STANDARD OPERATING PROCEDURE

TWO

SURFACE AND SUBSURFACE SOIL SAMPLING

Version 2.0 (3/18/2003)

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1.0 SURFACE SOIL SAMPLING

1.1 Equipment

Hand Augers (multiple size stainless steel buckets)
Power Auger (if required for 2+ foot depth)
Stainless steel trowels
Shovels (to remove gravel and debris)
Plastic sheeting and/or aluminum foil
Decontamination equipment as required
Hand tools (for equipment or other needs)
Camera and film
Watch
Labels
Cooler
Field log book
Soils Data form, Daily QC form, etc.
Site Safety and Health Plan
Appropriate sample bottles
Plastic bags (sealable)
Compass
200 ft tape

1.2 Procedures

Surficial soil samples shall be collected as follows. Vegetation at the sample location is removed by cutting or scraping away with a stainless steel trowel. While drilling the hole, remove gravel or other debris before obtaining the sample. Advance the auger or trowel to a depth of approximately six inches and then removed from the hole. Using pre-cleaned stainless steel equipment, extrude the soil directly into the sampling containers. If dedicated sampling equipment is not used, sampling equipment must be decontaminated before collecting another sample. See SOP 8 for details on Sampling Equipment Decontamination.

Samples for VOC analysis must be collected first. Fill VOC sample containers as full as possible to minimize headspace losses. Fill separate containers with a sufficient quantity of soil for analyses of other required parameters. Immediately place the samples on ice at 4^0 C. Enter all data into a permanent field log book. Describe soil samples as indicated below in Section 3.0, Lithologic Logging. See SOP 7 for details on Sample Preservation, Storage, Handling and Documentation.

2.0 SUBSURFACE SOIL SAMPLING

2.1 Equipment

Drill rig and equipment
Stainless steel split spoon
Shelby tubes
Sample containers - chemical and geotechnical analysis
HNu/photoionization detector
Decontamination equipment (as necessary)
Indelible pens
Boring log form, etc.
Cooler and ice
Ziploc® baggies
Plastic sheeting and/or aluminum foil
Compass
200 ft tape measure
Watch
Camera and film

2.2 Methods

Subsurface soil samples can be obtained by several methods depending on the type of samples required and the soil conditions. The usual method is to collect samples using a 2.5 to 3-inch diameter, 2.5 to 5 ft. long, continuous-drive, split-barrel sampler, which is advanced with the augers during drilling. This technique has several advantages, the primary one being good sample recovery over a large interval, and accuracy in that cuttings are less likely to be included in the sample than in other methods. Disturbance to the soil is minimal so that subtle structures such as laminations or voids are less likely to be destroyed and geologic contacts are more readily observed and logged. In loose soil and/or where large debris or cobbles impede the progress of the sampler, sample recovery with a continuous sampler may be poor and a different sampling technique may be used.

When continuous drive sampling is not practical, a 24-inch stainless steel split-barrel sampler can be driven a total of 24 inches into the undisturbed materials by dropping a 140-lb weight 30 inches. A 3-inch diameter split spoon may be used to increase the chances of sufficient volume recovery for sampling purposes. Record in 6-inch increments the number of blows required to drive the sampler. Indicate these data along with the amount of sample recovery in the drilling log. In the event of poor sample recovery, the consultant may elect to offset within 10 feet to obtain the missing sample interval. Note on the boring log if the offset boring is unsuccessful.

At times where samples are required from shallow depths (less than 10 feet) it may be more feasible to collect samples using a hand auger. In this case a clean, 4-inch diameter hand auger shall be advanced to the top of the desired sample interval. Collect the sample with a stainless steel trowel or sampling trier and place in a laboratory-cleaned glass container and labeled accordingly. Samples for VOC analysis must be collected first to minimize potential loss of volatiles. To minimize the potential for cross-contamination, use dedicated stainless steel trowels or sampling triers at each location. Between each use, decontaminate sampling equipment in accordance with SOP 8.

2.3 Sample Collection Procedures

2.3.1 Field screening samples

Soil samples should be collected for field screening every two and one-half feet, or at zones of obvious contamination, and at the water table. Perform the field screening in accordance with the SOP 1. Note the field screening results on the boring log.

2.3.2 Laboratory Samples

After collecting the field screening samples, collect soil samples for laboratory analysis. Samples for VOC analysis must be collected first to minimize potential loss of volatiles. Place VOC soil samples in a suitable container. Fill sample containers as full as possible to prevent headspace degradation of VOC. Properly label the container and immediately place the sample into coolers packed with ice to maintain a temperature of less than 4^0 C. When the headspace screening is complete for each boring, the laboratory sample that corresponds to the highest headspace sample is selected for laboratory analysis. If field screening showed no elevated headspace readings, the sample collected from at or just above the water table should be submitted for analysis. In some instances, it may be necessary to submit the samples from both the water table

and the highest headspace reading. The location of samples submitted for laboratory analysis should be selected to provide the information necessary to evaluate the exposure pathways.

Sample containers for VOC analysis should be stored together in coolers separate from containers for other analytical parameters. See SOP 7 for details on sample preservation, storage, handling, and documentation.

3.0 LITHOLOGIC LOGGING

The lithology of the sample along with any other pertinent information shall be logged by an environmental consultant. Particular consideration should be given to grain-size distribution (relative percentages of different size materials), presence of lamination or layering and soil consistency. Estimate the mineralogy for coarser grained material. Classify soil samples and enter onto the boring log using the Unified Soil Classification System (USCS), following methods outlined in ASTM standard D 2488 (American Society for Testing and Materials, 1984b). Prepare the final boring log using observations of the driller and on-site consultant and from laboratory analysis.