APPENDIX I

List of DRAFT Detailed Guidance Topics

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CT DEP Bureau of Water Management
Permitting, Enforcement and Remediation Division

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1. Post-Remediation Groundwater Monitoring
2. Application for Alternative Post-Remediation Ground Water Monitoring Program
3. Low Flow Sampling Procedures
4. Soil Vapor Sampling
5. Indoor Air Monitoring
6. Reuse of Polluted Soil

POST-REMEDIATION GROUNDWATER MONITORING

Statement of Purpose

The purpose of post remediation groundwater monitoring is to establish: (1) the effectiveness of soil remediation in preventing pollution of groundwater, (2) the effectiveness of any remediation taken to eliminate or minimize any risk to human health and the environment, and (3) that applicable requirements of the Remediation Standard Regulations (RSRs) have been met. In GB areas a determination must be made as to whether or not the plume interferes with any existing uses. Post remediation monitoring must occur over a number of years in order to be confident that, despite seasonal changes in hydraulic conditions or water quality conditions, the ground water plume meets all of the conditions of the RSRs.

Initiating Post Remediation Groundwater Monitoring

Post Remediation groundwater monitoring in GA/GAA areas commences after demonstration of compliance with surface water protection criteria, the volatilization criteria, and either background or the groundwater protection criteria, whichever is applicable. In GB areas, post remediation groundwater monitoring commences at the time of cessation of remedial actions. In cases of monitored natural attenuation it may be many years before compliance with the remediation standards can be demonstrated and post remediation groundwater monitoring can commence.

Design of Post Remediation Groundwater Monitoring Program

Post-remediation groundwater monitoring is based on the assumption that an appropriate site characterization has been performed. Data concerning groundwater flow regime, contaminants of concern with respect to a specific release area, and a demonstration of compliance with appropriate remedial standards should be readily available. The design of the post remediation groundwater program for each release area must be based on the accumulated data. Three key design elements are:

- Appropriate well design/placement. Monitoring locations for post remediation monitoring should focus primarily on the portion of the plume with the highest concentrations, but should also document the changes with time of the extent of the plume.
- Frequency of monitoring. The RSRs do not specifically require quarterly monitoring for post remediation monitoring. However, the frequency should be sufficient to characterize any seasonal changes in water quality or hydraulic conditions. It may be appropriate to monitor some locations more frequently than others. For example, it may be sufficient to monitor the fringe of the plume annually, at the time of year most likely to show an impact, while monitoring locations of the plume with the highest concentrations quarterly. In addition, once the seasonal variations in the plume are well understood, monitoring may in the later stages of post remediation monitoring be reduced in frequency.
- Analytical parameters. Post remediation monitoring should focus on the parameters that drove remediation. However, since post remediation monitoring is conducted after complete characterization of the plume, it may be possible to identify key indicator parameters that can be used to track the changes in the plume with time. In addition to laboratory analysis of the contaminants of concern identified during the investigation and remediation phases, field parameters such as pH, dissolved oxygen, and specific conductance may be used to monitor the plume.

Discontinuing Post Remediation Groundwater Monitoring Program

Unless the Commissioner approves an alternative post remediation monitoring program, post remediation groundwater monitoring in GA/GAA areas may be discontinued one year after compliance with background concentrations or three years after compliance with the groundwater protection criteria assuming all other applicable criteria have been met. In those circumstances, the body of post remediation data should include at least two years of consecutive quarterly samples. Post remediation groundwater monitoring in GB areas may be discontinued two years after cessation of all remediation if the applicable surface water protection criteria and volatilization criteria have been met and the groundwater is suitable for existing uses. In such areas at least four consecutive quarterly samples are needed to describe seasonal changes. Note that this sampling is in addition to any quarterly sampling necessary to demonstrate compliance with RSR criteria.

Alternative Post Remediation Groundwater Monitoring Program

Site specific circumstances may be appropriate for an alternative post remediation groundwater monitoring program. The alternative program must meet the goals of post remediation groundwater monitoring as described in §22a-133K-3(g)(1) for GA/GAA areas and §22a-133K-3(g)(2) for GB areas of the RSRs. An alternative program may be able to meet those goals without following the post remediation groundwater monitoring program specified in the RSRs. The alternative groundwater monitoring program must be approved by the Commissioner. When applying for the approval it is important to remember that the information submitted on the form may be the only significant involvement of the Department in the remediation and monitoring of the site. The information submitted with the application must be detailed enough for Department staff to make a decision regarding a recommendation to either approve or deny the request based solely on the application.

