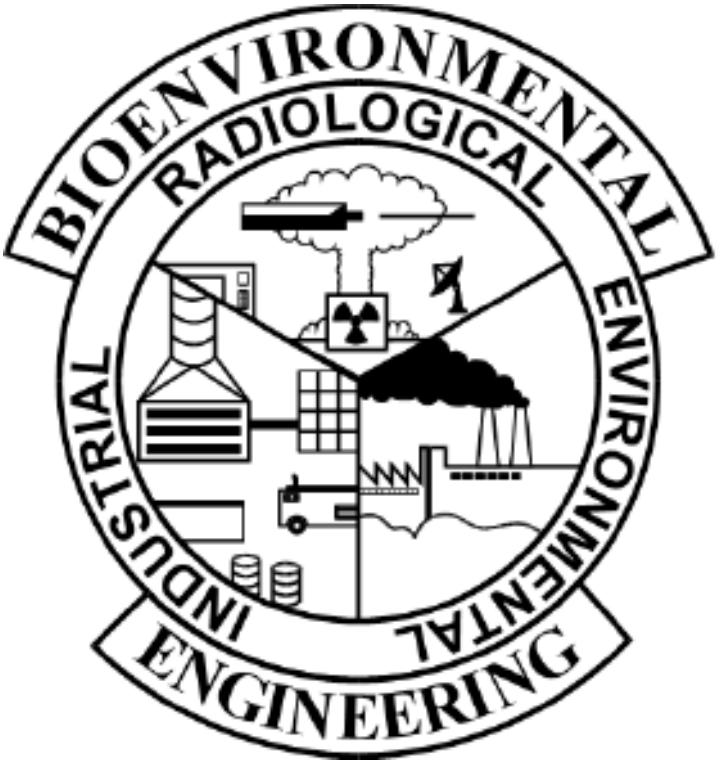
DEPARTMENT OF THE AIR FORCE
Headquarters US Air Force
Washington, DC 20330-1030

QTP 4B071-6
2 April 2015
Certified Current 14 July 2022

AIR FORCE SPECIALTY CODE 4B071
BIOENVIRONMENTAL ENGINEERING

Soil/Solid Sampling Strategy



QUALIFICATION TRAINING PACKAGE

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STS Line Item 4.5.3.3(a): Collect soil / solid samples (Auger)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	U.S. EPA Environmental Response Team (ERT)/REAC SOP 2012, *Soil Sampling*
Additional Supporting References:	• U.S. EPA Environmental Response Team (ERT)/REAC SOP 2001, *General Field Sampling Guidelines* • ASTM D 4700, *Standard Guide for Soil Sampling from the Vadose Zone* • ASTM D 1452-80, Standard Practice for Soil Investigation and Sampling by Auger Borings
CDC Reference:	4B051
Training Support Material:	• Auger tube sampler • PPE (apron, gloves, and eye protection) • Plastic sheeting or tarp • Sample container(s) • Sample labels • Decontamination supplies
Specific Techniques:	Conduct hands-on training and evaluation. Consider training related core task items with this item: Journeyman Training Module 4.5.3.2, *Determine or establish soil/solid sampling strategies*, and Journeyman Training Module 4.5.1.3, *Prepare and/or preserve samples for shipment*.
Criterion Objective:	Given the appropriate sampling equipment, collect a soil sample successfully completing all checklist items with NO trainer assistance.

Notes:

The 4.5.3.3 series of Craftsman Training Modules [(Spade, scoop or trowel)(Trier sampler)(Veihmeyer tube sampler)(Auger)(Chip/Core sample)] convey task steps for individual sample collection techniques that may or may not be used by all BE flights. Trainers should select and focus training only to the modules that support specific training requirements at their installation. Refer to the flight Master Training Plan for specific training requirements.

Ensure safety measures are used when collecting samples. Assess all hazards associated with the situation (i.e. hazardous atmosphere, hazardous conditions, etc.) and don appropriate PPE.

Augers screw into the soil and churn the soil to be sampled. Hand augers can reach depths of up to 4 feet, and gas powered augers can reach up to 12 feet.

