the saturated zone. The static mode could be used in a borehole with a maximum diameter of six inches or less. Downhole sensors that can be used in a borehole with a diameter of two inches or less are preferred for the Vendor FACTS database. The Vendor FACTS database will not include common geophysical, gamma, spontaneous potential, gamma-gamma, caliper, and neutron logging tools. Vendor FACTS also will not include TV cameras that can be inserted down a borehole.

Downhole Sensors—Vadose Zone—These portable or transportable sensors can be used to determine subsurface chemical or physical properties. These sensors must be capable of operation in the vadose zone, in either a dynamic or static mode. The dynamic mode would produce data in real time as the sensor was advanced through the subsurface. The static mode would involve a sensor that either could not provide data as it was advanced, or was not capable of being advanced through the vadose zone. The static mode could be used in a borehole with a maximum diameter of six inches or less. Downhole sensors that can be used in a borehole with a diameter of two inches or less are preferred for the Vendor FACTS database. The Vendor FACTS database will not include common geophysical, gamma, spontaneous potential, gamma-gamma, caliper, and neutron logging tools. Vendor FACTS also will not include TV cameras that can be inserted down a borehole.

Fiber Optic Chemical Sensors and Analyzers—These field portable sensors employ fiber optics to transmit excitation energy to either a reaction chamber or directly onto a sample matrix. Fiber optics also are used to return the signal produced from either a fiber coating, a reaction chamber, or a sample matrix, directly into some type of detector. Generally colorometric or spectroscopic detectors are used in this process. These sensors produce real time in situ data.

Transportable Technologies—These technologies require a vehicle or mobile lab to get on site, alternating current power source (although not in all cases), and are operated on site.

Portable Technologies—These technologies are manually portable (generally weighing 30 pounds or less), battery operated (can have alternating current power), self-contained, and used on site.

Gas Chromatography (portable only)—These field portable instruments cause a chromatographic separation of chemical constituents. These instruments employ isothermal or temperature programmable ovens, and megabore, capillary, or packed chromatography columns to separate chemical constituents. These instruments use chemical detectors, and data acquisition and integration software to quantitate chemical constituent concentrations. Recent advances in gas chromatography that are considered innovative are portable, weather-proof units that have self-contained power supplies. High-speed gas chromatography is also a recent innovation.

Ground Penetrating Radar—This technology, in use for some years now, consists of emitting pulses of electromagnetic energy into the ground, and measuring its reflection/refraction by subsurface layers and other features (such as buried debris). It is analogous to seismic techniques, but with a pulse of electromagnetic energy, rather than sound (physical) energy.

High Frequency Electromagnetic (EM) Sounding—These technologies, used for nonintrusive geophysical exploration, project high frequency electromagnetic radiation into subsurface and detect the reflection/refraction of the radiation by varying soil layers. Unlike ground penetrating radar, it uses continuous waves, as opposed to pulses.

High Resolution Seismic Reflection—The classic technique of seismic reflection/refraction has been used for decades, primarily for examining relatively large features, such as the salt domes (often containing petroleum) of the Gulf Coast. This technology includes means to refine it to determine smaller scale features, such as debris or the lenses, buried channels, and other features found in till deposits. This technology must be able to measure features of interest within 100 feet of the ground surface to be considered innovative.

Immunoassay—These field portable test kits use immunochemistry to produce compound specific reactions (generally colorometric) to individual compounds, or classes of compounds. These reactions are used to detect and quantify contaminants. The immunochemical reactions center around polyclonal antibodies. These antibodies are engineered to produce compound specific reactions. The methods used to bring the antibodies into contact with a water sample or soil sample extract are variable.

Infrared (Long Path) Monitors—Classic infrared techniques involve a path of one centimeter or less in a solid or liquid. This technology looks at gases in longer path lengths, from a few centimeters to hundreds of meters. In some cases, the path may be inside the instrument. Alternatively, the air being sampled is ambient, not confined to the instrument. The air being sampled may represent a point source, such as a stack being monitored, or it may be an area. The newest variant involves remote reading of a source; this may involve checking the exhaust of a car driving on the road or the reflection from an approaching cloud.

Mass Spectrometry (portable only)—This field portable technology involves modifying a large, laboratory instrument so it can be taken into the field. Mass spectrometry breaks molecules into fragments and determines the concentrations and mass/charge ratios of the fragments. Each molecule generates a distinct pattern of fragments, so a sufficiently sensitive system can provide absolute identification of a contaminant. Less sensitive systems can readily determine class characteristics of molecules by identifying relevant radicals and other less than molecule size groups. Mass spectrometry units that are considered innovative are portable, weather-proof units that have self-contained power supplies.

Nuclear Magnetic Resonance—This field portable and transportable technology involves modifying a large, laboratory instrument so it can be taken into the field. Nuclear magnetic resonance measures the electronic environment (that is, adjacent and nearby chemical bonds) of the nuclei of a particular species of atom. The most common laboratory and clinical use is on protons, but it can be used for any atom with an odd number of protons (such as the alkali metals, aluminum, and phosphorus) or an odd number of neutrons (such as carbon-13, magnesium-25, silicon-29, and chromium-53, all significant fractions of the naturally occurring elements). Thus, it can determine the chemical composition, or variation in chemical composition, throughout the mass of a sample.

Soil Gas Analyzer Systems—These portable systems provide on site or remote monitoring of soil gas constituents. Their main components are a soil gas sampling system, soil gas analyzer, and data storage or transmission station. All of these components are microprocessor controlled and can be programmed to provide routine periodic sampling and monitoring, or on demand sampling and monitoring. These systems also use some type of standard to provide periodic checks of accuracy and precision.

Supercritical Fluid Extraction—These portable and transportable, self contained units use supercritical fluids such as carbon dioxide to extract