Connecticut Department of
Energy & Environmental Protection
Bureau of Water Protection & Land Reuse
Remediation Division

Environmental Program Fact Sheet

Technical Impracticability
RSRs 22a-133k-3(e)(2)

Overview

This fact sheet outlines basic information about the use of a variance pursuant to Section 22a-133k-3(e)(2) of the Regulations of Connecticut State Agencies (RSRs) titled "Variance Due to Technical Impracticability of Ground-water Remediation". This fact sheet covers what the Technical Impracticability Variance (TI Variance) is and under what conditions it should be used, along with what a TI Variance could allow in terms of final site closure, including requirements for long-term responsibilities. This document also discusses the general process for obtaining a TI Variance and what information is typically needed for an initial technical meeting to discuss its potential applicability for a site.

A TI Variance is an option provided under the RSRs for groundwater contamination for which remediation to the required criteria is not technically feasible. A TI Variance is not a waiver for source area remediation or for addressing potential risks to receptors. Rather, it is a mechanism to manage risk to human health and the environment in situations where there is no readily available technology to complete remediation and achieve compliance with the applicable RSR groundwater criteria within a reasonable timeframe.

The TI Variance is an optional remedial approach, typically with long-term obligations, that can be shown to be protective of human health and the environment. The TI Zone is the geographic area covered by the TI Variance where groundwater contamination would otherwise exceed the applicable remediation criteria. The TI Zone is typically contaminant-specific and does not necessarily apply to all contaminants that are present at a site.

The DEEP expects that the person undertaking the remediation will provide an opportunity for public input prior to DEEP approval. An Environmental Land Use Restriction may be required on properties within the TI Zone to limit exposure to the impaired groundwater. On a case-by-case basis, DEEP may require financial assurance for any continued inspection, monitoring, containment, treatment, or contingency measures which may be needed to ensure that human health and the environment continue to be protected. In most cases, status reports will be required every 5 years to verify that the TI Variance continues to be protective. Once the source area(s) has been addressed to the maximum extent prudent, the TI Variance may be suitable to support a final verification and a subsequent Form II filing under 22a-134a or 22a-133x CGS or RCRA Corrective Action.

Applicability

There are two scenarios appropriate for TI Variances. In some cases both scenarios may apply at a site. The first scenario applies to groundwater impacts resulting from non-aqueous phase liquids, smears or discontinuous residuals that cannot be effectively removed or degraded, or their impact to groundwater prevented (herein referred to as a Residual Source). Generally, this is applied to dense non-aqueous phase liquids. Typically, light non-aqueous phase liquids do not pose similar technical difficulties to remediate, with residual contamination naturally degrading in a much shorter timeframe, but a TI Variance would remain as an option to address persistent exceedances of groundwater criteria following source remediation. A Residual Source scenario also applies to persistent contamination in a solid or sorbed form, rather than as a non-aqueous phase liquid.

The second scenario for a TI Variance is for steady state or slowly diminishing plumes that persist at unacceptable levels (herein referred to as a Persistent Plume). This applies to sites where the source area(s) has been remediated, however the resulting groundwater impacts will not dissipate within a reasonable timeframe (e.g. 20 years from source remediation) due to low groundwater velocity or other geologic conditions.

Please note that for PCBs present in NAPL, soil or groundwater, remediation may be subject to EPA review and approval under federal regulations at 40CFR761.

The use of a TI Variance would be appropriate once the following conditions are documented:

1. Remediation of the pollution source has been evaluated and implemented as appropriate.
    a. For the Residual Source scenario, the source area(s) for the contaminants have been "contained or removed to the maximum extent prudent", and light non-aqueous phase liquids remediated in accordance with Section 22a-133k-2(g) of the RSRs as applicable;
    b. For the Persistent Plume scenario, soil and groundwater monitoring have shown that remediation of the source area(s) has been completed and that there is no soil contamination within a source area causing continued impairment to groundwater;
    c. Note that source area remediation may entail remediation of sources of groundwater pollution that are below the water table and thus not be specifically subject to RSR pollutant mobility criteria.
2. Remediation and/or containment of the groundwater plume have been conducted to limit the extent of the TI Zone as necessary for the practical implementation of the TI Variance;
3. Groundwater monitoring adequately characterizes the plume and demonstrates that exceedances of remedial criteria will not exist outside of the TI Zone, and changes in contaminant concentrations will not pose a risk to human health and the environment;
4. Potential exposure pathways threatening human health and the environment from impaired groundwater have been identified and addressed; and
5. An evaluation of natural attenuation, based on monitoring subsequent to source remediation has shown that groundwater will not achieve remedial criteria within a reasonable timeframe.

