



**UNDERGROUND STORAGE TANK CLOSURE  
AND SITE ASSESSMENT REQUIREMENTS  
VERMONT AGENCY OF NATURAL RESOURCES  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
WASTE MANAGEMENT DIVISION**

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## **I. Introduction**

Closure of underground storage tanks (USTs) is a complicated and potentially dangerous process. It involves health and safety issues, hazardous waste concerns, and hydrogeologic investigation. Vermont's Underground Storage Tank Regulations require that advance notice be given and environmental site assessment be performed during the closure of most, but not all, USTs. Regardless of whether a particular tank is subject to those requirements, the Vermont Department of Environmental Conservation strongly recommends performing a site assessment. Advance notice and a site assessment are required at closure of the following types of tanks:

- A) All category one tanks (tanks required to have a permit); and
- B) Heating oil tanks larger than 1100 gallons capacity; and
- C) Farm and residential motor fuel tanks larger than 1100 gallons capacity; and
- D) Farm and residential heating oil tanks participating in the heating oil tank removal grant program.

Site assessment is a process of sorting through and evaluating available information in order to make an informed decision as to whether the closure is complete and whether there is a need for further investigation. A site assessment also ensures that possible environmental problems are not buried by hasty tank replacement, removal, or in-place closure.

A carefully performed site assessment is crucial to protect public health, groundwater, and surface waters of Vermont. Real estate transactions have been delayed or cancelled because of a poorly conducted or documented site assessment, since property buyers and lending institutions commonly insist on knowing what sort of environmental liability a given property may carry. Because site assessment involves judgment, there will often be some element of uncertainty. There may also be pressure to hurry the process, since facility operators usually want to return to "business as usual" as quickly as possible.

This guidance document is not intended to serve as a "how-to" manual on tank closure and site assessment. It does provide a discussion of the factors that must be taken into consideration during a site assessment and tank closure. Following the guidance contained herein should help tank owners and their contractors comply with the requirements of UST closure and site assessment found in Vermont Underground Storage Tank Regulations.

Tank owners must understand that even though the DEC may acknowledge that closure requirements are met, it is the tank owner who may be liable for future problems associated with any residual contamination that may not have been detected or adequately addressed during tank closure or remedial activities.

## **II. Step-by-Step Procedures to Permanently Close Underground Storage Tanks**

A) Notify the UST Program by phone (802-241-3888) or writing at least 5 days prior to the date scheduled for closure (if the tank(s) to be closed are subject to this requirement). The UST Program will forward closure forms and materials upon such notification.

B) All liquid must be pumped from the system, prior to removal from the ground. All material pumped from the tank must be handled as a hazardous waste, except as provided under the Vermont Hazardous Waste Management Regulations.

C) Connecting lines may be closed-in-place provided that all product is drained back into the tank, the piping is purged, and all openings are permanently sealed, and provided that removal is not necessary to adequately assess the site for contamination.

D) Tanks must be rendered non-explosive prior to removal or cutting the tank open. This may be accomplished by disconnecting all piping except the vent line, and sealing all openings in the top of the tank. Then, keeping the vent line connected and open, the tank can be rendered non-explosive by either:

- Inerting: inserting dry ice (solid carbon dioxide) into the tank in the amount of 1.5 pounds per 100 gallons of tank capacity. Once the dry ice has fully sublimated, the gaseous carbon dioxide should displace the oxygen from the tank's interior. Alternatively, nitrogen or another non-combustible gas may be introduced into the tank, but at low pressures to avoid buildup of static electricity. The tank is not considered inert until an oxygen meter registers less than 10% oxygen when measurements are taken 1 foot from the bottom of the tank, the middle of the tank's diameter and at the tank opening; or
- Purging: ventilating the tank with air using an explosion-proof gas exhauster operated with compressed air. An eductor may also be used with compressed air. The tank is not adequately purged until an explosivity meter registers less than 10% of the Lower Explosive Limit (LEL) when measurements are taken 1 foot from the bottom of the tank, the middle of the tank's diameter and at the tank opening.