TASK STEPS

1. Identify sample location and requirements.[1]
2. Prepare sample containers per the servicing laboratory or appropriate guidance, if necessary.
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary.
4. Spread plastic sheeting on the ground at each sampling location to help prevent cross-contaminating sampling equipment, contaminating the surrounding area and facilitate back-filling the hole.
5. Assemble the auger per the manufacturer's instructions, if necessary.
6. Begin drilling, periodically removing and depositing accumulated soil onto the plastic sheet.
7. Remove the auger from the hole slowly and carefully after reaching the desired depth.
8. Collect a sufficient volume of sample based on the type(s) of analyses to be performed.
9. Place the sample into the appropriate container.[2]
10. Cap and label the container properly.
11. Initiate sample preservation methods, as appropriate.
12. Clean/decontaminate sampling equipment between samples and after use.
13. Record data in OEHMIS (DOEHRS or equivalent), as appropriate.

LOCAL REQUIREMENTS:

NOTES:

1. The sample strategy, if available, should address these issues such as where, how much, equipment needed, etc.

2. Collect an adequate volume of sample based on the type(s) of analyses to be performed. If composite samples are to be collected, place sample in a stainless steel bowl for mixing, continue sampling and mix additional samples thoroughly with a stainless steel laboratory spoon or equivalent, and then transfer into the appropriate container.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.3(a): Collect soil / solid samples (Auger)

1. Why would an auger *not* be the sampler of choice for soil that is possibly contaminated with volatile organic compounds (VOCs)?
2. If the site of a soil collection sample is clay-like, which type of auger is best?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.3(a): Collect soil / solid samples (Auger)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify sample location and requirements?			
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary?			
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary?			
4. Spread plastic sheeting on the ground at each sampling location to help prevent cross-contaminating sampling equipment, contaminating the surrounding area and facilitate back-filling the hole?			
5. Assemble the auger per the manufacturer's instructions, if necessary?			
6. Begin drilling, periodically removing and depositing accumulated soil onto the plastic sheet?			
7. Remove the auger from the hole slowly and carefully after reaching the desired depth?			
8. Collect a sufficient volume of sample based on the type(s) of analyses to be performed?			
9. Place the sample into the appropriate container?			
10. Cap and label the container properly?			
11. Initiate sample preservation methods, as appropriate?			
12. Clean/decontaminate sampling equipment between samples and after use?			
13. Record data in OEHMIS (DOEHRS or equivalent), as appropriate?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT) TRAINER NAME (PRINT)

ANSWERS

1. Why would an auger *not* be the sampler of choice for soil that is possibly contaminated with volatile organic compounds (VOCs)?

   A: Augers churn the soil; therefore, any VOCs present would rapidly release into the air.

   (Source: 4B051 CDC)

2. If the site of a soil collection sample is clay-like, which type of auger is best?

   A: The screw auger bores holes in the soil, and the sample is then collected with an alternate device such as a small hand shovel. Bucket augers are used for loose soil; therefore, the screw auger is the best choice.

   (Source: 4B051 CDC)

STS Line Item 4.5.3.3(b) - Collect soil / solid samples (Chip/Core sample)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	U.S. EPA Environmental Response Team (ERT)/REAC SOP #2011, *Chip, Wipe, And Sweep Sampling* (available at http://www.epaosc.org/site/doc_list.aspx?site_id=2107)
Additional Supporting References:	None
CDC Reference:	None
Training Support Material:	• Hammer • Chisel and tongs • PPE (gloves and eye protection) • Sample container(s) • Sample labels • Decontamination supplies
Specific Techniques:	Conduct hands-on training and evaluation. Consider training related core task items with this item: Journeyman Training Module 4.5.3.2, *Determine or establish soil/solid sampling strategies*, and Journeyman Training Module 4.5.1.3, *Prepare and/or preserve samples for shipment.*
Criterion Objective:	Given the appropriate sampling equipment, collect a solid sample successfully completing all checklist items with NO trainer assistance.

Notes:

The 4.5.3.3 series Training Modules [(Spade, scoop or trowel)(Trier sampler)(Veihmeyer tube sampler)(Auger)(Chip/Core sample)] convey task steps for individual sample collection techniques that may or may not be used by BE flights. Trainers should select and focus training only to the modules that support specific training requirements at their installation. Refer to the flight Master Training Plan for specific training requirements.

Ensure safety measures are used when collecting samples. Assess all hazards associated with the situation (i.e. hazardous atmosphere, hazardous conditions, etc.) and don appropriate PPE.

