CHAPTER 6

SAMPLING DURING UST REMOVAL PROCEDURE

6-1. General. The purpose of this chapter is to recommend sampling procedures for the excavation of soils from UST sites and free-product sampling procedures for spills or leaks that have occurred at UST sites. The objectives of the sampling are:

(1) To obtain soil, and water if present, from the surface and known depths in the vicinity of the UST excavation for evaluation of site characteristics.

(2) To detect the presence of any contaminants.

(3) To evaluate the potential for pollutant migration.

The contractor should be responsible for assessing specific situations for the most appropriate response. Upon removal of USTs, pools of free product may exist in the ground cavity. The origin of these pools is usually seepage from the tank or spills associated with removal. Free-product pools should be sampled to possibly determine the nature and source of these liquids. Guidance for preparation of sampling plans can be found in EM 200-1-3.

6-2. Field Screening for Soil Samples. An organic vapor analyzer may be used as a cost-effective screening device for soil samples. When this instrument is equipped with a sampling probe and a flame ionization detector (FID) or a photoionization detector (PID), it is capable of detecting volatile hydrocarbons in the 1 to 1,000 ppm range. The results obtained are not quantitative, however. The results from several soil samples are relative and will allow the sampling team to select samples that are the most contaminated with hydrocarbons. The presence of little or no organic vapor is possibly indicative of noncontaminated soils. The USACE may use FID/PID results as the criteria for deciding which soil samples should be analyzed by the more expensive gas chromatography (GC) techniques (Method 8021 or Modified 8015). Other screening methods such as immunoassay may also be used for soil tests.

a. Purpose. Field screening is done for a variety of reasons. The technique is frequently used to screen soil samples for measurable levels of volatile organics. For example, the results can be used to select the most contaminated sample from a soil boring for complete analysis by Method 8021. Field screening is often used as a predesign activity to construct an effective sampling plan. The FID/PID is also used during construction to delineate the extent of excavation.

b. Field Equipment. A pint jar with metal ring-type lid is frequently used for this screen. The sample is placed in the bottle and covered with aluminum foil. The ring lid secures the foil. An organic vapor

analyzer (such as the Century OVA) is used to measure volatile organics.

c. Instructions for Headspace Analysis by FID/PID. This procedure is used in categorizing soil based on the quantity of organic vapor present and may be modified slightly.

(1) Stabilize and calibrate the FID/PID. Follow the manufacturer's instructions. Some models are factory calibrated to methane and should not be recalibrated. Other models require the use of a calibration gas; follow the manufacturer's recommendations for calibration (called "spanning") of the instrument (see Chapter 11).

(2) Place soil from the soil sampling equipment into the jar. Cover with foil and secure ring cap. The pint jar should be at least 3/4 full.

(3) Place the jar in hot tap water (30 degrees C.) for 5 minutes. An alternate method is to place the jar on the dashboard of a vehicle with the defrost cycle on.

(4) Remove the jar from the water or dashboard.

(5) Immediately insert the sampling probe through the foil and into the headspace above the soil.

(6) Take the reading and record the value in the field logbook along with the other particulars of the sampling point.

(7) Verify that the FID/PID is reading background before exposing the probe to another sample.

6-3. Sampling. Guidance for soil and water sampling may be found in EM 200-1-3.

a. Soil Sampling. Conduct soil sampling at the ground surface, including the exposed walls and bottom of the excavation or within the mound of excavated soil. Surface soil sampling typically refers to samples collected between 0 and 300 mm (0 and 12 inches) from the surface. Surface soil sampling may be accomplished with a trowel, a push tube, a hand auger, or a backhoe. Soil samples may provide two types of soil contaminant representation: grab and composite. These samples may be collected in random locations from a grid pattern or in selected areas believed to be contaminated (as evidenced by staining or measurable volatile organic readings).

(1) A grab sample is a discrete aliquot representative of a specific location at a given point in time. The sample is collected at one time and at one particular sampling point and depth.

(2) A composite sample is a nondiscrete sample composed of more than one specific aliquot that may be collected at various sampling locations, depths, and/or different points in time. The aliquots are thoroughly mixed together, and the mixture homogenized.

b. Water Sampling. If water is present in the excavation, and has not been determined to be groundwater, completely evacuate and dispose of it in accordance with all applicable regulations. If within 24 hours, the water recharges into the excavation to a level sufficient for sample collection, collect a sediment-free sample as soon as practicable. However, if water exists in the excavation and site conditions warrant immediate backfilling (that is, collapsing side walls or other safety issues), collect a water sample. Water sampled directly from inside an excavation or from a soil boring is not necessarily representative of normal groundwater conditions and should not be evaluated as a groundwater sample. Such samples may, however, be used to document the existence of a release (ASTM E 1599).