E) Tanks must be removed from the ground except where removal could compromise the integrity of a nearby structure or an adjacent fiberglass tank. The UST program will only approve in-place closure on a case by case basis. In such cases, the "Procedure for In-place Closure of Underground Storage Tanks" (found in section IV) must be followed.

F) Excavations should limit the amount of soils to be removed and then, segregate soils by degree of contamination. Where soils are temporarily stockpiled on site, this must be done to minimize vapor releases to the air, to minimize the transfer of contaminants to groundwater and to minimize any threat to public health or safety. This is commonly done by stockpiling the soils on top of a sheet of 6-mil (or thicker) polyethylene, and covering the pile with a layer of the same material. Excavated soils that are contaminated may not be transported off the site without prior written authorization by the DEC. Permission to excavate and transport contaminated soils does not constitute a determination of eligibility for reimbursement from the Petroleum Cleanup Fund. Refer

to the WMD guidance document Procedure for Reimbursement from the Petroleum Cleanup Fund for additional information. In locations where there is insufficient space to stockpile soils, an alternative off site location for stockpiling soils should be located and approved by the DEC prior to tank removal. Costly delays can occur if an off site location has to be found and approved by the DEC during the UST removal. Therefore, remember to plan ahead. A copy of the Off-Site Treatment Request Form is attached. At a minimum, the location must meet the following criteria before receiving DEC approval for off-site soil treatment:

- There are no bedrock drinking water supplies within a 200 foot radius.
- There are no shallow water supplies within a 200 foot radius. This requirement may be extended if shallow water supplies are shown to be hydraulically downgradient.
- There are no sensitive environments such as a stream, river, lake, pond, wildlife refuge, wetland, floodplain, Class I or Class II groundwater zone or other similar areas, adjacent to the treatment location.
- There is adequate room to allow for treatment to occur over the necessary time frame.
- The location can be made secure from public access.
- The location is not in a residential area.
- Written approval from the landowner, if different from generator, is obtained before treatment begins.
- The off-site location must be noticed to the local government prior to initiating any soil treatment. Necessary local permits should be obtained. The responsible party must provide evidence to the DEC that this notification has been made.

**NOTE:** The cost of excavating, treating, and disposing of petroleum-contaminated soils may qualify for reimbursement from the Petroleum Cleanup Fund (PCF) if the site meets the PCF qualifications, and the DEC has pre-approved, in writing, removal of contaminated soils as a remedial measure. Refer to the document entitled, "Procedures for Reimbursement from the Petroleum Cleanup Fund" for more information.

G) All sludge must be removed from the tank, and the tank's interior must be cleaned of all residues. This frequently involves entering the tank through a manway built into the tank, or by cutting a hole in the tank. Applicable OSHA confined space entry rules must be followed, and all tank bottom waste and spent cleaning solutions must be handled as hazardous waste, and therefore must be moved off site only by a certified hazardous waste transporter.

H) Tanks removed from the ground may not be reinstalled for petroleum storage, except under very limited circumstances specified in the Vermont Underground Storage Tank Regulations. Any tank that does not meet the new construction standards contained in the Underground Storage Tank Regulations must be rendered inoperable to prevent unauthorized re-use. **Vermont's Department of Labor & Industry, Fire Prevention Division prohibits re-use of old USTs for aboveground use.**

**NOTE: Any new or replacement Category One Underground Storage Tank must be permitted by the DEC before the commencement of construction.**

I) If transported, the tank must be scraped to remove loose backfill. The tank interior must be rendered inert to ensure that it is not subject to reaching an explosive condition (vapor buildup to the LEL) and it must be properly placarded on the ends and sides. Transportation of the tank must be in accordance with applicable state and federal transportation rules.

