}\ kg}{mg}\right) \times RBA \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times IRS_{con}\left(\frac{330\ mg}{day}\right)}$$

Dermal exposure

$$SL_{con\text{-}sol\text{-}derc}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right) \times BW_{con}(80\ kg)}{\left(\frac{CSF_o\left(\frac{mg}{kg-day}\right)^{-1}}{GIABS}\right) \times \left(\frac{10^{-6}\ kg}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times SA_{con}\left(\frac{3{,}527\ cm^2}{day}\right) \times AF_{con}\left(\frac{0.3\ mg}{cm^2}\right) \times ABS_d}$$

Inhalation of volatiles and particulates emitted from soil

$$SL_{con\text{-}sol\text{-}inhc}\left(\frac{mg}{kg}\right) = \frac{TR \times AT_{con}\left(\frac{365\ days}{yr} \times LT(70\ yrs)\right)}{IUR\left(\frac{\mu g}{m^3}\right)^{-1} \times \left(\frac{1000\ \mu g}{mg}\right) \times EF_{con}\left(EW_{con}\left(\frac{50\ wks}{yr}\right) \times DW_{con}\left(\frac{5\ days}{wk}\right)\right) \times ED_{con}(1\ yr) \times ET_{con}\left(\frac{8\ hrs}{day}\right) \times \left(\frac{1\ day}{24\ hrs}\right) \times \left(\frac{1}{VF_{ulim}\left(\frac{m^3}{kg}\right)} + \frac{1}{PEF_{sc}\left(\frac{m^3}{kg}\right)}\right)}$$

Total

$$SL_{con\text{-}sol\text{-}totc}\left(\frac{mg}{kg}\right) = \frac{1}{\frac{1}{PRG_{con\text{-}sol\text{-}ingc}} + \frac{1}{PRG_{con\text{-}sol\text{-}inhc}} + \frac{1}{PRG_{con\text{-}sol\text{-}derc}}}$$

Subcommittee 10 Concept Paper
Roles and Qualifications of Non-LEP Environmental Professionals

March 3, 2023

I. Introduction

A. *Charge of Subcommittee 10*

Subcommittee 10 was convened by and on behalf of the release-based working group ("Working Group") to examine the role and responsibilities of non-LEP environmental professionals in the release-based remediation program contemplated under Public Act 20-09. Specifically, Subcommittee 10 was asked to consider the following questions:

1. Under what conditions could other professionals certify that releases have been investigated, and, if required, remediated? Conditions mentioned in the statute include pollutant type, concentration or volume, and the imminence of harm to public health (Sec. 22a-134tt(c)(5)).

2. What other types of environmental activity could they supervise and what type of activity is currently being supervised by non-LEPs?

3. What education, experience or other qualifications are appropriate to ensure protection of public health and the environment in the specific scenarios contemplated?

4. What mechanism other than a new licensure can be used to demonstrate someone is qualified?

5. What mechanisms could be employed to limit concerns associated with relying on certifications by non-LEP environmental professionals?

B. *Review of DEEP Priority Issues*

During the February 14, 2023 meeting of the Working Group, DEEP summarized the Working Group's discussions of non-LEP professionals to date and shared DEEP's initial thinking and priorities. Specifically, DEEP identified four priority topics that should guide the development of the role and responsibilities of non-LEP professionals:

1. Creating a level playing field: Responsible Parties (RPs) may not want to utilize LEPs if they are required to report discoveries that non-LEPs would not be required to report, or if non-LEPs would not be held accountable in the same way that LEPs are. Under Conn. Gen. Stat. § 22a-134rr the responsibility to report rests with the creator/maintainer and consultants working on their behalf, whether or not they are LEPs.

2. Qualifications determined by complexity of release: Qualifications for non-LEP environmental professionals must be appropriate for the complexity of the release. It will be possible for non-LEPs to close out lower-risk scenarios, but LEPs will be required for other scenarios.

3. Certainty of closure: Ensure that a cleanup certification has a standard meaning regardless of the qualified professional who certified. A certification by a non-LEP that a release has been cleaned up should have the same weight as a release verified by an LEP. LEPs should not need to re-certify previously certified releases.

4. Ensuring certification and accountability: There is a need to ensure that non-LEP professionals can be held accountable. Third-party certifications (e.g., CHMM, PE) could be leveraged to demonstrate that the non-LEP professional has relevant qualifications. Non-LEPs could "self-certify" and attest that they meet qualification requirements, with enforcement for improper certifications.

The consensus and majority positions reached by Subcommittee 10 are broadly consistent with the priorities identified by DEEP. Specific DEEP priorities are discussed below in relation to Subcommittee 10 positions.

C. *Terminology*

This paper attempts to build upon the defined terms set forth in existing statutes and regulations while highlighting areas where further refinement is required. This paper will use the following defined terms:

1. Technical Environmental Professionals (TEPs): As discussed below, many of the previous subcommittees envisioned roles for non-LEP professionals, but each group used different terminology. To avoid confusion, the term TEP (technical environmental professional) is used throughout this document to refer to an individual, other than an LEP, who would be deemed qualified to address certain types of releases.

2. Remediation Standard Regulations (RSRs): We understand and assume that in connection with the release-based program the RSRs will be amended to encompass the concepts that the Working Group has suggested so far, or that new remediation regulations will be promulgated using the RSRs as a backbone. For the sake of discussion, we use "RSRs" to mean the RSRs as they may be amended or the new set of regulations that may be promulgated to define cleanup standards and endpoints.

3. Certification: We are intentionally avoiding the word "closed/closure" because the present usage is widespread, but confusing and/or unclear. We are using the word "Certification" to identify the documentation and signature, on a form specified by DEEP, which indicates that a release eligible for sign-off by a TEP has been cleaned up to the standards

specified in the RSRs. The subcommittee believes that the term "Certification" should be used for such releases regardless of whether a TEP or an LEP is signing the form and that there should be no difference in the form, certification statement, or requirements/expectations for activities performed for such releases if an LEP is the individual signing the Certification. Some Subcommittee members further argued that LEPs should not use their stamp on a Certification form because to do so would result in more weight being given to a sign-off by an LEP, which is counter to the objective of having a Certification by a TEP carry the same weight as an Certification by an LEP (discussed further below).

4. Lower-risk releases: There was discussion of how TEPs will handle lower-risk releases that are too complex to be handled by an untrained civilian. We acknowledge there will be more serious releases addressed by LEPs and less serious releases that could be handled by any member of the general public.

II. Group membership and procedures

Group members and affiliations are listed in **Appendix A**. Subcommittee 10 met on Thursday mornings. For a few weekly meeting cycles, Subcommittee 10 split into three subgroups which focused on specific thematic areas (the Who, What, and How questions discussed in more detail below). For the majority of the meetings, however, Subcommittee 10 met as a unified subcommittee.

III. Context

A. *Assumptions*

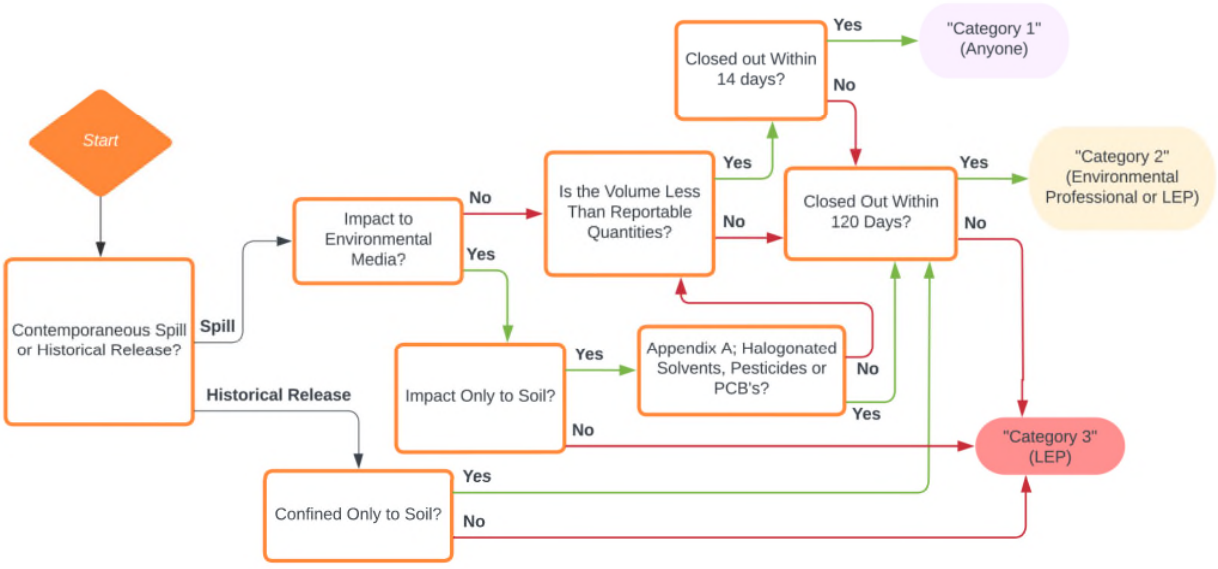
We assume that the basic outlines of the release-based program will be consistent with the recommendations of the Working Group and its subcommittees so far. In particular:

1. We assume that releases will be grouped into three categories according to severity and level of expertise required to clean them up. This assumption is consistent with the Phase II Drafting Team Report (July 2022), as summarized in Figure 1 below (though we recognize that there may be some tweaks as the program is developed, for example the timelines listed may change). The least significant releases (e.g., volumes below reportable quantities and cleaned up quickly) will be cleaned up by members of the general public. The most significant releases will require LEP verification. There will also be a category (Category 2 in the flow chart below) that requires some level of specialized training but not necessarily an LEP. This Subcommittee focused its review on Category 2 releases.