c. Equipment. Surface soil and water sampling require limited equipment including the following:

- HNu or OVA or equivalent monitoring devices (Chapter 11).
- CGI (see Chapter 10).
- Backhoe.
- Hand auger.
- Stainless steel trowels.
- Push tube.
- Stainless steel knives and spoons.
- Stainless steel mixing bowls.
- Pond sampler.
- Sample containers (see requirements in Chapter 8).
- Decontamination equipment (see Chapter 9).
- Personal protective equipment (respirator, etc.).
- Tape measure.

d. Materials. Supplies required to perform soil sampling include the following:

- Preservation supplies (ice).
- Sample labels, custody seals, and chain-of-custody forms.
- Personal protective supplies (gloves, tyvek).
- Decontamination supplies (see Chapter 9).
- Logbooks.

e. Operations, Procedures, and Instructions.

(1) Notify and inform the selected analytical laboratory before sampling of the estimated number of samples to be collected, the analyses required. Special requirements, if any, and expected sample arrival date. This information should be in the project DQOs provided to the laboratory. In addition, many states have developed required sampling patterns for obtaining samples from excavations. Contact the state agency to determine any requirements.

(2) Discuss (as a field team) the Site Safety and Health Plan (SSHP) prior to initiating field activities. All monitoring and protective equipment should be checked thoroughly at this time. Personal protective equipment and health and safety standards are specified for each activity in the SSHP.

(3) Set up decontamination, sample preparation, and support area at a central location.

(a) Equipment Selection and Preparation. Decontaminate all equipment, samples, and tools that will come in contact with sample media. Record decontamination process in log book. All sampling equipment must be made of inert and nonreactive material (i.e., stainless steel, PTFE, glass), and if not disposable, must be decontaminated before and between sampling points. Disposable sampling equipment may be thrown in the trash if not contaminated or drummed up and disposed with the soil. The decontamination procedure may vary depending on site and contaminant conditions. Chapters 7 and 9 outline decontamination procedures.

(b) Carry sampling equipment to sample location. Be sure all equipment rests on plastic sheeting next to sample location. Utilize an HNu or Organic Vapor Analyzer (OVA) or similar instrument to detect any organic vapors being emitted during excavation and sampling and a Combustible Gas Indicator (CGI) to monitor oxygen levels.

(4) Sample Container Preparation. Prepare and label all sample containers to be collected that day (sample containers are discussed in Chapter 8). Label should identify sample location ID, sample ID, depth, analyte, date, time of sampling, and any preservatives added (preservatives are not usually required for soil samples although some jurisdictions may require them, especially for volatile analytes). Time of sampling and depth should be added after sample is collected.

(5) Selection of Sampling Location. Sampling locations and depths required within the excavation are often selected to obtain the most contaminated sample. Consult the Implementing Agency (IA) to determine sample locations and depths. Soil samples should be taken from the surface down to approximately 300 mm (12 inches) in depth. *Under no circumstances is anyone to enter a hole for the purpose of sampling*. Soil samples are to be taken from the bucket of the backhoe or other implement being used for excavation. Samples should be collected from the native soil, not any surrounding backfill. All backfill should be removed during soil excavation.

(a) Worst-case locations include:

- Areas around the tanks and piping locations that record the highest reading with the vapor monitoring equipment or that look stained or discolored.
- The lowest point of the tank cavity, if this can be determined, where the tank meets the piping.
- Beneath the fill lines. At least two surface soil samples–one from either end of each tank–should be collected when the tank(s) are removed.

(b) Samples collected may consist of random grid grab samples, random grid composite samples, composite or grab of stained soils, offsite clean soil, or grabs or composites from runoff areas. Consult the Implementing Agency for further guidance on excavation sampling as well as sampling from the mound of excavated soil.

(c) If possible, an offsite sample should also be collected to compare with the excavation samples. This "background" sample should be collected in an undisturbed area. This may be difficult to obtain in an industrialized area.

(6) Soil Sample Collection. Collect a sample using a stainless steel trowel or spoon, hand auger, or similar device.

(a) Collect samples for volatile organic analysis (VOA) first to minimize loss of the soil contaminants.

(b) Fill VOA containers directly from a trowel. Do not homogenize VOA samples.

(c) For samples subject to other than volatile analyses, place a sufficient amount of soil in a stainless steel mixing bowl or tray for homogenization. This includes composite samples. Prior to homogenization, remove all twigs, stones,

and other debris from the soil. With a stainless steel spoon, the sample is scraped from the sides, corners, and bottom of the tray; rolled to the middle of the tray; and initially mixed. The sample should then be quartered and moved to the four corners of the mixing vessel. Each quarter of the sample should be mixed individually, then rolled to the center of the container, and the entire sample mixed again.