Application for Approval of an Alternative Post Remediation Monitoring Program

An application form for approval of an alternative post remediation groundwater monitoring program has been developed. The application requires a critical analysis of the proposed alternative groundwater monitoring program and the data collected to date. The data presented in the application must demonstrate:

- The groundwater system has had enough time to chemically and hydraulically equilibrate subsequent to cessation of active remediation.
- The current sampling program is sufficient to identify trends in data
- The plume is in steady state or receding.
- Based on hydrogeologic assessment and predictions, enough time has past for the contaminant to reach the monitor well locations.
- There is no evidence of any new or continuing sources of pollution.

Explanations of any inconsistencies in the data must also be submitted.

- If any wells were dry or could not be sampled, provide an explanation of why the alternative program is appropriate for meeting the goals.
- Any exceedences of RSR criteria during post-remediation groundwater monitoring would necessitate further technical review. If an exceedence occurs during the last monitoring event, the Department could not consider the post remediation groundwater sampling complete. Some instances may require a new demonstration of compliance, while other instances may require a demonstration that the reading is anomalous and that site conditions are consistent with the site conceptual model.

Finally, a justification as to how the proposed alternative program meets the goals of post remediation groundwater monitoring must be submitted.

APPLICATION FOR ALTERNATIVE
POST REMEDIATION GROUNDWATER MONITORING PROGRAM
22a-133k-3(g)

Part 1: General Site Data

Section A: Site Identification

Facility name and address: _____

_____

_____

_____

Type of operation:

Section B: Application Prepared By

Contact Person: _____ Phone: _____

Firm (name and address): _____

_____

_____

Section C: Application Submitted on Behalf of

Contact Person: _____ Phone: _____

Representing: _____

_____

_____

Section D: Regulatory Framework

Delegation: DEP / LEP / Voluntary DEP staff involved: _____

DEP Program: _____

Section E: Environmental Setting

Answer these questions for all sites:

Has compliance with surface water protection criteria been demonstrated? Explain the use of any alternative surface water protection criteria

Has compliance with volatilization criteria has been demonstrated? Explain any exceptions to the volatilization criteria (ie., ELUR prevents future building in the area)

Please provide a site locus map with significant features labeled.

Groundwater Class: _____

Surrounding land uses:

Availability of public water (results of well survey):

Receiving surface water body and classification _____

Distance from release(s) _____

Groundwater Remediation Goals:

For sites in GA/GAA Areas:

The Groundwater Protection Criteria for this site are based on:

_____ Background concentration
or
_____ RSR numeric criteria

Has compliance with background or the groundwater protection criteria been demonstrated?

For sites in GB Areas:

Are there any existing industrial/domestic groundwater uses in the vicinity of the site? If yes, explain whether or not the groundwater plume interferes with any of the existing uses.

2: Remediation Summary – Outline for Narrative

Identify each discrete area where a release has occurred and/or where remediation was conducted. Submit the following information for *each* release area. Supporting information should include a site figure(s) depicting release areas, water table contours, monitor wells, estimated extent of plume and other distinct and/or significant site features.

1. Briefly describe the release area. Include, at a minimum, type of release (eg, underground storage tank, lagoon, landfill, etc), contaminants of concern, duration and/or frequency of release(s).

2. Briefly describe remedial activities. Include confirmation sampling results.

3. Describe site hydrogeology. Include, at a minimum, a brief description of the overburden and bedrock geology, hydraulic conductivity, estimated time for contaminants to travel from the source area to the monitor well.

4. Describe the groundwater compliance monitoring program. Identify well locations, parameters analyzed, and summary of results demonstrating compliance.

5. Describe the post remediation groundwater monitoring program. Include well locations, parameters analyzed and summary of results collected to date.
   Explain any unusual trends or spikes.
   Demonstrate that the plume is in steady state or receding.