Figure 1

Basic Release Based Decision Tree

06-23-2022



2. We assume DEEP's emergency response role continues. DEEP staff currently triage all spills reported under the Conn. Gen. Stat. § 22a-450 spill regulations. They consider all information provided and decide whether to send emergency response staff to the spill incident. We assume that this practice will continue after the new regulations are in place so that DEEP can respond to imminent threats to human health and the environment (i.e., emergency responses) and, as appropriate, guide response activities.

3. We assume that Permitted Spill Response Contractors (PSRCs) will continue their immediate response role. We assume that some PSRCs will also be designated as TEPs, but not necessarily all of them. We assume that the immediate removal action (IRA) concept developed by Subcommittee 4 will be fleshed out to envision a role for PSRCs (e.g., mitigating an immediate hazard) but that confirmation of compliance with the RSRs may require an LEP or TEP.

4. We assume that TEPs will supervise investigations/cleanups that result in Certifications but that TEPs will not necessarily perform every task personally. At present, it is common for LEPs to rely on their colleagues and subcontractors to perform tasks that ultimately contribute to a Verification. For example, an LEP signing off on a Verification probably did not personally develop any wells, take any samples, or run any tests. LEPs routinely rely on work by others consistent with accepted practice. Similarly, TEPs will rely on subcontractors and colleagues for many tasks and need not perform the activities themselves as long as the activities are done under their supervision.

5. We assume that the RSRs will be amended to include endpoints for releases that do not impact environmental media, or impact environmental media only modestly. As discussed above, we assume that the RSRs will be amended to reflect the input of the Working Group. In particular, if all releases must be remediated to achieve compliance with the RSRs, the RSRs must be amended to include endpoints for releases that do not impact environmental media. We also assume that, consistent with the recommendations of Subcommittee 6, there will be a means for RSR compliance to be documented without confirmatory sampling (e.g., visual confirmation that a small release has been adequately cleaned up).

    a. Subcommittee 6 suggested that for certain types of spills (e.g., small and/or relatively more viscous) cleanup could be documented based on a visual review and amount of soil removed without confirmatory sampling. Subcommittee 3 also contemplated the possibility that no sampling be required for that type of release. Subcommittee 10 has not duplicated the efforts of Subcommittees 3 and 6 and does not take a position on the specific types of releases that can be Certified without sampling (if any).

6. We understand that DEEP does not have the capacity to create an additional licensing program for TEPs.

B. ***Previous Subcommittee Reports***

As DEEP staff outlined at the February 14, 2023 Working Group meeting, several previous subcommittees envisioned a role for non-LEP professionals. Selected relevant recommendations of prior subcommittees are discussed below. This discussion uses the terminology used by each individual subcommittee. We are intentionally preserving the use of the original terminology and not collapsing it all down to one "TEP" category because the issue of whether all of these functions should be performed by the same group of people has not yet been decided.

1. Subcommittee 3: Characterization.

    Subcommittee 3 contemplated a role for non-LEP environmental professionals in characterizing releases. They recommended training and/or continuing education programs for non-LEPs. This subcommittee also suggested the possibility of a self-certifying statement (with appropriate language to provide some level of responsibility for false statements) indicating that the TEP signing it had the appropriate qualifications for the activities they performed and/or a registration system that would require documentation of qualifications.

    The concept of accountability for non-LEPs was recognized as particularly important: "If non-LEPs were to be authorized to conduct characterization

under the Release-Based Cleanup Program, even of small, low-risk releases, a mechanism must be in place to provide assurance to the public and other stakeholders that the individual is qualified to perform the services and that there is accountability for that individual if the services are not performed in a manner that is consistent with prevailing standards, guidelines and regulations." Subcommittee 3 paper, at 21-22.

2. Subcommittee 4: Immediate Removal Actions

Subcommittee 4 envisioned a role for Qualified Environmental Professionals, or QEPs (including LEPs, licensed spill contractors, CHMMs, CIHs, Pesticide applicators UST operators), to perform IRA activities. Subcommittee 4 suggested that QEPs could be responsible for an "initial evaluation" of the release or potential release to determine whether there had been impacts to soil or groundwater.

Subcommittee 4 acknowledged that some releases, such as those impacting sensitive receptors or impacting (or potentially impacting) groundwater or surface water would need to be handled by an LEP rather than a different type of QEP.

3. Subcommittee 5: Tiers

Subcommittee 5 was of mixed opinion as to whether Tier 3 releases (lower risk releases and/or those in a monitoring posture after active remediation has been completed) require LEP oversight or if required monitoring could be performed by other QEPs. A majority agreed that final closure would require LEP documentation of regulatory compliance.

Subcommittee 5 discussed whether Tier 3 releases in "maintenance mode" (e.g., long term monitoring) could be led by a QEP. The definition of a QEP has not been agreed upon, but might be like the definition of Environmental Professional as defined in 40 CFR § 312.10. They also suggested that QEPs can document on-going maintenance and monitoring activities but should not document final closure to remedial standards.

4. Subcommittee 6: Modification of Cleanup Standards for Lower-Risk Releases

Subcommittee 6 envisioned a role for "trained professionals" to "respond" to certain types of releases, which the group acknowledged may or may not meet the same definition as "properly trained professionals" as defined in the spill regulations.

Subcommittee 6 stressed that the release-based regulations "need to ensure that closure by non-LEPs creates the same certainty of closure by LEPs" in order for the new program to succeed. Subcommittee 6 paper, at 3.

5. Subcommittee 8: Clean-up Completion Documentation, Verifications, and Audit Frequency and Timeframes

Subcommittee 8 contemplated a role for non-LEPs to "document closure" of a release and suggested that an online fillable form would make the documentation easier for a responsible party or non-LEP professional to work with.

Subcommittee 8 created a table setting forth the types of closure documentation appropriate for different types of releases, and suggested that three low-severity categories of releases could be closed by non-LEPs (contemporaneous releases below a reportable quantity, historical releases below reportable concentrations, spills to impervious surfaces).

IV. **Discussion**

A. ***WHO are TEPs? (DEEP Questions 3 and 4)***

1. Overview. The group agreed that certain releases could be Certified by persons who are not LEPs (i.e. nobody expressed the opinion that only LEPs can Certify releases). The group agreed that some combination of training, education, and experience was necessary for such individuals.

2. Training. Most, but not all, members of the group agreed that all TEPs must attend a training course that included basic information regarding release response and remediation. The group did not determine, or discuss to any significant extent, the specifics of the contents of the course or the number of contact hours that would be sufficient (but the discussion generally contemplated a training course that could be completed in one day). The group envisioned that such a course could be offered by private providers such as the Environmental Professionals Organization of Connecticut. Those members who agreed that a training course should be required also agreed that the requisite education and experience requirement must be met before entry into the training course would be allowed.

   Topics to be considered for training are provided in **Appendix B**.

3. Education and Experience. Because responding to spills requires compliance with/consideration of the standard of care, the group suggests that DEEP set forth a matrix of minimum combinations of education and experience required to qualify as a TEP. The below matrix is the lowest level of experience group members were comfortable with:

Education	**Experience***
Baccalaureate or advance degree in a related science or engineering field	2 years
Associates degree in a related science or engineering field, or baccalaureate degree	4 years
High school diploma or GED	6 years
*Experience must be relevant to release investigation, response and remediation.	

Some members of the group recommended greater levels of experience. Some expressed the view that experience dealing with releases to environmental media was more important than training or credentials due mainly to the fact that professional judgement will need to be exercised to evaluate and close release incidents. The more serious the release, the more robust the credentials that would be required. Once DEEP identifies the level of releases subject to Certification, the required TEP credentials could be identified with more precision.

4. Existing Credentials. In recognition that a separate licensing system will not be created, the group reviewed use of existing credentials as sufficient to qualify as a TEP. The group discussed whether existing credentials such as LSP, PE, CHHM, PG, and A/B UST Operator may suffice. Most members of the group agreed that the credential alone was not sufficient, but a TEP also needed to have the requisite experience and to attend the training course, since release remediation may be outside the person's scope of experience (example: an electrical engineering PE). The group recognized that a credentialed person likely has the requisite education to qualify as a TEP.