(d) Since excavation pits should not be entered, samples should be collected by the use of a backhoe. The backhoe is to scoop a bucket full of soil from the desired sampling location. The sampler then collects a sample from the center of the bucket.

(e) Local requirements may indicate the need to sample groundwater if present in the excavation. If this is required, sampling should be accomplished without entering the excavation. A long handled dipper should be used to collect the water sample.

(7) Sample Packaging. Place the sample in a sample container appropriate for the type of analysis to be performed. Container requirements are described in Chapter 8 and EM 200-1-3. The latest version of SW-846, referenced in Chapter 8, should be used to meet analytical requirements.

(a) Wipe the outside of the sample container to prevent the spread of contamination. The sample container must not contain any headspace. This no headspace requirement applies to samples collected for volatile organic analyses only. Log all samples in field logbook or on field sheets; include sample location, sample ID number, analytes, date, time, and signatures of samplers.

(b) As the samples are collected, place them in a Ziplock® bag in an ice chest containing an ice substitute or regular ice that has been double wrapped in plastic. Samples are kept on ice to maintain their integrity. Each sample should be individually wrapped to prevent possible cross-contamination. Highly contaminated soil samples must be placed in metal cans (see Chapter 8). Sample temperature should be maintained at 4 ± 2 degrees C.

(8) Decontamination. Refer to Chapter 9 for more information on decontamination procedures.

(9) Sample Shipping. Refer to Chapter 8 for shipping requirements.

6-4. Free-Product Sampling. This section applies to the sampling of residual free-product pools in an UST excavation. Limit sampling to liquid free product. Saturated soils or sludges should be sampled according to guidelines described previously. Further guidance on the characterization of free product may be found in EPA/510/R-96/001.

a. Precautions. Specific hazards in the excavation area include the danger of subsidence both in the pit and of the sidewalls. It is recommended that personnel never enter an excavation pit. Extreme caution also must be exercised when approaching a pit to sample from above, as sidewall subsidence occurs frequently and with no warning.

b. Equipment. Free-product sampling is an activity that requires limited equipment, including the following:

- HNu, OVA, or equivalent monitoring devices (see Chapter 11).
- Backhoe (if needed).
- Liquid sampling equipment.
- Narrow-mouthed glass bottles.
- Sample containers (see requirements in Chapter 8).
- Decontamination equipment (see Chapter 9).
- Personal protective equipment (respirator, etc.).
- Tape measure.

c. Materials. In addition to the equipment listed in the preceding section, the supplies required to perform free-product sampling include the following:

- Sample containers.
- Preservative supplies (ice).
- Sample labels, custody seals, and chain-of-custody forms.
- Personal protective supplies (gloves, Tyvek®).
- Decontamination supplies (see Chapter 9).
- Logbook.

d. Operations, Procedures, and Instructions.

(1) Notify the selected analytical laboratory before sampling of the estimated number of samples to be collected, the analyses that will be required, special requirements (if any) and when it should expect to receive the samples.

(2) Discuss (as a field team) the SSHP and the procedures outlined by it prior to initiating field activities. All monitoring and protective equipment should be checked thoroughly at this time. Personal protective equipment and safety and health standards are specified for each activity in the SSHP.

(3) Set up decontamination, sample preparation, and support area at a central location.

(4) Equipment Selection and Preparation. Decontaminate all equipment, samples, and tools that will come in contact with sample media. Record the decontamination process in logbook. All sampling equipment must be made of inert and nonreactive material (i.e., stainless steel, PTFE, glass), and if not disposable, must be decontaminated before and between sampling points. The decontamination procedure may vary depending on site and contaminant conditions. Chapters 7 and 9 outline decontamination procedures.

(5) Carry sampling equipment to sample location. Be sure all equipment rests on plastic sheeting next to sample location. Utilize an HNu, OVA, or similar instrument to detect any organic vapors being emitted during excavation and sampling and a CGI to monitor oxygen levels.

(6) Sample Container Preparation. Prepare and label all sample containers (sample containers are discussed in Chapter 8). Label should identify sample location ID, sample ID, depth, analyte, date, time of sampling, and any preservatives added.

(7) Selection of Sampling Location. Sampling locations are often selected based on equipment availability and proximity to the sides of the excavation pit. Samples should be taken from each pool occurring in an excavation pit. If only one large pool is present, at least two samples should be taken from separate locations within that pool.

(8) Sample Collection.

(a) Tools: Collect samples using clean, stainless steel/glass/aluminum combination subsurface grab or COLIWASA samplers. Equipment instructions are supplied by the manufacturers.

(b) Containers: Samples collected with these types of equipment must be transferred to sample bottles for shipment. Metal containers with inner cap seals are preferable, but glass may also be used.