6. Provide an explanation of how the program meets the goals of post remediation monitoring as identified in the Remediation Standard Regulations (§22a-133K-3 (g)(1) for GA/GAA areas and §22a-133K-3(g)(2) for GB areas).

LOW FLOW SAMPLING PROCEDURES

Statement of Purpose

The purpose of low flow (low stress) sampling is to collect groundwater samples that are representative of groundwater quality under natural flow conditions. In particular, the presence and concentration of dissolved organic and inorganic pollutants as well as the pollutants associated with mobile particulates are most accurately revealed through low flow sampling. Historic sample collection techniques often cause stress on an aquifer causing changes in the water chemistry and an inaccurate or incomplete analysis of site conditions. Low flow sampling techniques minimize stress on the aquifer by utilizing low pumping rates that result in minimal water level drawdowns.

Low Flow Approach

This guidance presents a generalized approach to low flow sampling. A site specific SOP should be generated prior to sampling. Actual site conditions may require that the procedure be adapted to fit site specific conditions. It is assumed that the monitor wells have been appropriately sited and screened in accordance with the data quality objectives of the sampling program. Typically, screen lengths are limited to 10 feet and the pump intake is located at the midpoint of the saturated screen length. The location of the pump intake should be adjusted if strata of higher permeability or areas of higher concentrations of pollutants can be identified. When possible, pump intakes should be located at least 2 feet above the bottom of the well in order to minimize the possibility of mobilizing sediment from the bottom of the well. Dedicated sampling equipment insures that samples are collected from the same location within the well during each sampling event. If dedicated equipment is not possible, the exact location of the pump intake must be identified and each sampling event must attempt to collect samples from that same location.

Well Development

Proper well construction and development are essential. Wells should be capable of yielding samples with a turbidity of less than 5 Nephelometric Turbidity Units (NTUs). This low flow sampling technique may be inappropriate for wells containing NAPL. A determination of the presence of NAPLs should be made prior to sampling.

Sampling Procedure

1. Measure static water level and set the indicator probe at a depth of 0.3 feet below the static water level.

2. Purge the well.

    - Start pump at lowest speed and increase the speed until discharge occurs. Monitor drawdown. If water is drawn down greater than 0.3 feet, the system should be operated intermittently so that drawdown does not exceed 0.3 feet.

    - Monitor field parameters after a volume equivalent to one pump volume plus one discharge tubing volume has been removed from the well. Field measurement should be collected with a flow-through-cell. Field parameters include: turbidity, DO, specific conductance, temperature, pH, and ORP/Eh.

    - Purging is complete when field parameters have stabilized. The parameters are stabilized when three consecutive readings taken at 3 to 5 minute intervals, are within the following limits:

- Turbidity (10% for values greater than 1 NTU)
- DO (10%)
- Specific conductance (3%)
- Temperature (3%)
- pH (±0.1 units)
- ORP/Eh (± millivolts)

3. Collect Samples. Water samples should be collected before it passes through the Flow-through-cell. VOCs should be collected first into appropriately preserved vials.

References:

Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Ground Water Samples From Monitoring Wells", Revision Number 2, U.S. EPA, dated July 30, 1996.

SOIL VAPOR SAMPLING

Statement of Purpose

In accordance with Section 22a-133k-3(c) of the Remediation Standard Regulations (RSRs), groundwater within 15 feet of the ground surface or a building must be remediated to the applicable volatilization criteria for groundwater. In accordance with Section 22a-133k-3(c)(3)(A), if soil vapor concentrations below a building are less than the applicable volatilization criteria for soil vapors then remediation of the groundwater to the applicable volatilization criteria for groundwater will not be required. The volatilization criteria for soil vapor are listed in Appendix F of the RSRs.

Sampling soil vapor concentrations in the vadose zone is often the most accurate method for determining if contaminants are volatilizing from the groundwater and possibly threaten indoor air quality.

This fact sheet provides general guidance to design and perform a soil vapor sampling program.

Design of Soil Vapor Sampling Program

The soil vapor sampling program must include the appropriate number of sampling locations to define the extent and degree of the soil vapor contamination resulting from volatilization from groundwater contamination located underneath a building. The soil vapor samples must be taken during a worst case scenario including the most conservative sampling locations, time of year, weather conditions, operation of ventilation systems (which may create a pressure gradient across a building's foundation), etc.