5. Registration. A majority of the group felt that a list of those who had been trained should be maintained. There was a minority view that training is not required so there is no need for a list of people who had been trained. The providers and course could be accredited by the LEP Board to ensure the content was acceptable to DEEP to satisfy the qualifications to become a TEP. There was discussion regarding whether another agency would have the capacity to register the TEPs (e.g., Consumer Protection).

6. Accountability. The group did not reach any consensus regarding the mechanism for accountability of a TEP, but did agree that there would need to be some mechanism that provided accountability. The group recognized the difficulties of holding a TEP accountable, since some may not have a license to lose. The group also discussed the extent to which TEPs might face consequences for improper Certifications in connection with other relevant credentials. Massachusetts LSPs reported that the LSP Board of Registration only reviews actions as they relate to the MCP and, therefore, an LSP would not be punished in Massachusetts for improper activities in Connecticut. Accountability is also discussed in Section C.

7. Alternative Certification/Special Cases: Some members of the group take a position that in some instances a limited TEP qualification may be appropriate. Examples include state and municipal professionals such as firefighters who have familiarity with motor vehicle fluid spills, EHS managers that are familiar with the materials handled at their facility and electric utility personnel who routinely respond to transformer spills (discussed further below). Language in the regulations could provide carve-outs for the indicated categories, and probably others, that would limit Certifications for each category of individuals to the types of releases with which they are familiar. It is also possible that language in the certification statement itself could be crafted such that the individual signing the statement would be certifying that they are qualified by knowledge and experience to certify the cleanup for the substances and circumstances of the release.

   It was recognized that for most of the situations noted below, an individual either performing the activity or supervisory personnel would have the requisite experience and training to cleanup the release, but it would still be necessary for anyone certifying a release to be sufficiently knowledgeable to document that the cleanup resulted in conditions that were in compliance with the RSRs.

   a. State or municipal technical professional. These people would be designated by the signatory authority to "certify" "certain" releases as "remediated". These "certain" releases could be defined or listed. We would expect them to include releases associated with typical motor-vehicle accidents, releases related to core operations (i.e. DPW) and other common releases that fire departments, etc. routinely handle today.

   b. Facility EHS professionals. A facility EHS manager might be authorized to sign off on spills of a certain type (perhaps as defined in the facility SPCC plan) but not on other types of spills outside the facility's experience and capacity.

   c. Utility professionals. Authorized utility personnel might be authorized to sign off on transformer releases (including PCB releases as currently authorized by DEEP) and other releases related to core operations but not other types of spills.

   d. Residential tank pulls. Tank removal contractors might be authorized to Certify residential tank pulls as long as the conditions of the release were consistent with other limitations for Certification by a TEP.

B. ***WHAT sort of releases will TEPs handle? (DEEP Questions 1 &2)***

A Subgroup of Subcommittee 10 was tasked with considering the characteristics of a release that could be Certified by TEPs that would be acceptable to the range of stakeholders that would need to believe that such Certifications carry the same weight as a similar Certification by an LEP.

The subgroup was in general concurrence that:

1. Certification by TEPs would be limited to interior releases wholly contained within a building or releases to pavement or soil only, with no impacts to other environmental media.

    a. Releases that occurred inside a building would need to be cleaned up within a specified time-frame to be Certified by a TEP, as long as the specified timeframes, which could vary based on the mobility of certain classes of substances, were short enough that there would be a low probability of the release reaching the underlying soil, regardless of the characteristics of the building floor. The certifying TEP would have to document that no obvious permeable pathways were present where the release occurred (i.e., cracks/joints in the floor, sumps, or drains). If a pathway for the release to migrate beyond the building interior were to be identified, the TEP could only Certify the cleanup if the further evaluation and cleanup fell within the limits of their expertise and were within the volume and timeframe limitations for Certification.

2. Subcommittee 10 reached consensus that any release that impacted groundwater would require an LEP for final sign-off, whether that be a verification or some other formal LEP closure mechanism. The group did not reach a consensus on how it should be determined that there has not been an impact to groundwater and the level of certainty that should be required.

    a. If there were no impacts to groundwater or no potential for the release to impact groundwater based on 1) the volume of the material released, 2) the depth to which excavation was necessary to meet RSR criteria was sufficiently above the capillary fringe, and 3) the mobility through soil of the constituent released would not result in groundwater impacts within the timeframe between when the release occurred and when it was remediated. Certification would be permitted provided the limitations on volume of soil excavated were not exceeded (noted below).

    b. Most subcommittee members felt that there should be some limit on the volume of soil that could be excavated and still allow

Certification and that the volume allowed should take into consideration the risk associated with the specific substance or class of substance. Possible options including using the same volume as Massachusetts for a Limited Removal Action (which does not require an LSP to be involved), which is 100 cubic yards of petroleum-contaminated soil and 20 cubic yards of soil contaminated with hazardous waste. Others in the subcommittee felt the volume allowed for Certification should be higher (up to 350 cubic yards), while some felt that perhaps even 100 cubic yards might be too high.

3. For Certification of a release, it was generally agreed that some time-frame should be set for how much time elapsed between when the release occurred and when remediation was initiated or completed.

    a. Timeframes proposed were as much as seven days or as short as 48 or 72 hours, with the possibility that the timeframe could differ depending on the mobility characteristics and volume of the substance released. The shorter timeframe would limit the potential for increased depth of penetration of a liquid release and, therefore, limit the amount of soil that would need to be excavated and reduce the potential for groundwater to be impacted. It is particularly important to limit the timeframe between release and cleanup because many substances, such as gasoline and solvents, can penetrate rather quickly through surfaces that some people consider impervious, and increased use of permeable pavement increases the potential for vertical migration into underlying soil.

    b. It was considered important that the characteristics of the substance released must be considered in setting timeframes, with less time allowed for cleanup to occur for those substances with constituents that have higher mobility and/or toxicity and greater potential to impact receptors.

4. Generally, historical releases would require an LEP for final sign-off due to the many unknowns that would exist in such discoveries of a release. A majority of members agreed that there might be some limited categories of historical releases that would be appropriate for Certification, but consensus was not reached on which specific types of historical releases.

    a. A number of members felt that an exception to historical releases requiring an LEP might be UST excavations, with the rationale being that the number of unknowns would be limited (i.e., the source of the release, as well as the material released would be known).

b. However, several members felt that such an exception should be restricted to smaller tanks and to tanks containing fuel oil, such as residential heating oil USTs. The rationale for that limitation was 1) the size of the tank, with larger tanks requiring deeper depths for excavation that would come close to the water table in many parts of Connecticut and a greater volume of soil that would likely require excavation were a release to be identified, 2) the mobility of substances such as gasoline and solvents (chlorinated or otherwise) and the greater likelihood that a release of that type of substance from a UST could reach groundwater faster due to increased mobility in the subsurface, and 3) the greater risk associated with the constituents in gasoline or solvents, including the risk of vapor intrusion.

c. Other restrictions proposed herein to limit Certifications generally (impacts to soil only and limitations on the volume of soil excavated), would still exist for Certifications related to USTs.

d. Possible exceptions to allowing Certification of releases from residential heating oil tanks might be in cases where a potable water supply well was present at the property where the release occurred or whether such a potable well could be present at locations within some limited distance and the proximity of residential USTs to residences and the potential for vapor intrusion would need to be considered. Evaluating those pathways goes beyond the collection of soil samples at appropriate locations, with analysis for specified constituents and subsequent comparison of analytical results to RSR numerical criteria and seems to fall within the LEP domain due to the potential risk to receptors.

5. For any release that is Certified by a TEP, the Certification must state that conditions at the release area following cleanup are in compliance with the RSRs. A majority of members felt that a TEP evaluation with respect to compliance with the RSRs should be restricted to comparison of any laboratory results to the default, numerical criteria specified in the regulations (potentially including fast-track APS stanards) without using any alternative provisions of the RSRs. LEPs are specifically trained in RSR interpretation and implementation.

a. Therefore, for a TEP to certify that remediation of a release resulted in compliance with the RSRs, the value to which analytical results would be compared would have to be the Residential Direct Exposure Criteria and the Pollutant Mobility Criteria applicable to the groundwater classification for the area where the release occurred, as those are the most stringent standards that would not require additional interpretation of the

RSRs or use of any RSR alternative approaches, such as ELURs to prevent residential use.

b. The TEP would also only be able to compare analytical results to standards already within the regulations, since using criteria identified in the additional polluting substances list requires application of additional provisions of the RSRs, as does developing criteria for additional polluting substances not already on the APS list, and both of these activities fall clearly within the LEP realm. Because of this restriction on Certifications, the subcommittee strongly recommends that when the RSRs are updated to accommodate the needs of the Release-Based Program, the list of criteria currently in the RSRs be expanded to include those constituents on the list of additional polluting substances or perhaps at least drop the requirement that one must request approval for use of the criteria identified on that list.