J) If the tank(s) are subject to the site assessment requirement, or if conditions suggest a release may have occurred, a site assessment must be performed to determine the presence of a release where contamination is most likely to be discovered. (See Section III.) The DEC must be notified within 2 hours of discover of petroleum contamination. During normal business hours, notification can be accomplished by contacting the UST Program at (802) 241-3888. Outside normal business hours, notification can be accomplished by contacting the Department of Emergency Management at (800) 641-5005.

K) The site assessment report must be sent to the DEC, so the UST Program can forward the necessary form to the owner in order to update information both in the local land records, and in the State's notification and permit records. If the site assessment report is incomplete or improperly completed, the DEC will require additional work. Any additional work requested by the DEC to fulfill UST Closure Assessment requirements will not be considered eligible for reimbursement from the Petroleum Cleanup Fund.

### **III. Guidelines for Performing a Site Assessment at Petroleum UST Closure Sites**

During the permanent closure of USTs, and when a release of petroleum from a tank may have occurred, the Vermont Underground Storage Tank Regulations require that a site assessment be completed to assess what effect contamination has had on public health and the environment. This assessment must be conducted by a qualified consultant or engineer with experience in environmental sampling for the presence of hazardous materials. A site assessment must evaluate the degree and extent of petroleum contamination, if any exists, and must identify threats to public health and the environment. The following guidelines have been developed to address the issues involving the assessment of petroleum contamination:

#### **A) General Site Information**

It is the responsibility of the tank owner, or tank owner's representative, to gather and report all necessary information to adequately define a problem at the specific site being investigated. Required site information must be given on the DEC's UST closure form. The completed and signed form, along with a site map and a narrative report, must be submitted to the DEC within ten (10) days of closure. Upon notification, the UST Program may request report submission within 72 hours of closure.

The site map should include information such as street names, UST location, property boundaries, adjacent properties, buildings, storm drains, sewers, water lines, monitoring wells, water supply wells within 500 feet of the site location, adjacent surface waters, sensitive environmental areas (wetlands, etc.), recreation areas, etc.

The site map must be as accurate and precise as possible. A scale of 1 inch = 50 feet is recommended, but should not be smaller than 1 inch = 100 feet. (Since water supply wells within 500 feet of the tank site should be included on the map, an arrow pointing in the direction of a well and its measured distance from the tank area may be used if the well is far enough away that it will not fit on the map area.)

All relevant site-specific information not reported on the tank closure form and the site sketch map must be included in a separate site assessment report. Such information may include unusual site conditions, unusual conditions observed downgradient of the tank site, leak detection records, inventory records (including water pump outs), complaints or reports from neighbors or employees, on-site weather

conditions, etc. Also included in this narrative must be a brief analysis of surrounding land uses and identification of any particularly vulnerable buildings such as hospitals, nursing homes, schools, day care centers, along with their respective populations.

### **B) Site Characteristics and Contaminant Investigation Results**

One of the most important steps in the site assessment process involves searching for contaminants where they are most likely to be encountered. Some of the most common areas to find contamination include, but are not limited to the following: around the fill pipe, along the piping trench, underneath the dispensers, and the tank excavation itself.

All monitoring equipment, which is used during the tank closure and site assessment, must be appropriate for that type of use and must be properly maintained and calibrated. For gasoline, kerosene, diesel fuel, and #2 fuel oil, the DEC requires the use of a photoionization detector (PID) for measuring soil contamination levels. Other instruments or measurement methods must have prior approval from the DEC. PID measurements are useful, but by themselves are insufficient, for assessments where USTs contained heavy fuel oils and/or waste oil. For waste oil and heavy fuel oils, laboratory analysis of representative and discreet soil samples is necessary, since PIDs often will not respond predictably to these contaminants.

