EPA

A CITIZEN'S GUIDE TO DRYCLEANER CLEANUP

www.drycleancoalition.org

State Coalition for Remediation of Drycleaners

Background

Drycleaners are found in suburbs, business districts, and strip malls. Drycleaners use cleaning fluids called solvents to clean clothes and other fabrics. Solvents can be used safely if properly managed; however, solvents can harm people, animals, and plants if released to the environment.

Drycleaning solvents can be stored in drums or in tanks above or below ground. Spills or discharges of these liquids can contaminate soil and water. Cleaning solvents or waste containing solvents should not be poured on the ground or down the drain. These chemicals can seep into the ground from septic tank systems or leaking sewer pipes. Even small, unintended, or unknown releases from the operation of drycleaners can contaminate the environment.

Drycleaners have used many types of cleaning fluids through the years. Products based on petroleum, such as Stoddard solvent (somewhat like paint thinner), were the cleaning fluids of choice in the 1940s and '50s. Some cleaners still use them. These products are lighter than water. If they are released to the ground in quantity, they can drain through the soil to float atop the groundwater table. Once there, they slowly dissolve into the water to form a toxic plume. The plume can affect drinking water supplies. Also, vapors from the released solvent and plume can rise through the soil into buildings. This process is called "vapor intrusion."

Other cleaning fluids used by most drycleaners are chlorinated solvents. Different types have been used in the United States, and some are still used for spot cleaning. Perchloroethene (PERC, or PCE) has been the solvent of choice since the 1960s. These solvents are denser than water, which means they sink instead of float. When released to the ground in quantity, they contaminate the soil and groundwater for a long time. The contamination can last tens to hundreds of years. The vapors from these solvents can also intrude into buildings.

Where are the Risks

Drycleaning solvents can threaten human health mainly by contaminating indoor air or drinking water. They often cannot be smelled or tasted. The amount of solvent found in indoor air or drinking water does not have to be large to be harmful.

Cleanup Goals

Cleanup goals are chosen to make the site and resources safe for their intended use. The cleanup goal for groundwater that provides drinking water might differ from one for water not used for drinking water. The cleanup method(s) must be able to achieve the goal in a reasonable time frame.

Time Available for Cleanup

Diverse cleanup methods take different amounts of time to reach the cleanup goal. The methods that achieve cleanup fastest can cost more in the short term. The time allowed for cleanup is balanced against the cost and potential reuse of the property.

What Affects Cleanup Method Choice

Cleanup can be approached in different ways. Direct and present threats to the public, like contaminated well water, can be mitigated by providing clean drinking water. Mitigation measures do not address the source of the problem. A remedy, on the other hand, takes steps to clean up the contamination.

Many factors go into choosing a cleanup method.

- The type and amount of contamination: Was the spill pure solvent or was it mostly water? The larger the release, the greater the area that will need cleaning.
- The type of soil at a site: Clay soils are harder to clean than sandy soils.
- How far solvents reach underground: Water very far down in the ground is less likely to be affected by a release. However, some solvents are heavier than water, so they tend to sink when leaked into groundwater. It is hard to clean up solvents that settle deep into groundwater. Some cleanup methods become too costly to use.
- Limits on how a cleanup method can be used: Digging up the affected area is limited by how deep the equipment can reach. Some methods work slowly. Some work quickly. Some work well in one type of soil but not in another. No one method can work for every site.
- Size of work area: The space available to set up and use equipment may be too small for some cleanup methods.
- Cost of cleanup: While ensuring that a cleanup protects human health and the environment is the most important factor when selecting a cleanup method, cost may also be considered when choosing a remedy. A project manager may choose a cleanup method that is less expensive than another option if both will result in the same level of cleanup.
- When the spill occurred: The length of time that has passed since the release occurred can affect the preferred cleanup method.
- Urgency of threat to people and the environment: In some instances, a contaminated site does not pose an immediate threat to people or the environment and an active cleanup technology is not necessary. In these cases, the project manager may recommend frequent monitoring of the site or place restrictions on its use.

Legal Issues

Almost all cleanups will require permits or some regulatory program oversight for site activities. Some permits will be fairly easy to get. Others, such as permits to inject chemicals to clean up the ground or groundwater, can be more difficult to obtain. State laws govern the approach used for setting cleanup goals. Cleanup goals can vary depending on the risk posed and whether the affected property will be or is used for housing, commerce, or industry.

What Cleanup Methods are Available

Mitigation Methods

Groundwater

When drycleaning liquids are found in a drinking water well, a filter can be installed in the home. The filter will remove contaminants until the groundwater is cleaned up. It is important to maintain filters by keeping them clean and changing them frequently. In some cases, bottled water is supplied until drinking water supply lines can be installed. These methods provide protection quickly but do not fix the problem. Where feasible, affected homes can be connected to public water lines to eliminate exposure to contaminated groundwater.