Contaminant Characteristics

The type and potential breakdown products of the contaminants must be taken into consideration when designing a soil vapor sampling program and determining the appropriate sampling containers and sampling methods. The quantitative analysis method used must be able to detect the variety of chemicals that may be present at the site at acceptable detection levels such that analytical results can be compared to volatilization criteria for soil vapor listed in Appendix F of the RSRs. It is important to note that some breakdown products are more volatile that the original substance and therefore may have lower volatilization criteria which will require lower detection limits.

Chemical characteristics of contaminants such as vapor pressure, Henry's Law constant, solubility and soil sorption coefficient affect the migration of the contaminant. Vapor pressure and Henry's Law constant describe the degree to which a contaminant partitions into the vapor phase. In general active soil vapor sampling will reliably detect contaminants that have a vapor pressure greater than 0.5 mm Hg and a Henry's Law constant greater than 0.1. Soil sorption describes the degree to which a contaminant will dissolve into water. Chemical properties affect migration of contaminant and should be taken into consideration when designing a soil vapor sampling program.

Subsurface Conditions

The volume, areal extent and depth of contaminants should be estimated based on site history and site geology prior to designing the soil vapor sampling program. Using the estimated area of the contaminant plume will assist in the appropriate placement and frequency of soil vapor sampling points to best delineate the concentrations of contaminants at the site.

The following soil properties including soil types, permeability, water content, organic content and thickness of vadose zone will affect the migration and detection of soil vapor:

- Soils with smaller grain size tend to be less permeable with higher water content and thicker vadose zone which tend to inhibit the migration of soil vapor.

- Soils with larger grain sizes tend to be more permeable with lower water content and a thinner vadose zone which tend to provide migration pathways for soil vapor.
- Soils with high organic content tend to have higher water content and lower permeability which tend to inhibit soil vapor migration.
- Active soil vapor sampling is ineffective when moisture content exceed 80 percent.
- Determining the soil-air permeability may help assess the influence of geologic materials and moisture content and define low permeability areas. An estimate of soil-air permeability can be calculated by comparing airflow data with the corresponding vacuum pressure or by using a pressure transducer during collection of a soil vapor sample.

The geologic stratigraphy of the site as well as the location of any lenses of different types of materials must be investigated or interpreted from geologic mapping to determine the influence these features may have on the migration of soil vapor.

The locations of permeable and impermeable subsurface layers, as well as preferential migration pathways, need to be determined. Impermeable subsurface features such as perched water tables, clay lenses, buried pavement or concrete and foundations provide areas where soil vapors may be accumulating. Subsurface conduits such as underground utilities conduits, excavated areas, backfilled areas, tree roots and foundations may provide preferential paths for soil vapor migration since these features tend to be backfilled with high permeability materials. All underground utilities and any other underground features that may provide a preferential pathway for soil vapor migration must be mapped and sampled accordingly.

Depth to groundwater, groundwater flow direction and rate of flow should be determined or estimated to define the location of the plume of contaminants. The depth to groundwater and the distance that soil vapor needs to travel to the ground surface or to a subsurface foundation will affect the concentrations detected in the soil vapor samples.

Atmospheric and Seasonal Considerations

Temperature and barometric pressure, as well as other atmospheric conditions, affect the rate of soil vapor release to ambient air. Weather conditions such as frozen soils, snow pack, and infiltrating precipitation may inhibit the diffusion of soil vapor to the ground surface surrounding a building and possibly force soil vapors to migrate into the preferential pathways at a site such as a basement. Atmospheric and seasonal conditions should be noted and taken into consideration when interpreting soil vapor sampling results.

Seasonal fluctuation in the groundwater must be noted since an increase in groundwater level will bring the contaminated groundwater closer to the ground surface which may cause the concentrations of soil vapors detected to increase.

Monitoring Locations

Soil vapor sampling locations should be selected based on site specific conditions. Soil vapor samples should be taken from directly beneath foundation or as close to the foundation as possible as well as in preferential strata or pathways or locations where vapors may collect to best determine potential impacts to the indoor air quality of the building. PID/FID or portable GC/MS can be used to locate “hot spots” prior to collecting soil vapor samples for laboratory testing. A grid system may also be used to sample the impacted area. If two sampling points in a grid system have a two or three order of magnitude difference in concentration then a sample should be collected in the area between the two points.