6. The group was about evenly split on the question of whether an LEP should be required to use his/her LEP stamp when preparing a Certification. Under the current LEP regulations, use of an LEP stamp on any document other than a verification or associated documents is not allowed. Some group members argued that if an LEP happens to be preparing a Certification, he/she should be able to Certify such a release using the same statement as a TEP and should not be required to use their LEP stamp or have their Certification be required to have any additional elements than a similar Certification by a TEP. They argued that imposing any differences in such a Certification for LEPs would completely undermine the objective of having Certifications by TEPs be regarded with the same level of validity as a similar Certification by an LEP. Other members of the group argued that under the LEP Rules of Professional Conduct (R.C.S.A. §22a-133v-6), an LEP may be disciplined in connection with services for which an LEP license is not required, so there will always be differences unless there are also corresponding changes to the LEP regulations.

7. Some fraction of Certifications prepared by TEPs will have errors. In defining the universe of releases that may be Certified by TEPs, DEEP and the Working Group will need to consider the acceptable level of risk present if a TEP gets it wrong. Each individual release may be relatively lower risk, but there will be a lot of them.

8. The special cases listed above (municipal/state professionals, facility EHS professionals, utility professionals) might not be authorized to handle the full universe of spills that would be handled by a TEP, but would handle a more tightly-defined set of releases.

9. Further discussion is needed regarding the level of investigation a TEP or trained person be required to complete to demonstrate that their involvement was appropriate and that an LEP does not need to be involved.

C. ***HOW will the program be implemented to foster environmental protection and market acceptance? (DEEP Question 5)***

A subgroup of Subcommittee 10 was tasked with considering Question 5 of our charge: What mechanisms could be employed to limit concerns associated with relying on Certifications by non-LEP environmental professionals? In other words, how can the Certification option be structured to ensure environmental protection while gaining market acceptance? The HOW subcommittee came to the following conclusions:

1. The strength of the training/credentialing program will impact market acceptance. As discussed above, the more serious the releases that will be handled through the Certification pathway, the more important training and education become. A majority, but not all members, agreed that a robust training and credentialing program will help assure market participants and other stakeholders that TEPs are qualified to prepare Certifications for the releases subject to the Certification pathway.

2. Solid documentation that is easily prepared and easily understood will play an important role in market acceptance. A Certification will only be useful if LEPs and market participants can rely upon it without redoing work. In addition to training and documentation of TEP credentials, it will be important to document the TEP's work. If an LEP is trying to decide whether or not to rely on TEP work, the original data, photos, and other documentation will help him/her reach that decision and feel more comfortable with that decision. A live web-form that expands as needed would be helpful. There should also be opportunities to upload photos, figures, data and other documentation. The attached checklist provided as **Appendix C** presents a conceptual framework.

3. There needs to be a strong, enforceable certification statement. A critical part of the Certification should be a certification statement attesting that the signatory meets the specified qualifications and attesting that the information contained in the Certification is true, accurate and complete. There should be penalties for intentional misstatements on the Certification form.

   Subcommittee 10 notes that DEEP Certification language for several existing forms provides that false statements are punishable as a criminal offense (as permitted under Conn. Gen. Stat. § 22a-6(a)(8). A majority of Subcommittee 10 recommend that intentionally false statements on Certifications should similarly be punishable as criminal offenses.

4. DEEP needs to be involved in enforcement. There was consensus that DEEP needs to have some sort of enforcement mechanism to hold TEPs accountable for improper Certifications. The subgroup was evenly split on whether there should be audits of Certifications. Some were concerned that DEEP may not have the capacity for an audit program. The group notes that Conn. Gen. Stat. 22a-134tt(g)(a) requires the release-based regulations to "[a]uthorize the commissioner to audit any verification" but that "verification" is defined by statute to specifically refer to documents prepared by LEPs.

5. A Certification must incorporate the same standard of care as would be expected for Certification by an LEP, such as sufficient sampling and analysis to support the certification statement. The standard of care for TEPs will need to be the same as for LEPs, because otherwise LEPs would not be able to rely on a Certification.

6. A Certification must have the same legal weight as an LEP Verification. While consensus has not been reached on precise terminology, there is consensus that the final product of the TEP must have the same legal and technical weight as a LEP Verification for the TEP option to have value to market participants. In order to earn market acceptance, the final TEP product should be well-documented with specific required sections similar to a verification.

   Some LEPs in Subcommittee 10 have noted that R.C.S.A. §22a-133v-6(c)(2) provides that an LEP may "rely upon the advice of one or more persons whom such licensee determines are qualified by education or experience to the extent that such reliance is consistent with the common and accepted practice of a licensed environmental professional." A majority of Subcommittee 10 members request that DEEP/the LEP Board of Examiners amend this regulatory section to specifically state that an LEP may rely upon the Certification of a TEP (modified to reflect the relevant terminology that is ultimately chosen). Other group members felt that this was not necessary, because the existing language would permit an LEP to rely on work by a TEP at his/her discretion.

D. Additional Considerations

1. When the TEP concepts are fleshed out more fully they will need to be integrated into the larger release-based framework in additional ways. For example, will TEPs be subject to direct reporting obligations similar to certain SEH conditions now?

2. It will be impossible for the Certification to fully satisfy all market participants, as risk tolerance varies significantly between various market participants. There will always be some especially risk-averse market

participants who will want to do their own sampling rather than rely on Certifications prepared by/on behalf of others.

3. During due diligence activities, multiple releases can be identified at a site. Managing multiple releases with varying tracking numbers, timeframes and requirements could become burdensome for larger sites. We recommend that consideration be given for an exemption from reporting for sites placed in a LEP-administrated voluntary cleanup program, like we have today, including verification up to a certain date, including the date of verification.

4. Several members of the group recommend that the initial regulation drafting efforts focus on revising the RSRs. It was pointed out that the RSRs are applicable to releases to the environment and the group agreed that many of the reported contemporaneous spills never reach the environment, as they are released directly to concrete or asphalt and are abated prior to reaching the environment. For this new program to be effective, regulations with procedures and/or standards to close these types of releases will be required. Some believed drafting this portion of the new regulation package was not necessary to evaluate non-LEP closures, while others believed focusing drafting time on this portion of the new regulation package would ultimately aid in making final decisions on who, what, and when non-LEPs could certify closure of releases. Based on previous presentations from DEEP, we understand that DEEP also has RSR revisions they are contemplating. Furthermore, focusing on revising the RSRs at this time would allow for the incorporation of the cumulative risk assessment concepts, recommended by Subcommittee 9.

5. Some subcommittee members prepared supplemental materials that set forth positions that are not reflected in this paper. The supplemental materials are provided as **Appendix D**.

Appendix A - Roster

Subcommittee 10: Role and Qualifications of Non-LEP Environmental Professionals

Robert Kovach	ERM	Licensed Environmental Professionals
Thomas Salimeno	Stantec	Licensed Environmental Professionals
Gail Batchelder	HGC Environmental	Licensed Environmental Professionals
John Liddon	Kleinfelder	Licensed Environmental Professionals
Samuel Haydock	BL Companies	Licensed Environmental Professionals
Brent Henebry	Fuss & O'Neill	Licensed Environmental Professionals
Matthew E Hackman	Matthew E Hackman PE CHMM Inc.	Licensed Environmental Professionals
Deborah Motycka Downie	Haley & Aldrich/Town of Stonington	Licensed Environmental Professionals
Amy Velasquez	RWA	Municipal Representative
Plato Doundoulakis	Atlas Environmental	Municipal Representative
Michael Paonessa	Dura Construction LLC	Any other interested member of the public
Michael Lawlor	Partner Engineering and Science, Inc.	Any other interested member of the public
Douglas Pelham	Cohn Birnbaum & Shea P.C.	Environmental Transaction Attorneys
Emilee Scott	Robinson + Cole	Environmental Transaction Attorneys
Sally Kropp	Kropp Environmental Contractors, Inc.	Any other interested member of the public
Kenneth Hynes	Eversource	Any other interested member of the public
Dustin Mitchell	ESI, Inc.	Any other interested member of the public
Allison Forrest-Laiuppa	DEEP	Agency Resource
Gary Trombly	DEEP	Agency Resource
Ryan Mowrey	DEEP	Agency Resource

Appendix B

Potential Training Topics for TEP Training

The following topics are suggested for inclusion in any training course that TEPs should take in order to be able to certify that conditions remaining where the release occurred and where the released substance came to be located are in compliance with the RSRs, as amended.