A description of the site geology and hydrology must be completed, which will include some, if not all, of the following:

- Soil technical data using the unified Soil Classification System (SCS) or AASTHO (American Association of State Transportation and Highway Officials) classification (type, thickness, texture.)
  - Hydrogeology (permeability, depth to water table, groundwater flow direction, etc.)
  - Strata (different layers of sand, gravel, silts, clays, etc. must be identified.)
  - Bedrock (description, location, characteristics, etc.)
- The degree and extent of any petroleum contamination should be identified on site. This generally will include extensive field measurements with a photoionization detector (PID) or equivalent. Field readings are expected throughout the entire excavation, taken at various depths as well as throughout the area laterally. If appropriate, the following information must also be included:
- Test pit and boring log data (description, methods and results).
  - Field observations and studies (soil gas, odor, seeps in banks, sheens on surface water, vapors in basements etc.)
  - Sampling of adjacent water wells and analytical results.
  - Free product thickness (if any).

### **C) Receptor Analysis**

A complete site assessment must also include an analysis of all possible receptors of petroleum contamination. A receptor is any location -- either natural or made by people -- that could be adversely affected by petroleum vapors or liquid product. Examples include lakes, streams, wetlands, basements of buildings, water supply wells, etc. A thorough and complete analysis of all potential receptors is essential since the DEC carefully considers sensitive receptors and contamination levels when determining what level of remedial activity is warranted.

**D) Analytical Methods and Results**

If samples are taken for laboratory analysis, the following documentation must be provided:

- Material sampled and analytical test to be done on that sample.
- Sampling method. The DEC requires discreet samples and will not accept the results of composite samples.
- Results, if available. If results are not included in the report, indicate when they are expected.

As stated above, laboratory samples are required for a complete assessment for an UST that contained heavy fuel oil or waste oil. For #4 and #6 fuel oils, laboratory analysis for volatile organic compounds (VOCs) by gas chromatograph / photoionization detector methodology (e.g., EPA Method 8021B) and an approved Total Petroleum Hydrocarbon (TPH) method must be used. For used oil, laboratory analysis for RCRA 8 total metals, PCBs, Cyanides, volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) by gas chromatograph / mass spectrometry methodology (e.g., EPA Method 8260 and 8270), and an approved TPH method must be used. In most cases, a minimum of two samples per excavation will be required.

For cases in which soil excavation is conducted as a remedial measure, laboratory samples are required to confirm that the full extent of the contamination is removed, and that no further investigation (such as groundwater monitoring wells) is needed.

The UST program understands that analytical results are not often available within 10 days of the tank closure. Unless extreme circumstances warrant expedited analysis and reporting procedures, it is acceptable for laboratory results to be sent in after the initial site assessment form and report are submitted to the UST program.

**E) Conclusions and Recommendations**

Included in the site assessment report must be a section containing any conclusions or recommendations that can be made. Has there been a release of a hazardous material? If so, what was the most likely source of that release? What risk does the contamination pose to public health and the environment? And, what further work is needed to better characterize the contamination? The UST program is tracking the frequency of UST system releases, and which components of the system fail most often. It is extremely helpful to have a consultant's best professional opinion as to whether the release was the result of spills and overfills, piping leaks, tank failure or any other factor that may have contributed to release.

The most important conclusion and recommendation that the DEC is looking for is whether the site needs further investigation. If so, explain which further steps are warranted and why. Any impacted or threatened receptors must be clearly identified.

**F) Quality Assurance/Quality Control**

One of the most important requirements of a site assessment is the quality control/quality assurance program. This ensures that accurate and reliable information is reported so that a proper assessment of the site can be made. All field measurement instruments must be properly calibrated prior to each day's use. A calibration log must be kept to document these measurements. This information must be provided upon DEC request to validate information and conclusions. Any samples collected for laboratory analysis must follow state or federal protocols. The sampling and analysis methods and

plans must be provided upon DEC request. All sampling for laboratory analysis must have proper QA/QC samples, including field or trip blanks and duplicate samples.

#### **G) Minimum Requirements for Conducting Site Assessments**

Federal OSHA requirements in 29 CFR 1910.120 mandate that any employee working in a hazardous environment, including petroleum contamination must have proper training. This training is the employer's responsibility and will be needed to conduct UST closure site assessments.