Soil Vapor Intrusion

Harmful vapors from solvents in soil or a toxic plume can rise to the surface. The vapors can enter into buildings through cracks in flooring or concrete slab foundation. Several methods are available to slow or stop chemicals from entering a building. The methods can be used alone or together. The first step is to seal cracks in the floors and walls. Gaps around utility conduits, sumps, and elevator shafts should also be sealed. If the building has a crawl space or the slab has been temporarily removed, plastic sheeting placed on the ground is a barrier to soil gas.

Fan Venting Soil Gas from Under Building to Outside Air

The most common way to mitigate vapor intrusion uses a fan or blower to draw air from the soil beneath a building and discharge it to the outside air. This system is called sub-slab depressurization. These systems can be installed in houses with basements or slab-on-grade construction. Holes are drilled through the slab into subsurface soil. Pipes are placed in them, and the opening around each pipe is sealed. The pipes are connected to a venting system. A fan pulls soil gas from beneath the slab and vents it to the outside.

Remediation Methods

Excavation

Digging up contaminated soil and sending it to a landfill is the quickest and most direct way of cleaning up a site. The use of this method depends upon how much soil is affected, how deep the contamination goes, and whether there is enough room for the equipment to get to it. Soil that is under buildings or in the groundwater is seldom dug up.

Soil Vapor Extraction

Soil vapor extraction (SVE) is a cleanup technique for contaminated soils used at some drycleaner sites. A vacuum is applied to the subsurface soil to draw out soil gas for treatment above ground. The vapors can be cleaned above ground by one of the many treatment methods available. SVE is very effective in sandy soil. It can be used to draw out solvent vapors under or next to a building. SVE minimizes the potential for vapor intrusion while the site is being cleaned up. There must be enough space for the equipment above ground. On the down side, reaching cleanup goals can take several years.

SVE Treatment System

Pump and Treat

Pump and treat systems remove contaminated groundwater for treatment above ground. These systems can slow or stop the spread of the toxic plume. Wells with pumps in them can be installed below ground and at some distance from the treatment unit. The treated water can be handled in different ways. It can be pumped into a storm sewer or sanitary sewer, or re-injected into the aquifer.

Solar Power Pump and Treat

In-Ground Chemical Oxidation

In some cases, drycleaner solvents can be destroyed without pumping them above ground. In situ (in place) chemical oxidation involves injecting reactive treatment products where they are needed to destroy contaminants with a goal of leaving harmless by-products after treatment. Harmless by-products remain after treatment. The oxidants are very effective against dissolved solvents and sometimes solvent residues. They are less effective on highly concentrated or pooled

Chemical Oxidation

solvents. While adding expense to the cleanup, this method can help meet cleanup goals faster. Several injection wells may be required, but the delivery system is portable and likely on the site for a short time.

Thermal

Heating units can be placed below ground to destroy or vaporize chemicals that are hard to remove by other means. Solvents in silt or clay soil typically are hard to remove. Some heating technologies (resistive and conductive) use electrical energy to heat the source soil to temperatures near or above the solvent boiling point. These methods use electrodes or heater units. The units are placed within the soil area to be cleaned up. Another method, steam heating, injects steam into the ground to vaporize the solvents. These vapors can be captured by SVE and treated above ground. Heating can be more expensive than other methods, but it works very well. It should be considered when a source zone is hard to treat and cleanup time is short. Depending on the amount of solvent, the heating units might remain on the site for six months or more.

Biodegradation

All drycleaning solvents can be eaten by microbes (bacteria) to some extent. The chemical might degrade without treatment if conditions in the groundwater are favorable. But the underground conditions often must be altered to spur microbes to act upon solvents, especially chlorinated solvents. Injecting harmless fluids, such as whey or molasses, into the treatment zone can stimulate native microbes. If certain types of microbes are needed to break down solvents, they may have to be added. Biodegradation must be monitored to make sure that the plume does not migrate or cause a vapor intrusion problem.

Florida DEP Injecting Molasses into the Groundwater

Natural Attenuation

This method relies on natural conditions in the subsurface to degrade, disperse, dilute, take up, transform, or otherwise clean up chemicals. It is often used as a remedy for low-risk situations or when there are low levels of chemicals in groundwater. This process takes a longer time than most cleanup methods. Depending on the situation, it may be monitored to prove cleanup is taking place.

Institutional Controls

Institutional controls are used with other cleanup methods. They prevent people from drinking the groundwater or coming in contact with the solvents until the other cleanup methods have worked. The controls sometimes restrict drilling wells or disturbing the soil after action above ground at the site has ended.

For More Information

The State Coalition for Remediation of Drycleaners (SCRD) website contains reports that discuss site cleanup methods. The site has over 175 case studies of drycleaner sites that have been assessed and cleaned up, with cost data (www.drycleancoalition.org/). A listing of all SCRD state representatives, complete with contact information and links to state drycleaner program websites, can be found by visiting http://www.drycleancoalition.org/members.cfm#contacts.

U.S. EPA has a webpage called “Citizen’s Guides to Cleanup Methods.” The Guides provide more details about the different cleanup methods (www.clu-in.org/products/citguide/).

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