

## Frequently asked questions about the Vadose sampling system

Vadose sampling consists of primarily pore gas sampling from tubing built into a sealing liner, or pore water collected in absorbent spacers on a liner which can be recovered by inversion of the liner, or with reactive coverings on the exterior of the liner. Questions that have been asked are:

1. *What kind of samples are gained with a vadose system?* Pore gas, pore water, radioactive components in the pore water, and such pollutants as DNAPLs, LNAPLs, VOCs, and dissolved components, tritiated water vapor, and many other kinds of substances in the pore space.
2. *What are the installation techniques for vadose sampling?* Open stable boreholes, direct push rods, assessment of core brought to the surface.
3. *What are the names of the names of the FLUTE vadose techniques?* NAPL FLUTE (color reactive cover system), Vadose FLUTE gas sampling system, FACT (FLUTE activated carbon technique), Vadose absorbers.
4. *How can FLUTE systems be emplaced in unstable sediments?* Via direct push rods or through sonic drilling casing. Gas sampling can be done in cased wells with one or more screened intervals.
5. *Can one do gas sampling and absorber collection of pore water in the same hole with the same liner?* In Yucca Mountain, NV, gas sampling liners were installed in horizontal holes with the ability to install a second liner in the same hole with absorbent coverings. The absorber liner was inverted from the hole while the gas sampling liner remained in place and inflated. This is called the Duet technique.
6. *How does one keep a vadose liner inflated?* Some gas sampling systems are filled with a dry sand. Some liners are supplied with solar cells and continuous air pumping to keep them inflated and still removable. Some are installed with a water fill to keep them inflated for long periods of time in shallow holes.
7. *How much do vadose systems cost?* See the price sheet on our web site [www.flut.com](http://www.flut.com).
8. *Can vadose systems be left in place for many years?* Yes, some are still in place after 10 years.
9. *How deeply can vadose systems be emplaced?* They have been installed to over 400ft.
10. *Can vadose systems be installed in horizontal holes?* Yes, many are.
11. *How does the FACT system work?* The activated carbon felt wicks by diffusion the contaminants from the pore space over an interval of several days. The liner with the carbon felt is then inverted from the hole, the carbon felt is sectioned stored in a vol and sent to the lab for analysis submerged in methanol. GCMS analysis of the carbon provides a relative concentration per gram of carbon and the species identification.
12. *Where has the FACT been used?* In Denmark and the USA. It is a relatively new method.
13. *What kind of compounds can react with the NAPL FLUTE cover?* See the list of reactive compounds in the NAPL FLUTE section of our web site.
14. *Does FLUTE have methods for assessment of core from the vadose zone?* Yes, for many kinds of core with both the NAPL FLUTE reactive cover and the FACT.
15. *Can I test the cover material with my compound?* Yes, but if it is very volatile, it should be done in a confined space and well protected against immediate evaporation. The underground environment does not allow evaporation, so the in situ mapping is best.
16. *Can one map coal tar or creosote?* Yes, it is very often used for that contaminant.
17. *Can the FLUTE vadose methods be used in fractured rock?* Yes, it often is.

18. *Can vadose pore gas sampling systems be used with the Water FLUTE system?* Yes, that has been done frequently. The pore gas sampling tubing is routed directly to the surface in sleeves in the liner with the usual Water FLUTE spacer on the exterior of the liner.
19. *Can one assess the NAPL stains on the exterior of a liner without removing the liner from the borehole?* Yes, that can be done with a camera inside our transparent liner filled with water. It can also be done with an air filled liner at much greater depth through an air lock at the wellhead.
20. *How long have the vadose sampling systems been available?* 26 years (since 1990).
21. *Are the vadose systems used in characterizing radioactive contamination?* Yes, that was the original use.
22. *Are FLUTE vadose systems used for landfill monitoring?* Yes. The liners can propagate in any direction with air, around corners, and can tow many kinds of logging sondes through the interior of the liner as the liner is propagating along a passage. Examples are neutron moisture sondes, induction coupled electric logs, gamma logs, etc....