Chip sampling is appropriate for porous surfaces and is generally accomplished with hammer and chisel. The sampling device should be laboratory cleaned, autoclaved, and wrapped in clean aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

TASK STEPS

1. Identify sample location and requirements.[1]
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary.
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary.
4. Don disposable gloves.
5. Chip the sample area horizontally and vertically to an even depth.
6. Collect an adequate volume of sample based on the type(s) of analyses to be performed.
7. Place the sample into the appropriate container.
8. Cap and label the container.
9. Record all pertinent data in the site logbook and on field data sheets.
10. Complete the sampling analysis request form.
11. Complete the chain of custody record.
12. Initiate sample preservation methods, as appropriate.
13. Clean/decontaminate sampling equipment between samples and after use.
14. Record data in OEHMIS (DOEHRS or equivalent), if applicable.

LOCAL REQUIREMENTS:

NOTES:

2. The sample strategy, if available, should address these issues such as where, how much, equipment needed, etc.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.3(b): Collect soil / solid samples (Chip/Core sample)

1. Why is the sampling device used in chip sampling cleaned and wrapped in clean, autoclaved aluminum foil after use?
2. What type of surface is appropriately sampled using the chip sample method?
3. Reagents are not required for preservation of chip sample. True or false?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.3(b): Collect soil / solid samples (Chip/Core sample)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify sample location and requirements?			
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary?			
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary?			
4. Don disposable gloves?			
5. Chip the sample area horizontally and vertically to an even depth?			
6. Collect an adequate volume of sample based on the type(s) of analyses to be performed?			
7. Place the sample into the appropriate container?			
8. Cap and label the container?			
9. Record all pertinent data in the site logbook and on field data sheets?			
10. Complete the sampling analysis request form?			
11. Complete the chain of custody record?			
12. Initiate sample preservation methods, as appropriate?			
13. Clean/decontaminate sampling equipment between samples and after use?			
14. Record data in OEHMIS (DOEHRS or equivalent), if applicable?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT) TRAINER NAME (PRINT)

ANSWERS

1. Why is the sampling device used in chip sampling cleaned and wrapped in clean, autoclaved aluminum foil after use?

   A: To prevent cross contamination in the collection of an ensuing sample.

   (Source: CDC 4B051 and U.S. EPA Environmental Response Team (ERT)/REAC SOP #2011, Chip, Wipe, And Sweep Sampling, Section 2.0)

2. What type of surface is appropriately sampled using the chip sample method?

   A: Chip sampling is appropriate for porous surfaces.

   (Source: U.S. EPA Environmental Response Team (ERT)/REAC SOP #2011, Chip, Wipe, And Sweep Sampling, Section 2.0)

3. Reagents are not required for preservation of chip sample. True or false?

   A: True

   (Source: U.S. EPA Environmental Response Team (ERT)/REAC SOP #2011, Chip, Wipe, And Sweep Sampling, Section 6.0)

STS Line Item 4.5.3.3(c): Collect soil / solid samples (Spade, scoop or trowel)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	U.S. EPA Environmental Response Team (ERT)/REAC SOP #2012, *Soil Sampling* (available at: http://www.epaosc.org/site/doc_list.aspx?site_id=2107)
Additional Supporting References:	• U.S. EPA Environmental Response Team (ERT)/REAC SOP 2001, *General Field Sampling Guidelines* • ASTM D 4700, *Standard Guide for Soil Sampling from the Vadose Zone* • ASTM D 5633, *Standard Practice for Sampling with a Scoop*
CDC Reference:	4B051
Training Support Material:	• Spade, scoop, or trowel • Shovel • PPE (apron, gloves, and eye protection) • Sample container(s) • Sample labels • Decontamination supplies
Specific Techniques:	Conduct hands-on training and evaluation. Consider training related core task items with this item: Journeyman Training Module 4.5.3.2, *Determine or establish soil/solid sampling strategies* and Journeyman Training Module 4.5.1.2, *Prepare and/or preserve samples for shipment.*
Criterion Objective:	Given the appropriate sampling equipment, collect a soil sample successfully completing all checklist items with NO trainer assistance.

Notes:

The 4.5.3.3 series of Craftsman Training Modules [(Spade, scoop or trowel)(Trier sampler)(Veihmeyer tube sampler)(Auger)(Chip/Core sample)] convey task steps for individual sample collection techniques that may or may not be used by BE flights. Trainers should select and focus training only to the modules that support specific training requirements at their installation. Refer to the flight Master Training Plan for specific training requirements.

