SOIL VAPOR EXTRACTION SYSTEMS

Date Initiated:

October 28, 1998

Dates Modified / Updated:

PROCESS DESCRIPTION:

A variety of soil / vapor extraction devices have been installed at contaminated properties for site remediation purposes. These devices are most often used to mitigate gasoline spills but can also be effective for a wide range of volatile organic solvents. The equipment usually consists of a blower with air extraction wells vented to an activated carbon filter. On some sites, the activated carbon may be replaced with a thermal oxidizer, catalytic oxidizer, scrubber, or passive vent. In nearly all instances, the basic operating principle involves the passing of clean air through the contaminated soil to remove a volatile contaminant. The following methods are used by the District to estimate emissions from soil vapor extraction processes;

Ea = Ua x PPMVa x MW x Ci x k

Eh = Uh x PPMVm x MW x Ci x k

Where:

Ea = Annual emissions of each contaminant, (lbs/year)

Eh = Maximum hourly emissions of each contaminant, (lbs/hour)

Ua = Annual equipment throughput, (ft3/year)

Uh = Maximum hourly throughput, (ft3/day)

PPMVa = Annual average organic outlet concentration, (ppmv as reference compound)

PPMVm = Maximum hourly organic outlet concentration, (ppmv as reference compound)

MW = Molecular weight of outlet concentration reference compound, (lbs/lbm)

Ci = Concentration of each listed substance, (lbs/lb)

k = Conversion factor, (lbm/ft3)

EMISSIONS INFORMATION:

In general, soil vapor extraction equipment is operated on a near continuous basis and outlet exhaust concentrations are usually in the low ppmv range. Actual emission rates tend to decrease rapidly from initial 'design' concentrations. Some exhaust concentrations are sufficiently dilute as not to require control devices. The exhaust speciation profile is usually similar to the source of the contamination but could differ dependent upon the control device.

ASSUMPTIONS / LIMITATIONS:

- To properly estimate emissions, the selected calculation procedure must incorporate the molecular weight of the reference compound used to measure the ppmv in the exhaust. For example, a soil vapor extraction system employed to mitigate a gasoline spill must use a calculation procedure based on methane if the exhaust concentrations are reported in units of ppmv as methane.

- The material composition information requested on the reporting form is used to speciate the extraction system exhaust. Where an installed control device captures the volatile organics in question at different efficiencies (i.e. carbon, catalytic oxidation, etc.), this 'material composition' profile may differ substantially from the original contamination.

- A default material composition profile (gasoline, methylene chloride, perchloroethylene, etc.) will be included with each calculation procedure. While this profile should be representative of uncontrolled extraction systems, site specific exhaust composition information should be used where available.

- Outlet concentrations and compositions must be reported after the final control device. Because of this, the release point control efficiency is irrelevant and not included in the calculation procedure.

- Fugitive emissions are assumed to be negligible. This assumption may not be valid for remediation sites involving soil / contaminant excavation.

- Maximum hourly emissions are calculated using the maximum operating flow rate and exhaust concentration.

- In many cases, long term operation of soil - vapor extraction equipment is not cost effective. As inlet concentrations quickly drop from the initial startup levels, the actual lbs of contaminant recovered / removed significantly decreases. Alternative forms of remediation should be considered as the volatile portion of the

contamination becomes negligible. The use of soil - vapor extraction equipment to remediate nonvolatile contaminants is expensive, time consuming, and ineffective.

FORMS:

A separate reporting form must be completed for each soil vapor extraction system on site.