Extent of Remediation Required

The RSRs allow a TI Variance where remediation has "reduced the concentration of pollutants in groundwater to steady state concentrations that exceed any applicable criteria". However, the extent of the plume exceeding criteria must also be "reduced to the extent technically practicable", or the impracticability of such reduction of plume area must be demonstrated. When a TI Variance is part of a long-term solution, it will not be considered as an alternative to addressing the source of the pollution to the maximum extent prudent and implementing other appropriate remediation techniques. It is expected that remediation of a contaminant source and plume will be implemented using commonly used technologies capable of meaningfully reducing the duration and extent over which a TI Variance would be necessary to limit the extent of a plume subject to a TI Variance. The focus of this remediation would be on those portions of a release area and for those contaminants of concern that are able to be remediated. The DEEP expects that remedial measures will have been evaluated and implemented, as appropriate, to address the groundwater pollution prior to issuance of a TI Variance.

Long-Term Responsibilities

As part of the TI Variance, certain assumptions will be made regarding the land uses and the potential for receptors to be exposed to the polluted groundwater within the geographic area subject to the TI Variance (i.e., TI Zone). Typically, in order for these assumptions to remain valid, restrictions must be put in place to prevent alterations to land use assumptions both on-site, and in many cases off-site, and potentially beyond the limits of the plume, to prevent exposure to the pollutants in groundwater.

Long-term responsibility for a TI Variance will typically include one or more of the following:

- Five-year review, reporting and certification requirements;
- Continuation of operation and maintenance associated with the approved controls;
- A long-term groundwater monitoring program for the purpose of confirming that risks to human health and the environment do not occur due to unexpected changes in groundwater quality;
  (Note: Groundwater monitoring necessary to achieve compliance under the RSRs for releases or constituents not covered by the TI Variance will still be required.)
- Land use monitoring, inspection, review, and reporting on whether the selected remedial option of a TI Variance is effective at being protective;
- Receptor updates on any buffer specified to the TI Zone; and
- Financial assurance for operating and maintaining existing controls and contingency costs for future corrective measures to address changes in land use which may cause the selected remedial approach to cease to be protective of human health and the environment.

Information Needed for an Initial TI Meeting

The DEEP will meet with parties interested in evaluating whether a TI Variance is appropriate as a remedial component for a specific site. In order for such an initial meeting to be productive, it will be necessary to have a fairly thorough understanding of the source areas and a Conceptual Site Model (CSM) relating those releases with the groundwater impacts that would be subject to the TI Variance. The following information should be brought to the initial meeting:

1. Summary of why the TI Variance is being sought;
2. Applicant's relationship to property owner;
3. Brief site history, description of all Areas of Concern (AOCs), and summary of the investigations completed;
4. Discussion of hydrogeology including appropriate groundwater flow maps;
5. Discussion of the vertical and horizontal delineation of contaminants and media that are the subject of the TI Variance;
6. Discussion of the stability of the plume;
7. A regional location map showing source area(s), estimated lateral limits of the plume and presumed discharge location(s) of plume;
8. A basic understanding of nearby receptors including discussion of potential on-site and off-site groundwater uses, vapor intrusion risks and ecological receptors;
9. Efforts to address residual sources and source media subject to the TI Variance; and
10. Discussion of feasibility of more permanent remedies.

Any information available related to the following items would also be useful to contribute to the discussion during the initial meeting:

11. A statement that all AOCs relevant to the TI Variance have been investigated and the nature and extent of releases is understood (no unaddressed sources contributing to the TI Zone);
12. Maps and relevant cross sections showing vertical and horizontal delineation of contaminants and media that are the subject of the TI Variance;
13. A conceptual TI Zone boundary, showing the projected long-term extent of exceedances of groundwater criteria;
14. Discussion and tabulation of all available groundwater data including duration and frequency;
15. Discussion of steady state nature and fate and transport evaluation in support of TI Variance request; and
16. Discussion of viability of Monitored Natural Attenuation as an alternative.

Process Flow Chart

See attachment on page 5.

This overview is designed to answer general questions and provide basic information. You should refer to the appropriate regulations for the specific language. It is your responsibility to comply with all applicable regulations. The information contained in this fact sheet is intended only to acquaint you with the Technical Impracticability Variance and does not constitute the Department's interpretation of the applicable regulations.

PROCESS FLOW CHART

The following flow chart is provided to illustrate the sequence of components in the process for requesting a TI Variance. CSM = Conceptual Site Model; RA = Remedial Approach.