Sampling depth should be determined by sampling a vertical profile to assess the permeable strata and to determine the contaminant distribution vertically.

Soil Vapor Sampling Procedures

Site specific sampling procedures must be developed, submitted and adhered to throughout sampling at the site. This section describes the minimum information that must be included in a site specific sampling procedures.

Types of Soil Vapor Sampling

Active soil vapor sampling requires pumping air from the soil above the groundwater table to be sampled. Active soil vapor sampling allows for rapid sample collection and provides prompt analytical results. Using active soil sampling, volatile organic compounds can be sampled directly and semivolatile organic compounds can be sampled for indirectly. Active soil vapor sampling allows for multiple samples to be taken to confirm analytical results.

Passive soil vapor sampling requires sampling ambient air flow by placing sorbent materials in the ground that will adsorb contaminants over time and measures the cumulative mass. Using passive soil vapor sampling allows for semivolatile organic compounds to be sampled for directly and provide more accurate results for semivolatile organics than active soil vapor sampling. However, passive soil vapor sampling typically requires about 3 to 6 weeks to produce analytical results and multiple samples cannot be taken from the one passive sample to confirm the analytical results.

Sample Containers

The samples may be stored in tedlar bags and steel or silicon coated steel canisters or drawn through sorbent cartridges. The type of container used should be chosen so as not to interfere with the analysis of the soil vapor sample.

Installing Monitoring Ports

A 3/8 or 1/2-inch diameter hole is driven into the ground to a depth of 4 to 5 feet using a slam bar, a direct push system or a hollow stem auger. Soil vapor can be sampled at other depths by the use of a longer bar or bar attachment. A ¼-inch O.D. stainless steel or copper probe is inserted into the hole. The hole is then sealed around the top of the probe to reduce dilution and cross-contamination from the atmosphere or indoor air.

Sampling Pumps

The soil vapor contained in interstitial spaces of the soil is sampled by pulling the soil vapor sample through the probe using an air sampling pump. Recommended pumping rate is 1.5 liters per minute for a minimum of 15 minutes.

Purge Volume and Rates

Tests should be conducted to optimize the purge volume and rates. Optimal sampling conditions occur when contaminant concentrations stabilize when the purge volume and rates are varied at a single location while sampling. These tests should also be used to check for subsurface connections with the atmosphere. If there is a connection with the atmosphere the contaminant concentration will drop off rapidly or atmospheric gases will be detected and the sample taken at that location will not be appropriate.

Atmospheric and Seasonal Data

Temperature, barometric pressure, weather conditions and use of heating/cooling systems in the building should be noted during the time samples are collected.

QA/QC Sampling Procedures

Site specific QA/QC sampling procedures must be developed, submitted and adhered to throughout sampling at the site. At a minimum the following QA/QC procedures must be taken into consideration:

- Sampling at all sampling points should be completed in a short period of time since changes in temperature, humidity and barometric pressure can affect soil vapor sampling results.
- The same sampling procedure should always be used at all sampling points to obtain consistent data.
- The insides of the sample train should be as dry as possible because moisture can affect the concentration levels.
- Ambient air in the sample train must be purged prior to sampling.
- Sampling equipment needs to be properly decontaminated.
- Blank samples should be taken regularly to ensure proper decontamination of equipment and measure background VOC contamination levels.
- Duplicate samples should be taken one per every ten samples collected to ensure reproducibility of data.
- Sample containers should be monitored for leakage.

Analytical Method for Soil Vapor

Samples should be analyzed using an appropriate analytical method such that the analytical method can identify and quantify the contaminants of concern at acceptable detection limits.

Analytical results of soil vapor samples must be compared to the volatilization criteria for soil vapor listed in Appendix F of the RSRs.

References

Expedited Site Assessment Tools for Underground Storage Tank Sites: A Guide for Regulators, EPA 510-B-97-001, March 1997.

Soil Gas Monitoring in the Vadose Zone, ASTM D5314-92.

Soil Vapor Extraction Technology: Reference Handbook, EPA 540/2-91/003, February 1991.