Ensure safety measures are used when collecting samples. Assess all hazards associated with the situation (i.e. hazardous atmosphere, hazardous conditions, etc.) and don appropriate PPE.

The collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is used to collect the sample. Do not use plastic utensils when sampling for semivolatile compounds.

TASK STEPS

1. Identify the sample location and requirements.[1]
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary.
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary.
4. Clear area of extraneous material (leaves, twigs).
5. Carefully remove the top layer of soil to the desired sample depth with a clean device.
6. Remove a thin layer of soil from the area which came in contact with the spade using a clean stainless steel scoop, spoon, or trowel.
7. Insert scoop or trowel into material and extract sample.[2]
8. Place the sample into the appropriate container.
9. Cap and label the container properly.
10. Initiate sample preservation methods, as appropriate.
11. Complete the sampling preventing, minimizing and limiting cross contamination of samples.
12. Clean/decontaminate sampling equipment between samples and after use.
13. Record data in OEHMIS (DOEHRS or equivalent), as appropriate.

LOCAL REQUIREMENTS:

NOTES:

3. The sample strategy, if available, should address these issues such as where, how much, equipment needed, etc.

2. Collect an adequate volume of sample based on the type(s) of analyses to be performed. If composite samples are to be collected, place sample in a stainless steel bowl for mixing, continue sampling and mix additional samples thoroughly with a stainless steel laboratory spoon or equivalent, and then transfer into the appropriate container.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.3(c): Collect soil / solid samples (Spade, scoop or trowel)

1. List criteria for appropriate selection of a sampling device:
2. If soil contamination at the site is obvious, what is the protocol for collecting samples?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.3(c): Collect soil / solid samples (Spade, scoop or trowel)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify sample location and requirements?			
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary?			
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary?			
4. Clear area of extraneous material (leaves, twigs)?			
5. Carefully remove the top layer of soil to the desired sample depth with a clean device?			
6. Remove a thin layer of soil from the area which came in contact with the spade using a clean stainless steel scoop, spoon, or trowel?			
7. Insert scoop or trowel into material and extract sample?			
8. Place the sample into the approprate container?			
9. Cap and label the container properly?			
10. Initiate sample preservation methods, as approprate?			
11. Complete the sampling preventing, minimizing and limiting cross contamination of samples?			
12. Clean/decontaminate sampling equipment between samples and after use?			
13. Record data in OEHMIS (DOEHRS or equivalent), as appropriate?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT) TRAINER NAME (PRINT)

ANSWERS

1. List criteria for appropriate selection of a sampling device:

   A: How far you need to go down into the soil, the type of soil being sampled, the analytes of concern, and the type of samples you will be collecting (disturbed or undisturbed).

   (Source: 4B051 CDC)

2. If soil contamination at the site is obvious, what is the protocol for collecting samples?

   A: Collect samples from the least contaminated areas first then work to the most contaminated areas.

   (Source: 4B051 CDC)

STS Line Item 4.5.3.3(d): Collect soil / solid samples (Trier sampler)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	U.S. EPA Environmental Response Team (ERT)/REAC SOP #2012, *Soil Sampling* (available at: http://www.epaosc.org/site/doc_list.aspx?site_id=2107)
Additional Supporting References:	• U.S. EPA Environmental Response Team (ERT)/REAC SOP 2001, *General Field Sampling Guidelines* • ASTM D 4700, *Standard Guide for Soil Sampling from the Vadose Zone* • ASTM D 5452, *Standard Practice for Sampling Using a Trier Sampler*
CDC Reference:	4B051
Training Support Material:	• Trier sampler • PPE (apron, gloves, and eye protection) • Sample container(s) • Sample labels • Decontamination supplies
Specific Techniques:	Conduct hands-on training and evaluation. Consider training related core task items with this item: Journeyman Training Module 4.5.3.2, *Determine or establish soil/solid sampling strategies*, and Journeyman Training Module 4.5.1.3, *Prepare and/or preserve samples for shipment*.
Criterion Objective:	Given the appropriate sampling equipment, collect a soil sample successfully completing all checklist items with NO trainer assistance.