- Basic overview of conceptual site modeling as it pertains to a release
    - Substance released (how characteristics of specific substances can affect migration following a release to various media)
    - movement/migration from the point of the release and additional media that might be affected, potential pathways to other media
    - potential chemical changes in a substance after release, such as volatilization, increased viscosity, etc.
    - potential human and environmental receptors to be considered
    - any conditions likely to remain after cleanup
- Importance of Documentation of Release Extent and Cleanup Activities Performed
    - Key elements to record and discuss to the extent necessary so others can understand what occurred and the extent of the release prior to cleanup
    - Documentation of any cleanup/remediation activities performed, such as horizontal and vertical excavation limits, unusual conditions encountered, samples collected, sequence of events
    - Nature and volume of material removed from the release area, means of transport, and disposal location
    - Importance of sketch maps and photos
    - Written acknowledgement/documentation of all pertinent information based on checklists, as well as relevant information not addressed on a checklist
- Soil Sampling
    - techniques and expectations for soil sample collection for various release and remediation scenarios, concept of adequate characterization for post-remediation scenario
    - requirements for collection for certain types of constituents such as VOCs
    - requirements for preservation of samples
    - documentation of sampling activities – location, depth, sketch, etc., as applicable
- Wipe Sampling, depending on how RSRs are amended
- Air Sampling, depending on how RSRs are amended

- Recognizing relevant hydrogeologic characteristics
    - Conditions indicating proximity to the water table/saturated soil conditions
    - Potential pathways to groundwater or surface water from the release area
- Interpreting Laboratory Results
- RSR Basics
    - Direct exposure
    - Pollutant mobility
    - Groundwater and surface water classification
    - Tabulated, numeric criteria
- Review of Certification Form
    - Elements of the form
    - Where to find information if not specifically associated with the release
    - Certification statement
    - Legal considerations
    - Potential consequences for false statements

Throughout the training course the importance of documentation will be emphasized, particularly with respect to the objective of conveying information in a complete and coherent manner, so anyone reviewing the information can get a full picture of what has occurred, what activities were performed, the rationale for choices that were made, and how the conditions remaining at the release area following cleanup are in compliance with the regulations. The document must support the conclusions associated with the certification; and the level of detail and documentation expected will be reflective of the nature of the release in terms of volume, toxicity, media affected, and sensitivity of potential receptors. The goal is for all stakeholders to achieve a level of comfort that the release has been satisfactorily remediated and conditions remaining at the release location do not pose an unacceptable risk to human health, safety, welfare, and the environment as that risk has been identified in the regulations.

Appendix C

IMMEDIATE ACTION FIELD ASSESSMENT

FORM MUST BE SUBMITTED WITHIN 48 HOURS OF IMMEDIATE ACTION

Part I General Information

Was the release reported to CT DEEP? ☐ Yes ☐ No

If Yes, Case Number: _____

If Yes, ER Supervisor badge number:_____

If Yes, ER Coordinator badge number:_____

Was the subject site drinking water sampled? ☐ Yes ☐ No

If Yes, was a copy of the analytical results attached to this document? ☐ Yes ☐ No

Property Information

Responsible Party (RP) ☐ Property Owner ☐ Leasee ☐ Third Party ☐ Public Roadway

Property Owner or Leasee

Property Name

Property Address

City/Town

State

Zip

Tax Assessor Town

Lot

Block

Map

Acres

Part II Party Completing Form

☐ Licensed Environmental Professional (LEP)

☐ Other Environmental Professional

☐ CT DEEP ER Coordinator Badge Number _____

Appendix C

Part III Substance Released

Common Name of Substance Released _____

Substance Was Identified By ☐ Generator Knowledge ☐ SDS/MSDS ☐ Testing ☐ Testing ☐ Sample ☐ Other

Does the SubstanceContain: ☐ Non-chlorinated VOCs ☐ Chlorinated VOCs ☐ Metals ☐ PAHs ☐ SVOCs ☐ PCBs
☐ Petroleum Hydrocarbons ☐ Pesticides ☐ Herbicides ☐ Other Concern _____

Was the Release to the Surface? ☐ Yes ☐ No
If YES: ☐ Asphalt ☐ Concrete ☐ Soil ☐ Water Body

Was the Release to the Subsurface? ☐ Yes ☐ No
If YES, Soil Type: ☐ Gravel ☐ Sand ☐ Silt ☐ Clay

Was a Preferential Pathway Present? ☐ Yes ☐ No
If YES: ☐ Culvert ☐ Manway ☐ Storm Drain ☐ Sump ☐ Conduit / Pipe Run
☐ Swale / Trough ☐ Curtain Drain ☐ Recent Excavation ☐ Other _____

Part IV Settings and Receptors

Site Logistics

What Was the Designated Property Use ☐ Residential ☐ Commercial ☐ Industrial ☐ Public Roadway
Were Buildings or Structures Located at the Release Area? ☐ Yes ☐ No
Were the Buildings or Structures Occupied? ☐ Yes ☐ No
If Occupied, What Designation? ☐ Residential ☐ Commercial ☐ Industrial ☐ Public
Were any Preferential Pathways Investigated or Identified? ☐ Yes ☐ No
Is there a Significant Grade Difference at the Release Area? ☐ Yes ☐ No

Environmental Setting

Groundwater Classification ☐ GA ☐ GAA ☐ GAAs ☐ GB ☐ GC
Surface Water Classificaion ☐ AA ☐ A ☐ B
Coastal and Marine Surface Waters ☐ SA ☐ SB
Aquifer Protection Area? ☐ Yes ☐ No
Nearest Downgradient Surface Water Body _____
Distance to Surface Water Body Named Above _____
Depth to Water Table ☐ Identified _____(Feet Below Ground Level) ☐ Assumed ☐ Unknown
Depth to Bedrock ☐ Identified _____(Feet Below Ground Level) ☐ Assumed ☐ Unknown

Appendix C

Sensitive Receptors (Within 250 Feet of the Site)

- ☐ School
- ☐ Child Care Facility
- ☐ Recreational
- ☐ Healthcare Facility
- ☐ Sensitive Water Resource (Public Water, Fishing Areas)
- ☐ Other (Specify)

Water Supply Wells

Is there a known impact to Groundwater at the Time of the Release?	☐ Yes	☐ No
Is there a Public Drinking Water Well Present Within 250 Feet?	☐ Yes	☐ No
Is Public Water Supplied?	☐ Yes	☐ No
Is Public Water Available?	☐ Yes	☐ No
Was a Well Receptor Survey Completed?	☐ Yes	☐ No

Significant Enviromental Hazard (As Defined in 22a-6u)

Was a Significant Environmental Hazard Identified?	☐ Yes	☐ No
Was a Significant Environmental Hazard Notification Filed with CT DEEP	☐ Yes	☐ No

Vapor Intrusion

Is the Release Suspected to be Present Under a Structure?	☐ Yes	☐ No
Was the Building Occupied at the Time of the Release?	☐ Yes	☐ No
Were Any of the Buildings Evacuated at the Time of the Release?	☐ Yes	☐ No
Were Any Preferential Pathways Investigated or Identified?	☐ Yes	☐ No

Part V Remediation

Soil Remediation

Is there a known impact to Soil at the Time of the Release?	☐ Yes	☐ No
If Yes, is the release on the ground surface?	☐ Yes	☐ No
If Yes, the visual impact is estimated to be (dimensions) _____		
If Yes, is the release subsurface?	☐ Yes	☐ No
If yes, is the estimated volume of soil impacted over 350 tons?	☐ Yes	☐ No
If yes, did it migrate off of the subject property?	☐ Yes	☐ No
If yes, is the soil impact combined with other non-permeable surfaces?	☐ Yes	☐ No
If Yes, was contaminated soil excavation conducted?	☐ Yes	☐ No

If Yes, Soil excavation was performed by the following method:

☐ Hydraulic Machine ☐ Power Vacuum Truck ☐ Hand Excavation

If Yes, was any pooling product identified in the excavation?	☐ Yes	☐ No
If Yes, was any groundwater identified in the excavation?	☐ Yes	☐ No

Appendix C

If Yes, were any free product removal actions performed?	☐ Yes	☐ No
If yes, after soil was removed, were samples collected?	☐ Yes	☐ No
If Yes, was a copy of the analytical results attached to this document?	☐ Yes	☐ No

Part VI Documentation

Assessment Documentation and Certification

The following attachments are included:

☐ SDS ☐ Laboratory Analytical ☐ Data Tables ☐ Project Figures
☐ Photos ☐ Written Report ☐ CT DEEP Correspondence ☐ Other _____

Applicant certifies that all information on this form is true to their best belief and knowledge ☐ Yes ☐ No

Signatory name _____
Signatory email _____
Signatory phone _____
Signature _____
Date _____

Appendix D

Supplementary Submission of Group 10 Subcommittee.

To all readers, the intent of this additional submission is to offer a different point of view from other core group members. This document is not to disagree with or refute the main document, but only offers supplemental information. This comes from the perspective of spill cleanup contractors and other field response personnel, which have firsthand experience with the immediate cleanup of releases and the resources required to perform such activities.