INDOOR AIR MONITORING

Statement of Purpose

In accordance with section 22a-133k-3(c)(5)(B) of the Remediation Standard Regulations (RSRs), Exemption from volatilization criteria, volatilization criteria do not apply to sites for which an indoor air monitoring program has been approved by the Commissioner and implemented. Target indoor air concentrations are listed on pages 53 and 54 of 66 of the RSRs.

"Any person seeking the Commissioner's approval of an indoor air monitoring program shall submit to him a detailed written plan describing the proposed indoor air monitoring program, including but not limited to

- a description of the distribution and concentration of volatile organic compounds beneath the building,
- the location of proposed monitoring points,
- the proposed frequency of monitoring,
- the parameters to be monitored,
- a description of proposed actions to be taken in the event such monitoring indicates that the monitored parameters exceed proposed specified concentrations, and
- a proposed schedule for reporting to the Commissioner on the results of such monitoring for as long as monitoring is conducted at the site."

This fact sheet provides general guidance to design and perform an indoor air monitoring program.

Design of Indoor Air Monitoring Program

The initial indoor air monitoring program must be conducted during three worst case scenarios (e.g. building closed up for 24hrs. prior to sampling, winter conditions such as heat on with minimum air exchange, etc.), one of which must be conducted during a rain event when the pressure and temperature gradients between the inside of the building and the outdoor environment are maximized. Long term indoor air monitoring must be conducted for a minimum of one year on a bimonthly basis at locations most likely to be affected by volatile organic compounds and under conditions determined during the initial indoor air monitoring program. After the first year of sampling, alterations to the monitoring program may be proposed based on the sampling results collected during the first year.

It is also important to consider conducting a soil vapor sampling program in conjunction with the indoor air monitoring program to better interpret the indoor air sampling results and understand soil vapor migration at the site (see Soil Vapor Sampling fact sheet).

Contaminants

All volatile contaminants detected in groundwater, as well as all likely breakdown products should be analyzed for during the indoor air monitoring program.

Environmental Conditions

Prior to sampling a survey of the building should be conducted to determine the best locations to conduct the indoor air monitoring. The survey must include the following:

- The size of the building and room dimensions.
- The type of basement floors and walls.
- The type of heating system used.
- Location of indoor or outdoor fuel tanks.
- Use of air exchange systems or venting, air conditioning, heating, and any open windows, etc. during the indoor air monitoring.

- The type of ground cover (e.g. grass, pavement, etc.) outside the building. Impermeable ground covers such as pavement may cause vapors to collect in those areas.
- Number of occupants and location of occupants within the building, as well as the use of areas within the building.
- Products stored and used inside the building that may cause interference with the indoor air monitoring. To the extent possible, potential sources of volatile organic compounds stored or used in the building should be removed prior to sampling.
- Locations of possible preferential pathways into the building. Sump pumps and pipes or utilities entering the building through the walls or floors of the basement may be preferential pathways. Foundation/slab drainage system may also be another preferential pathway.
- Any other factors that may influence the indoor air monitoring, including but not limited to recent renovations, new paint, new carpeting, etc.

Variability in indoor air sampling results can occur due to a number of environmental conditions. Each indoor air sampling plan must attempt to identify these site specific environmental conditions that may affect the sample results. Indoor air sampling tends to have more variability than soil vapor sampling.

Monitoring Locations

The number of sampling locations should be based on size of building and number of locations that may have high levels of contaminants. Screening tools such as PID/FID and/or soil vapor samples (see Soil Vapor Sampling fact sheet) and/or indoor air grab samples may be used to guide the determination of the location and number of "hot spots", potential sources of contamination, and potential migration pathways to be sampled using the indoor air sampling procedures. Enough samples must be taken to appropriately assess the conditions in the building and to assess each potential migration pathway.

At a minimum samples must be taken at the following locations:

- Basement location(s) where the highest levels of contaminants may be detected, e.g. cracks in the basement floor, dirt floors, field stone basement wall, sump pump areas, pipes entering the basement, etc.
- At minimum one sample should be taken from each occupied living or working space in breathing zone. Breathing zone is 3 to 5 feet from the floor.
- Second floor of living space in breathing zone.
- Ambient background levels in air outside the building.
- One duplicate sample per sampling day must be taken to determine data reproducibility/precision. Two canisters must be collected in parallel over the sampling period at one sampling location.