Notes:

The 4.5.3.3 series of Craftsman Training Modules [(Spade, scoop or trowel)(Trier sampler)(Veihmeyer tube sampler)(Auger)(Chip/Core sample)] convey task steps for individual sample collection techniques that may or may not be used by all BE flights. Trainers should select and focus training only to the modules that support specific training requirements at their installation. Refer to the flight Master Training Plan for specific training requirements.

Ensure safety measures are used when collecting samples. Assess all hazards associated with the situation (i.e. hazardous atmosphere, hazardous conditions, etc.) and don appropriate PPE.

A trier sampler is a narrow tube (with a T-handle) that is open on one side and is used primarily for sampling of loose soil on the surface or just under the surface. It is not recommended for compacted soil, clay or rocky soil. To use the trier, you simply drive the sampler into the soil and scoop up the sample.

TASK STEPS

1. Identify the sample location and requirements.[1]
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary.
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary.
4. Insert the trier into the material to be sampled at a 0^o to 45^o angle from horizontal.
5. Rotate the trier once or twice to cut a core of material.
6. Slowly withdraw the trier, making sure that the slot is facing upward.
7. Place the sample into the appropriate container.[2]
8. Cap and label the container properly.
9. Initiate sample preservation methods, as appropriate.
10. Complete the sampling preventing, minimizing and limiting cross contamination of samples.
11. Clean/decontaminate sampling equipment between samples and after use.
12. Record data in OEHMIS, as appropriate.

LOCAL REQUIREMENTS:

NOTES:

4. The sample strategy, if available, should address these issues such as where, how much, equipment needed, etc.

2. Collect an adequate volume of sample based on the type(s) of analyses to be performed. If composite samples are to be collected, place sample in a stainless steel bowl for mixing, continue sampling and mix additional samples thoroughly with a stainless steel laboratory spoon or equivalent, and then transfer into the appropriate container.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.3(d): Collect soil / solid samples (Trier sampler)

1. When sampling with a trier, the trier is inserted at what angle?
2. Under what circumstances would a trier sampler be recommended?
3. Why is a trier sampler not recommended for rocky or clay soil?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.3(d): Collect soil / solid samples (Trier sampler)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify the sample location and requirements?			
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary?			
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary?			
4. Insert the trier into the material to be sampled at a 0° to 45° angle from horizontal?			
5. Rotate the trier once or twice to cut a core of material?			
6. Slowly withdraw the trier, making sure that the slot is facing upward?			
7. Place the sample into the appropriate container?			
8. Cap and label the container properly?			
9. Initiate sample preservation methods, as approprate?			
10. Complete the sampling preventing, minimizing and limiting cross contamination of samples?			
11. Clean/decontaminate sampling equipment between samples and after use?			
12. Record data in OEHMIS (DOEHRS or equivalent), as appropriate?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT) TRAINER NAME (PRINT)

ANSWERS

1. When sampling with a trier, the trier is inserted at what angle?

   A: 0 to 45° degrees

   (Source: ASTM D 4700, Standard Guide for Soil Sampling from the Vadose Zone, para 7.2.3, SOP #2012)

2. Under what circumstances would a trier sampler be recommended?

   A: Sampling loose soil on the surface or just under the surface.

   (Source: 4B051 CDC)

3. Why is a trier sampler not recommended for rocky or clay soil?

   A: It is long and narrow and could bend easily in rocky or clay soil.

   (Source: 4B051 CDC)

STS Line Item 4.5.3.3(e): Collect soil / solid samples (Veihmeyer tube sampler)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	None
Training References:	• U.S. EPA Environmental Response Team (ERT)/REAC SOP 2001, *General Field Sampling Guidelines*.
Additional Supporting References:	• ASTM D 4700, *Standard Guide for Soil Sampling from the Vadose Zone* • Soil Science: February 1929 – Volume 27 – Issue 2 – pp. 147-152: *"http://journals.lww.com/soilsci/Citation/1929/02000/An_Improved_Soil_Sampling_Tube.9.aspx*
CDC Reference:	4B051
Training Support Material:	• Veihmeyer tube sampler • PPE (apron, gloves, and eye protection) • Sample container(s) • Sample labels • Decontamination supplies
Specific Techniques:	Conduct hands-on training and evaluation. Consider training related core task items with this item: Journeyman Training Module 4.5.3.2, *Determine or establish soil/solid sampling strategies*, and Journeyman Training Module 4.5.1.3, *Prepare and/or preserve samples for shipment.*
Criterion Objective:	Given the appropriate sampling equipment, collect a soil sample successfully completing all checklist items with NO trainer assistance.