Role and Qualifications of Non-LEP Environmental Professionals

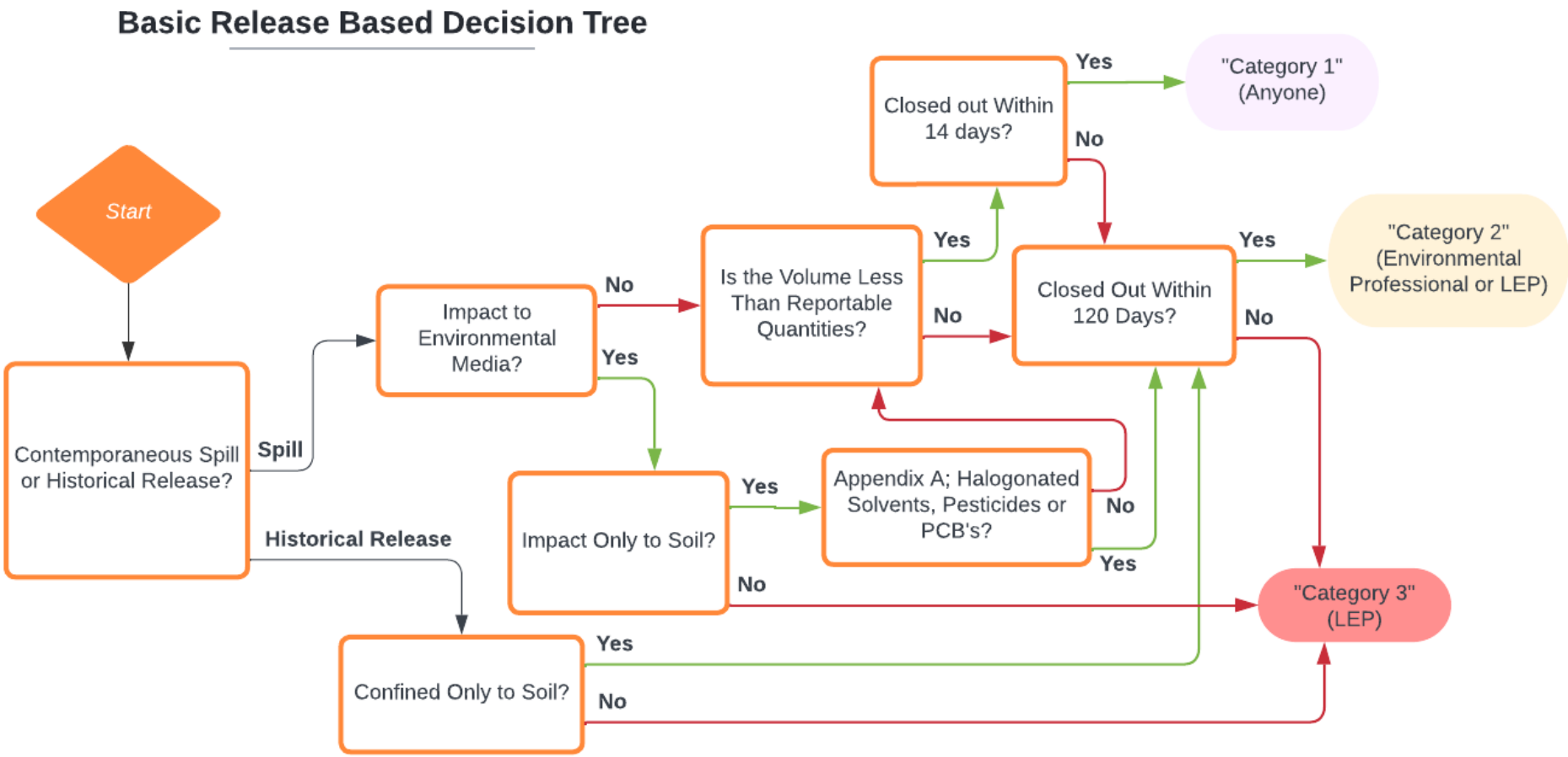
The release based cleanup program pursuant to CGS 22a-134pp through 134xx (Chapter 445b) provides an opportunity to expand the universe of professionals who may oversee certain types of environmental investigation and remediation of releases. In the statute, some releases may be remediated without being verified by a Licensed Environmental Professional. During the previous subcommittees, it has become clear that the class of professionals that would certify such releases needs to be defined. This subcommittee should discuss the following:

1. **Under what conditions could other professionals certify that releases have been remediated, and, if required, investigated? Conditions mentioned in the statute include pollutant type, concentration or volume, and the imminence of harm to public health (Sec. 22a-134tt(c)(5).**

Conditions that other professionals certify that releases have been remediated and or investigated would include the following:

- Releases to environmental media
- Releases not to environmental Media
- Historical releases confined to soil
- Contemporaneous releases
- Spills involving Halogenated solvents, pesticides, or PCB to soil
- Underground storage tank removals.
- Releases that will be cleaned up within 120 days.
- Releases to soil only, that do not exceed the following:
    - Petroleum: Time in hours x depth in feet x volume in cubic yards $\leq$100
    - Hazardous Materials: Time in hours x depth in feet x volume in cubic yards $\leq$20
    - A spill of fuel oil to soil:
        - If cleaned up within 1 hour, could be a depth of 5 feet and volume of 20 cy. If cleaned up in 4 hours, a depth of 5 feet and only 5 cy. The longer you wait, the smaller the volume you are allowed to clean up without notification and an LEP. The longer the contaminant is in soil, the more uncertainty as to how far it went.

Below is a decision tree for reference:



2. **What other types of environmental activity could they supervise and what type of activity is currently being supervised by non-LEPs?**

    - Preliminary evaluations
    - Phase I environmental site assessments
    - Phase II site investigations
    - Phase III remedial investigations / feasibility studies
    - Release reporting
    - Investigation / confirmation of underground storage tanks
    - Temporary or permanent closure of underground storage tanks
    - Groundwater sampling and monitoring
    - Site characterization
    - Operation and maintenance of monitoring systems
    - Electric Utility Transformer PCB/Non-PCB spill cleanup

3. **What education, experience or other qualifications are appropriate to ensure protection of public health and the environment in the specific scenarios contemplated.**

See the attached table on the next page for reference:

CHMM, LEP, EPA EP, A/B Operator, Utility Environmental Coordinator and PSCC Comparison						
	CHMM	CT DEEP LEP	EPA EP	CT DEEP Permitted Spill Cleanup Contractor	Electric Utility Environmental Coordinator	A/B Operator
Standard Track						
Minimal Experience	4 years	8 years	3 years Relevant Experience with certification; 5 years with Baccalaureate; 10 years with no degree	Accordance with regulations of CT State agencies, Section 22-449(c)-103 and 22a454, CFR Title 49 including 171.8 172.704 and 177.816, 29 CFR1910112a(3)	Utility commission specific to individual company	Is demonstrated by passing grade on exam
Education or Training	Bachelor's Degree +	Bachelor's Degree +	Bachelor's Degree + and/or Tribal or State License	Yes	Yes	Yes
Testing	Yes	Yes	Unknown	Unknown		Yes
Continuing Education	Yes	Yes	Yes	Yes	Yes/OSHA HAZWOPPER 8 HR Refresher	Yes
Moral Character	Yes	Yes	Yes	Yes	Yes	Yes
Alternate Track						
Minimal Experience		14	10 years Relevant Experience			
Responsible Charge Experience		7				
Testing		Yes				

Appendix D

Qualification Breakdown by Designation

Licensed Environmental Professional (LEP)

- Bachelor's or advanced degree from an accredited college or university in a science or engineering field specified by subparagraph (2)(A) of this subsection - (2)(A) A bachelor's or advanced degree from an accredited college or university shall be in one or more of the following fields or in a related science or engineering field found by the Board to be fundamentally equivalent to one of the following: biology, chemistry, earth sciences, ecology, engineering (civil, environmental, mechanical, chemical, or agricultural), environmental sciences, environmental studies, geology, hydrogeology, hydrology, natural resources management, soil sciences, toxicology, water resources, and wetland science.

- Or is a professional engineer licensed in accordance with Chapter 391 of the Connecticut General Statutes, or (B) for a minimum of fourteen (14) years engaged in the investigation and remediation of releases of hazardous waste or petroleum products into soil or groundwater, including a minimum of seven (7) years in responsible charge of such investigation and remediation.

- (C) Engaged-in experience shall be professional experience for which the Board determines that an applicant's primary duties have consistently involved both the investigation and remediation of releases of hazardous waste or petroleum products into soil or groundwater.

-CHMM

- Baccalaureate degree (or higher) from an accredited college or university, with a preference for disciplines in applied science or related field, chemistry, biology, geology, hazardous materials management, environmental science, environmental management, physical or life science or environmental technology, and

- A minimum of four years of relevant experience in the field of hazardous materials management or a related field.