Indoor Air Sampling Procedure

Site specific sampling procedures must be developed, submitted and adhered to throughout sampling at the site. This section describes the minimum information that must be included in a site specific sampling procedure.

Sampling Containers

Six-liter pre-evacuated steel or silicon coated steel canisters should be used to sample indoor air for compliance with the RSRs. Initial pressure should be set at –30 inches of Hg and final pressure should be less than 0 psig (approximately –6 to –8 inches of Hg).

Thermal desorption tubes may also be used to collect indoor air samples for compliance with the RSRs. The appropriate sorbent must be selected based on the contaminants of concern.

Other sampling containers will be considered by the DEP if appropriate justification is given.

Flow Regulators and Sampling Duration

Indoor air samples should be collected over an 8-hour period. Flow regulators should be calibrated to sample at a rate of 9 ml/minute for an 8-hour sampling period. Other sampling period lengths will be considered if appropriate justification is given.

Sampling Data

At a minimum the following information should be recorded during the sampling event:

- Date and time of sampling.
- Indoor and outdoor temperature hourly throughout the sampling period.
- Indoor and outdoor relative humidity hourly throughout the sampling period.
- Indoor and outdoor barometric pressure readings hourly throughout the sampling period.
- Wind speed and direction hourly throughout the sampling period.
- Operation of any air exchange systems, heating systems, and air conditioning systems throughout the sampling period.
- Presence or absence of occupants during sampling.
- Normal weekday operation in progress or not.

QA/QC Sampling Procedures

Site specific QA/QC sampling procedures must be developed, submitted and adhered to throughout sampling at the site. At a minimum the following QA/QC sampling procedures must be documented:

- Certification that canisters are clean and free of leaks.
- Calibration and cleanliness of flow regulators.
- Analysis of laboratory blanks.
- Analysis of field/trip blanks.
- Data reproducibility/precision by collecting duplicate samples.
- Analytical accuracy by analyzing QC canisters containing select volatile organic compounds with each batch of canisters to be sampled.
- Canister surrogate spiking results.
- Chain of custody.
- Validity of data for usability.

Analytical Methods for Air

Samples should be analyzed using at appropriate method (e.g. EPA Method TO-15) such that the analytical method can identify and quantify the contaminants of concern at acceptable detection limits.

Monitoring results must be compared to the Target Indoor Air Concentrations listed on pages 53 and 54 of 66 of the RSRs. Any indoor air monitoring result exceeding the Target Indoor Air Concentration is a concern.

References

Compendium of Methods for the Determination of Toxic Compounds in Ambient Air, EPA-600/4-84-041.

Use of Polluted Soil and Reuse of Treated Soil

RCSA 22a-133k -2(h)

Regulation Requirement

"(3) Polluted soil

Polluted soil from a release area may be treated to achieve concentrations of substances that do not exceed either the applicable direct exposure criteria or pollutant mobility criteria. After such treatment, such soil may be reused on the parcel from which it was excavated or on another parcel approved by the Commissioner, provided that such reuse is consistent with all other provisions of sections 22a-133k-1 through 22a-133k-3, inclusive, of the Regulations of Connecticut State Agencies and:

(A) Prior to reuse, a map showing the location and depth of proposed placement of such soil is submitted to the Commissioner;
(B) Such soil is not placed below the water table;
(C) Such soil is not placed in an area subject to erosion; and
(D) Any such soil in which the concentration of any substance exceeds the pollutant mobility criteria applicable to a GA area is not placed over soil and ground water which have not been affected by a release at the parcel at which placement is proposed; and
(E) For soils polluted with PCB, the Commissioner has issued a written approval in accordance with by section 22a-467 of the General Statutes."

Submittal Objective

The submittal to the Commissioner should provide the information necessary to support the appropriateness of the reuse, and also document the reuse in DEP files for discovery by any subsequent file search.

In detail, the submittal must document:

- **The location where the soil is to be placed,**

  Location of the reuse site should be documented by providing a copy of a part of a USGS topographic map at 1:24000 scale with the site located thereon. This should be accompanied by text with identification of the site owner, contact information, the site name, street address, hamlet (post office), and official Connecticut town. The specific location where the soil is to be placed should be documented on a site map drawn to scale with permanent landmarks shown.