(c) Methods: When necessary, a backhoe may be used to transport a pool and surrounding soil to the surface for collection of the free-product sample. Another technique is to pump out the free product from the excavation into the sample jars using a peristaltic pump. After water separation, samples

should be transferred to metal or glass containers with inner cap seals for transport.

(d) Separating free product: Often, free product will occur in pools mixed with water from precipitation or ground seepage. In these cases, attempts should be made in the field to separate free product from the water to obtain an adequate quantity for analysis. Generally, 250 mL (8oz) of product is a sufficient amount for most analyses required. To achieve separation, liquid in a narrow-mouthed glass bottle must be allowed to settle until the water has clearly dropped to the bottom section. Cap the opening and tilt the bottle sideways until the floating phase portion floats clear of the mouth. Much of the water can then be drained away by simply uncapping the opening while tilting the bottle. Repeat this procedure until the desired amount of free-product sample is recovered. The residual water must be disposed of according to individual facility guidelines.

(9) Sample Packaging. Place the sample in a sample container appropriate for the type of analysis to be performed. Container requirements are described in Chapter 8. The latest version of SW-846, referenced in Chapter 8, should be used to meet analytical requirements. Wipe the outside of the sample container to prevent the spread of contamination. The sample container must not contain any headspace. This applies to the collection of organic samples for VOCs only. Log all samples in the logbook; include sample location, sample ID number, analytes, date, time, and signatures of samplers.

(10) Chain-of-Custody. Chain-of-custody procedures are described in Chapter 8.

(11) Decontamination. Decontaminate sampling equipment before and after sampling. First clean equipment of gross contamination then wash it with Alconox soap and distilled water. Rinse it using deionized water and allow it to dry. Refer to Chapters 7 and 9 for more information on decontamination procedures.

(12) Sample Shipping. Ship samples via an overnight carrier and pack according to the DOT or International Air Transport Association (IATA) procedures for the transport of samples. Refer to Chapter 8 for more information on sample shipment.

6-5. Waste Disposal. Waste that is generated during sampling in and around the UST(s) must be containerized and labeled according to its contents. The waste must be packaged in DOT-approved containers for subsequent treatment or disposal as outlined in Chapter 5.

6-6. Reporting and Documentation Requirement.

a. Use a field logbook to record:

- All activities performed, including names of samplers.
- Location and depths of samples.
- Dates and times when these activities were performed.
- Personnel contacted.
- Field conditions.
- Times of site arrival and departure.
- Soil color and texture.
- Instrument calibration information.
- Any unusual circumstances. Information should be factual, as it will be required for preparation of the Closure Report discussed in Chapter 1. If logbook corrections are necessary, draw a single line through the original entry, write the corrected entry alongside it, and initial and date the correction.

b. Information not recorded in the logbook must be recorded on field forms. In either case the following information must be recorded:

- Site identification.
- Type of samples.
- Sample identification numbers.
- Date and time collected.
- Collector's name.
- Field observations.
- Measurements.

Record safety and health monitoring information in the field logbook or on field data forms. Record everything so that events can be reconstructed at a later date. This logbook, combined with copies of the custody forms submitted to the laboratory with the samples, will serve to document sampling activities.

c. Photographs are suggested. If photos are taken they need to be labeled with the date, name of photographer, roll number, site name, camera type and lens size, sequential number of photo, and general direction. See EM 200-1-3 for additional information. Telephoto or wide-angle shots cannot be used in enforcement proceedings because they can distort the view.

6-7. Department of Transportation Sample Shipping Requirements

a. Special consideration must be given to shipment of samples that are regulated as hazardous materials by the Department of Transportation. The following types of samples commonly encountered during UST removal activities are potentially DOT-regulated hazardous materials:

- Tank contents.
- Saturated soil samples.
- Free product samples.
- Water samples preserved with acid.
- Decontamination fluids.
- Sample preservatives such as methanol.

b. Definition of DOT Hazardous Material. Samples generated during UST removal activities are regulated by DOT as hazardous materials most commonly because they either meet the definition of a combustible liquid, a flammable liquid, a corrosive liquid, or because they are RCRA hazardous wastes. For example, samples of tank contents, free-product, or saturated soils having a flashpoint between 60.5°C (141°F) and 93°C (200°F) are regulated as combustible liquids. Materials having a flashpoint of less than 60.5 degrees C (141 degrees F) are regulated as flammable liquids. Water samples, which have been acidified for preservation purposes, may meet the definition of a DOT corrosive liquid. Spent decontamination fluids utilizing nitric acid, methanol, or hexane may be regulated by DOT because they are RCRA hazardous wastes. See Chapter 8 for sample packaging, marking, and shipping requirements. See 49 CFR, Subchapter C for details on Hazardous Materials Regulations.