- Degrees from colleges or universities outside of the U.S. are acceptable if they are documented as equivalent to a BS/BA degree issued in the U.S., candidates with degrees from colleges and universities outside of the U.S. must upload a copy of their statement of equivalency from a recognized evaluating agency.

- Relevant experience includes, but is not limited to, the following examples:
    - Hazardous materials identification and handling in compliance with applicable laws and regulations.
    - Planning and preparing for and responding to hazmat emergencies and incidents.

- Sampling and analysis (of air, water, soil, waste) for potential contaminants.
- Site investigation and remediation.
- Hazmat program or project management.

PSCC (Permitted Spill Cleanup Contractor)

LICENSES & PERMITS

Spill Cleanup Contractor Permit, Hazardous Waste Transporter Permit, HIC Contractor License, P9 Pump and Tank Contractor License, Asbestos Abatement Supervisor, State of Connecticut Basic Boating

CERTIFICATIONS

Asbestos Abatement Supervisor Training, Mystic Air Quality Consultants, Remediation and Standard Regulations, Field Safety Corporation, Installer Certification Training, Level I, Veeder-Root, Basic Boating Safety Certification, Manchester Community Technical College, Emergency Response to Terrorism, Connecticut State Fire Academy, Emergency Response Course, OSHA 1910.120, Remediation Standard Regulations Fundamental Review, EPOC of Connecticut, Sampling of Hazardous Materials, USEPA, Boston, MA, HAZMAT Railroads, Connecticut State Fire Academy, Treatment Technologies for Superfund Sites, USEPA, Boston, MA, Introduction to Groundwater Investigation, USEPA, Edison, NJ, Metering for Hazardous Materials, Connecticut State Fire Academy, Hazardous Materials Operational, Connecticut State Fire Academy, Emergency Response to Hazardous Incidents, USEPA, Edison, NJ, Pesticides, Connecticut State Fire Academy, Diking, Damming, & Diverting, Connecticut State Fire Academy, Small Container Spill Control, Connecticut State Fire Academy, Response to Hazardous Materials, Connecticut State Fire Academy, Toxicology, Connecticut State Fire Academy, Oil Storage Tank Operator Training, Bureau of Remediation & WM, Underground Storage Tank Decommissioning, International Conference of Building Officials

1. Permitted Spill Cleanup Contractors (PSCCs) need to be able to "certify" **regulated** UST removals are either "no release" (analogous to filing a PTP Form I) or "certified as meeting applicable RSR criteria." PSCCs are also state contractors who DEEP uses for their responses.
2. There is a concern with groundwater. It is not uncommon for groundwater in CT to be shallower than the base of a regulated UST (these include most larger USTs).

    a. Restricting certification of USTs where groundwater is encountered by a LEP would NOT affect their business as a PSCC, and PSCCs would likely form business relationships with LEPs to provide full service. There could be a limitation to petroleum USTs only, and PSCCs would be qualified as any other environmental services firm when it comes to knowing how and where to sample to demonstrate

compliance. This may reasonably mitigate the perceived increased risk of an undetected or inadequately remediated "site" with residual contamination above applicable RSR criteria.

b. PSCCs would make a formal submittal for UST pulls, certifying either "no release" or "certified as meeting applicable RSR criteria." This is analogous to the forms water supply well drillers submit upon installation of a new supply well, which could be argued have a similar potential to impact human health.

PSCCs, in addition to being able to certify releases of (<RQ?) oil or hazardous material to soil with no impact to groundwater, additionally can "certify" regulated petroleum UST removals, regardless of groundwater is encountered and regardless of groundwater classification. Should there be restrictions if there are sensitive receptors.

Utility Environmental Coordinator (UEC)

Contemporaneous MODF (Mineral Oil Dielectric Fluid) responses by electric utility companies are either emergency responses due to impacts from storm damage (wind, ice, downed tree, etc..), vehicle accidents (hit and broken poles) or other equipment failures of pole transformers and pad mounted transformers (overload, bushing cracks, gasket issues, etc..). They may also conduct environmental remediation work that may or may not have been the result of a previous historic release on the property owned by the utility company. Electric Utility Environmental Coordinators obtain a vast amount of emergency spill response and remediation knowledge associated with Utility Equipment and respond on privately owned and public property, right of ways, and Utility owned property.

An Environmental Coordinator is usually responsible for a specific region within the state of Connecticut during blue sky days and what is known as a "major storm response" and frequently nights and weekends are covered through a single coordinator through a on call rotation. Over the course of a year, whether blue sky or storm events, a UEC will respond to approximately over one hundred releases. The responsibilities of an UEC encompass public health and safety and the environment. Upon arrival to a scene, the UEC confirms that the site is safe for entry for not just (his/her) self, but for the response contractor personnel. An assessment is made to the cause of the release, source oil analysis through field testing and lab analysis, the volume, waste identification PCB/Non-PCB waste, media that has been impacted (soil, asphalt, water), reconnaissance of the area for any sensitive receptors. Resources for the emergency response are dispatched and overseen by the UEC while remediation activities occur.

If sampling of the waste and/or the spill area are warranted (PCBs >1 ppm) and /or recommended (by state ERU, customer request, or prudency), the UEC will usually collect samples themselves with oversight of the sampling protocol (soil/wipe sampling/grid), analysis (methodology), and site diagram. Additional responsibilities of the UEC include, but are not limited to: waste profiling, approval paperwork, waste sampling and analysis, waste disposal facility acceptance, and finally confirmation that waste has been properly disposed of according to state and federal regulations.

A recap of experience that UEC's includes:

- PCB spill cleanup policy guidance data
- Identifying PCB concentrations and source
- Sampling methodology from PCB/ Non-PCB cleanup sites
- Decontamination and alternate disposal methods for TSCA waste
- Field screening, grid sampling and wipe sampling guidance protocol
- Cleanup and disposal options for PCB/Non-PCB remediation waste

The remediation group's responsibilities may include: historic releases, releases related to substations, large releases of non MODF, releases that may have made it to the groundwater, public waterways, and/or sensitive receptors. Environmental coordinator may oversee initial emergency response and closes out with the assistance of a staff LEP and/or related environmental consulting firms.

A/B Operator

A/B Operators must demonstrate through an operator training exam that they are familiar with, and have industry knowledge related to the following

- Cathodic protection and piping for tanks
- How to perform annual inspections of UST facilities
- UST facility specific integral spill buckets, stage I vapor recovery, ball float overfill prevention, suction piping, drop tube overfill prevention valves, electronic overfill prevention valves.
- They must have general knowledge regarding out of service facilities, daily inventory and statistical inventory analysis, comprehensive use of heating oil, record keeping requirements.
- They must be competent in spill cleanup from releases related to an UST system, the reporting requirements associated with that release, and the spill actions required of either the manager at the site, and/or an independent spill contractor if hired.

UST A/B operators have general knowledge and know and understand the resources required to clean up releases from petroleum products to the grounds surface and other surfaces. They may not be versed on delineation of or absence or presence of pollutants in groundwater.

Possible restrictions: no sensitive receptors. Most of the UST A/B operator training focused on potential sources or scenarios of a release, and what was to be done in response to a known or suspected release.

4. **What mechanism other than a new licensure can be used to demonstrate someone is qualified?**

A minimum qualification, training, and education DEEP implemented requirement that is documented on a CTDEEP provided form. This would be a self-certification that is held by the user and available for review by state officials upon request.

5. **What mechanisms could be employed to limit concerns associated with relying on certifications by non-LEP environmental professionals?**

Is DEEP willing to ask the LEP Board for an advisory ruling that would affirm that the "one or more persons" referenced in c(2) includes certifications made under the RBCP? This would provide liability and personal comfort to LEPs, if the licensing board makes clear that they are not going to make reliance on a RBCP "certification" by a non-LEP automatically a form of professional negligence.

For an LEP to make reliance on a "certification" by a non-LEP, operating under this Release-Based Cleanup Program, "a common and accepted practice." There is a concern about the issue of increased liability for the LEP in this reliance

Although the real, bottom-line objective of what DEEP has tasked Subcommittee 10 to do is come up with a list of alternatives to LEP Verification that LEPs, attorneys, and the regulated community will accept as being, albeit for a much more limited scope, equivalent in reliability to a LEP Verification. An issue may be that the LEPs concern that when a LEP relies on "others", particularly the conclusions made by "others", the LEP is ultimately liable, personally, for that conclusion. So, LEPs feel, quite reasonably, that they need to feel comfortable relying on "others", and they have not reached an acceptable level of comfort with relying on non-LEPs "certifying" release cleanups.

The LEP regs section on Professional Competency say:

> "(c) Professional Competency
>
> (1) In providing professional services, a licensee shall act with reasonable care and diligence and shall apply the knowledge and skill of a licensee in good standing practicing in the applicable field at the time such services are performed.
>
> (2) A licensee may perform professional services only when qualified by education or experience, and only to the extent such services involve activities with respect to which such licensee is so qualified. In rendering professional services, a licensee may rely, in part, upon the advice of one or more persons whom such licensee determines are

qualified by education or experience to the extent that such reliance is consistent with the common and accepted practice of a licensed environmental professional."