The DEC also requires proper field instrument training for equipment used in the assessment and proper training of sample collection. In addition, the DEC recommends training in, and practical experience with, at least one of the following areas: engineering, soil science, hydrogeology, geology and/or earth sciences. Site assessments conducted inadequately or by unqualified personnel will be returned, and further information will be required.

#### **IV. Procedure for In-Place Closure of Underground Storage Tanks**

Section 8-605(2)(b)(iii) of the Vermont Underground Storage Tank Regulations states that "Tanks shall be removed from the ground except that the Agency may allow permanent closure-in-place on a case-by-case basis if removing the tank(s) would compromise the integrity of either an overlying structure or an adjacent fiberglass reinforced plastic tank." The Department of Environmental Conservation (DEC) has also found it is appropriate to close a tank in place if buried gas or electrical conduits are located close to the planned excavation, and cannot be readily removed.

In cases where a tank is to be closed in place, excavation to access the top of the tank is still necessary. Closing a tank in place is often more expensive than removing a tank from the ground, since extra steps are involved and additional worker safety requirements must be followed. The following guidelines have been prepared to assist in meeting these requirements:

1. All material pumped from the tank must be handled as a hazardous waste, except for product destined for reuse.
2. The tank must be purged or inerted as described in Section II.
3. Clean the tank prior to transporting off site, all liquid and sludges must be removed. The tank cleaning can be done by gaining access by a port that is usually cut in a purged tank, if the tank does not have manway. From this access port or manway, all liquid and sludges can be removed. Cleaning the tank interior will often involve entering the tank; all applicable health and safety requirements for confined space entry must be followed. Trained professionals familiar with the health, safety and explosivity hazards associated with petroleum vapors may only accomplish this activity. Once the sludge and waste materials have been pumped out, the interior must be cleaned with a suitable detergent. All tank bottom sludge and spent cleaning solutions must be handled as a hazardous waste. To obtain soil samples, drill through the tank from the inside. If this method is to be used for the site assessment, sample holes must be distributed to ensure representative coverage. The same cautions for confined space entry requirements as in #2 above apply.
5. After the tank has been properly cleaned, it can be filled to capacity with an inert material (such as sand or concrete slurry) until all voids are filled.

6. All piping that can be removed without compromising the integrity of structure should be removed and disposed of appropriately; and
7. Subsurface environmental contamination can also be assessed by using one of the following methods:
  - a. Excavation beside the UST to some depth below its underside, usually with a backhoe; or
  - b. Groundwater monitoring well installation beside and downgradient of the UST; or
  - c. Soil boring with spoon sampling; or
  - d. Any other method as approved by the Agency in advance.

Excavation beside the UST is one way to confirm whether contamination is present. In urban areas or in areas where underground lines may be present, Dig Safe will need to be called for reference information.

Where backhoe operation is deemed impractical, groundwater monitoring wells may be used. Groundwater monitoring wells are best installed by employing a hollow stem drill rig. A drill auger penetrates the ground and removes soil. When groundwater is located, a monitoring well, usually made of slotted PVC pipe, is put in place. The auger is then withdrawn, and the slotted PVC pipe is backfilled with a special filter sand. Through the use of a bailer, groundwater sampling can be performed.

Soil boring with split spoon sampling also involves the use of a drill rig. Soil samples are drawn at specified intervals using a split spoon sampler, typically every five feet of drilling. The soils can either be analyzed on site by utilization of a PID, or may be sent to a laboratory for analysis.

The DEC will allow the fill-in-place closure to be utilized in special conditions. However, this process does not release UST owners from the responsibility for contamination found from the listed methods of investigation. If contamination is found the state may require the responsible party to retain a qualified consultant to conduct further investigation. These consultants must follow state guidelines in remediating impacted soils, groundwater or surface waters.

## **V. Approval**

This document is hereby approved and adopted, in accordance with the Vermont Administrative Procedure Act (3 V.S.A. section 835).

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_ 2003  
P. Howard Flanders, Director, Waste Management Division  
Vermont Department of Environmental Conservation