- **Water Table Elevation in Relation to Reused Soil**

  The water table elevation, and its seasonal fluctuation, may be referenced by elevation in the text, shown on cross-sections, or both. Documentation should clearly show the regulatory requirement is met. Water table elevation and seasonal variation may be interpreted from soil mottling and rootlet presence in test pits if water level monitoring data is not available. If this option is elected, provide the rational for determination of water table level, and the data supporting the determination.

- **Erosion Control Measures**

  Description of erosion control measures during soil placement and after construction is finished should be provided, and the final landform contour should be described or shown on a site map and cross-section. The documentation must show that the reused soil will not migrate from the placement location both during construction and in the long term. Performance objectives for erosion control parallel those required in the General Permit for Stormwater from Construction Activity. For small projects a detailed design of erosion control measures is not required if reference to Connecticut's Soil Erosion and Sediment Control Guidelines and description of how they will be applied at the site is appropriately included. Larger projects should cross-reference any General Permit registration number, and append a copy of the Stormwater Pollution Control Plan to document appropriate controls will be in place.

- **Pollutant Concentrations**

  Chemical characterization of the reused soil condition is required to document the Remediation Standard Regulation (RSR) criteria for reuse are met.

  To support the chemical characterization adequacy, a brief description of the site of origin Conceptual Site Model, including history, nature of release, and identification of constituents of concern, should be included.

  The sampling objective is to characterize the soil quality as it will be when placed. Testing should be at a frequency of approximately one sample every 50 to 500 cubic yards, depending on homogeneity of the soil being placed, with a minimum of three samples. Testing must address both pollutant mobility and direct exposure criteria for all constituents of concern.

  If the soil, as excavated, is expected to meet the criteria, sampling may be from the stockpile. Alternatively, Phase III site characterization data may be submitted if it suffices to characterize the soil in a pre-excavation mode for dynamic placement. If the soil is to be treated at a permitted facility the facility, the treatment process, the target treatment criteria, and the testing to verify successful treatment should be described.

Submittals

The current regulations require that when reuse is proposed at the site of origin of the polluted soil, notice must be provided to the Commissioner prior to such reuse. Generally, no response from DEP will be provided unless the proposed reuse is inconsistent with the regulations. DEP recommends that notice be provided at least a week in advance of the proposed reuse so, if the proposed reuse is clearly inconsistent, DEP can advise the parties involved before construction has occurred. DEP intends to revise the prior notice requirement in the future.

When reuse is proposed at a site other than the site of origin of the polluted soil, notice must be provided to the Commissioner prior to reuse, and approval must be obtained before reuse may occur. DEP recommends that notice be provided a minimum of three weeks in advance of the proposed reuse. Issuance of reuse authorizations is routine, provided the submittal is complete and the reuse is consistent with the regulatory requirements. Delays occur when submittals are incomplete or the proposed reuse is inconsistent with the regulations.

Submittals should be addressed to:

Coordinator of Soil Reuse
Permitting, Enforcement and Remediation Division
Bureau of Water Management
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Special Considerations

- DEP requests that the submittal be made by or transmitted by the property owner, and in the case or reuse on a different site that that of the origin of the polluted soil, both property owners.

- Reuse, in GB Groundwater Quality Classification areas, of soil meeting GB Pollutant Mobility Criteria, rather than GA criteria, is limited to locations where the pollutant(s) of concern is(are) already present. Environmental sampling data documenting the prior presence of pollutants of concern, at the site of placement, must be submitted.

- Non-residential criteria cannot be used as the reuse criteria unless an Environmental Land Use Restriction is in effect for the property, and includes the specific pollutants and area in its characterization section.

- PCBs are regulated under the Toxic Substances Control Act and separate written authorization must be obtained from the Commissioner if they are present in soils proposed for reuse.

- If approval is requested to reuse soil on a parcel and the property owner has not yet conducted the sampling to demonstrate compliance with RSR criteria, they may specify performance criteria for reuse. Such a request should include a sampling and analysis plan to document compliance, and a material management plan to ensure that rejected soils are appropriately managed. Verification testing results must be submitted for DEP review and to complete the initial submittal file.