This subcommittee should respond to the above questions in the context of releases that non-LEP environmental professionals may confirm have been remediated without a verification being required. In the release based cleanup program, "verification" means the written opinion of a licensed 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.

Key Recommendations

- Special emphases should be placed on years of experience coupled with the years in a supervisory position.
- Immediate action field assessment form should be integrated into new regulations. Also recognize that end goal is that forms should be available online, being interactive and progressive, will direct to qualified professional if certain fields are blank / answered. Debate on who is required to complete the form (only environmental professionals and/or LEP or others).
- There are three categories of information (Release Based Decision Tree Category 1, 2, and 3.)
- The size of the release that is available to be closed out by a non-LEP has been debated and volumes considered could include 100-350 yards or no soil limit.
- If contamination of groundwater, surface water, and/or drinking water is demonstrated, it must be escalated to an LEP for closure / closeout / verification (no consensus on what term should be used).
- Although the majority agreed to follow the EPAs definition of an environmental professional. Including qualifications, training, and education, much emphasis was shared that sample collection training and or courses should be required.
- General consensus is that risk-based considerations of certain pollutants would need to be reviewed so that acceptable criteria could merge with "real world" everyday cleanup. Debate on if this is practical. RSR's may need to be modified.
- Consensus of many is that contemporaneous vs historical leads to a requirement that an LEP is needed 80% of the time when there is a historical release.
- Debated where NO SAMPLING would be required as a specific type of release based on volume, substance, location, and media impacted.
- Little consensus on what non-LEP documentation the general market would consider reliable enough to make informed decisions on (reliance vs market acceptability).

- PSCCs, in addition to being able to certify releases of (<RQ?) oil or hazardous material to soil with no impact to groundwater, additionally are able to "certify" regulated petroleum UST removals, regardless of groundwater is encountered and regardless of groundwater classification. Should there be restrictions if there are sensitive receptors?
- Emphasis placed on carving out a 12-18 gallon release to soil (typical of a transformer) that Utility Environmental Coordinators (UEC) will be able to continue to remediate. They will also need to respond to a triple bank of transformers (54 gallons) and pad mounted transformers (100+ gallons)
- Regardless of whether a site is "certified" by an LEP, an Environmental Professional (EP), a Utility Environmental Coordinator (UEC), Permitted Spill Cleanup Contractor (PSCC), A/B Operator, or Certified Hazardous Materials Manager (CHMM), DEEP Emergency Response Coordinator, or anyone else the Department deems knowledgeable enough, there MUST be continuity for all stakeholders. Attached on the next page an idea of what a field assessment form may include. This form would be filled out by the certifying party.

IMMEDIATE ACTION FIELD ASSESSMENT

FORM MUST BE SUBMITTED WITHIN 48 HOURS OF IMMEDIATE ACTION

Part I General Information

Was the release reported to CT DEEP ☐ Yes ☐ No

If Yes, Case Number: _____

If Yes, ER Supervisor badge number:_____

If Yes, ER Coordinator badge number:_____

Was the subject site drinking water sampled? ☐ Yes ☐ No

If Yes, was a copy of the analytical results attached to this document? ☐ Yes ☐ No

Property Information

Responsible Party (RP) ☐ Property Owner ☐ Leasee ☐ Third Party ☐ Public Roadway

Property Owner or Leasee

Property Name

Property Address

City/Town

State

Zip

Tax Assessor Town

Lot

Block

Map

Acres

Part II Party Completing Form

☐ Licensed Environmental Proffessional (LEP)

☐ Other Environmental Proffessional

☐ CT DEEP ER Coordinator Badge Number _____

Part III Substance Released

Common Name of Substance Released _____

Substance Was Identified By ☐ Generator Knowledge ☐ SDS/MSDS ☐ Testing ☐ Testing ☐ Sample ☐ Other

Does the SubstanceContain: ☐ Non Chlorinated VOCs ☐ Chlorinated VOCs ☐ Metals ☐ PAHs ☐ SVOCs ☐ PCBs
☐ Petroleum Hydrocarbons ☐ Pesticides ☐ Herbicides ☐ Other Concern _____

Was the Release to the Surface? ☐ Yes ☐ No
If YES: ☐ Asphalt ☐ Concrete ☐ Soil ☐ Water Body

Was the Release to the Subsurface? ☐ Yes ☐ No
If YES, Soil Type: ☐ Gravel ☐ Sand ☐ Silt ☐ Clay

Was a Preferential Pathway Present? ☐ Yes ☐ No
If YES: ☐ Culvert ☐ Manway ☐ Storm Drain ☐ Sump ☐ Conduit / Pipe Run
☐ Swaile / Trough ☐ Curtain Drain ☐ Recent Excavation ☐ Other _____

Part IV Settings and Receptors

Site Logistics

What Was the Designated Property Use ☐ Residential ☐ Commercial ☐ Industrial ☐ Public Roadway
Were Buildings or Structures Located at the Release Area? ☐ Yes ☐ No
Were the Buildings or Structures Occupied? ☐ Yes ☐ No
If Occupied, What Designation? ☐ Residential ☐ Commercial ☐ Industrial ☐ Public
Were any Preferential Pathways Investigated or Identified? ☐ Yes ☐ No
Is there a Significant Grade Difference at the Release Area? ☐ Yes ☐ No

Environmental Setting

Groundwater Classification ☐ GA ☐ GAA ☐ GAAs ☐ GB ☐ GC
Surface Water Classificaion ☐ AA ☐ A ☐ B
Coastal and Marine Surface Waters ☐ SA ☐ SB
Aquifer Protection Area? ☐ Yes ☐ No
Nearest Downgradient Surface Water Body
Distance to Surface Water Body Named Above
Depth to Water Table ☐ Identified _____(Feet Below Ground Level) ☐ Assumed ☐ Unknown
Depth to Bedrock ☐ Identified _____(Feet Below Ground Level) ☐ Assumed ☐ Unknown

Sensitive Receptors (Within 250 Feet of the Site)

☐ School
☐ Child Care Facility
☐ Recreational
☐ Healthcare Facility
☐ Sensitive Water Resource (Public Water, Fishing Areas)
☐ Other (Specify)

Water Supply Wells

Is there a known impact to Groundwater at the Time of the Release? ☐ Yes ☐ No
Is there a Public Drinking Water Well Present Within 250 Feet? ☐ Yes ☐ No
Is Public Water Supplied? ☐ Yes ☐ No
Is Public Water Available? ☐ Yes ☐ No
Was a Well Receptor Survey Completed? ☐ Yes ☐ No

Significant Enviromental Hazard (As Defined in 22a-6u)

Was a Significant Environmental Hazard Identified? ☐ Yes ☐ No
Was a Significant Environmental Hazard Notification Filed with CT DEEP ☐ Yes ☐ No

Vapor Intrusion

Is the Release Suspected to be Present Under a Structure? ☐ Yes ☐ No
Was the Building Occupied at the Time of the Release? ☐ Yes ☐ No
Were Any of the Buildings Evacuated at the Time of the Release? ☐ Yes ☐ No
Were Any Preferential Pathways Investigated or Identified? ☐ Yes ☐ No

Soil Remediation

Is there a known impact to Soil at the Time of the Release? ☐ Yes ☐ No
If Yes, is the release on the grounds surface? ☐ Yes ☐ No
If Yes, the visual impact is estimated to be (dimentions) _____
If Yes, is the release subsurface? ☐ Yes ☐ No
If yes, is the estimated volume of soil impacted over 350 tons? ☐ Yes ☐ No
If yes, did it migrate off of the subject property? ☐ Yes ☐ No
If yes, is the soil impact combined with other non-permeable surfaces? ☐ Yes ☐ No
If Yes, was contaminated soil excavation conducted? ☐ Yes ☐ No
If Yes, Soil excavation was performed by the following method:
☐ Hydraulic Machine ☐ Power Vacuum Truck ☐ Hand Excavation
If Yes, was any pooling product identified in the excavation? ☐ Yes ☐ No
If Yes, was any groundwater identified in the excavation? ☐ Yes ☐ No
If Yes, were any free product removal actions performed? ☐ Yes ☐ No
If yes, after soil was removed, were samples collected? ☐ Yes ☐ No
If Yes, was a copy of the analytical results attached to this document? ☐ Yes ☐ No

Assessment Documentation and Certification

The following attachements are included:
☐ SDS ☐ Laboratory Analytical ☐ Data Tables ☐ Project Figures
☐ Photos ☐ Written Report ☐ CT DEEP Correspondence ☐ Other _____

Applicant certifies that all information on this form is true to their best belief and knowledge ☐ Yes ☐ No
Signatory name _____
Signatory email _____
Signatory phone _____
Signature Box _____
Date _____