Notes:

The 4.5.3.3 series of Craftsman Training Modules [(Spade, scoop or trowel)(Trier sampler)(Veihmeyer tube sampler)(Auger)(Chip/Core sample)] convey task steps for individual sample collection techniques that may or may not be used by all BE flights. Trainers should select and focus training only to the modules that support specific training requirements at their installation. Refer to the flight Master Training Plan for specific training requirements.

Ensure safety measures are used when collecting samples. Assess all hazards associated with the situation (i.e. hazardous atmosphere, hazardous conditions, etc.) and don appropriate PPE.

The Veihmeyer is a good core sampler for most types of soil and can reach depths of up to 10 feet. It is the best sampler for undisturbed soil samples taken at depths greater than 1 foot. Its major limitation is that it cannot penetrate stony or rocky soil. The Veihmeyer sampler is used by driving the solid shaft to the desired sampling depth then driving a tube into the soil at the desired depth to collect the sample.

TASK STEPS

1. Identify the sample location and requirements.[1]
2. Prepare sample containers per the servicing laboratory or appropriate guidance, if necessary.
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary.
4. Assemble the sampler by screwing in the tip and the drive head on the sampling tube.
5. Insert the tapered handle (drive guide) of the drive hammer through the drive head.
6. Place the sampler in a perpendicular position on the material to be sampled.
7. Drive the sampler into the material to the desired sampling depth .
8. Record the length of the tube that penetrated into the media.
9. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head.
10. Rotate the sampler at least two revolutions to shear off the sample at the bottom.
11. Lower the sampler handle (hammer) until it just clears the two earlike protrusions on the drive head and rotate about 90º.
12. Collect a sufficient volume of sample based on the type(s) of analyses to be performed?
13. Withdraw the sampler from the material by pulling the handle (hammer) upward.
14. Dislodge the hammer from the sampler.
15. Turn the sampler tube upside down, tap the head gently against the hammer and carefully recover the sample from the tube.
16. Place the sample into the appropriate container.[2]
17. Cap and label the container.
18. Initiate sample preservation methods, as appropriate.
19. Complete the sampling preventing, minimizing and limiting cross contamination of samples.
20. Clean/decontaminate sampling equipment between samples and after use.
21. Record data in OEHMIS (DOEHRS or equivalent), if applicable.

LOCAL REQUIREMENTS:

NOTES:

5. The sample strategy, if available, should address these issues such as where, how much, equipment needed, etc.

2. Collect an adequate volume of sample based on the type(s) of analyses to be performed. If composite samples are to be collected, place sample in a stainless steel bowl for mixing, continue sampling and mix additional samples thoroughly with a stainless steel laboratory spoon or equivalent, and then transfer into the appropriate container.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.3(e): Collect soil / solid samples (Veihmeyer tube sampler)

1. Why is a tube sampler such as the Veihmeyer a good sampling device to collect VOCs?
2. What is the major limitation of the Veihmeyer tube sampler?
3. What depth range is associated with use of the Veihmeyer tube sampler?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.3(e): Collect soil / solid samples (Veihmeyer tube sampler)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify the sample location and requirements?			
2. Prepare sample container(s) per the servicing laboratory or appropriate guidance, if necessary?			
3. Decontaminate or pre-clean any equipment to be used for sampling, if necessary?			
4. Assemble the sampler by screwing in the tip and the drive head on the sampling tube?			
5. Insert the tapered handle (drive guide) of the drive hammer through the drive head?			
6. Place the sampler in a perpendicular position on the material to be sampled?			
7. Drive sampler into the material to the desired sampling depth?			
8. Record the length of the tube that penetrated into the media?			
9. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head?			
10. Rotate the sampler at least two revolutions to shear off the sample at the bottom?			
11. Lower the sampler handle (hammer) until it just clears the two earlike protrusions on the drive head and rotate about 90º?			
12. Collect a sufficient volume of sample based on the type(s) of analyses to be performed?			
13. Withdraw the sampler from the material by pulling the handle (hammer) upward?			
14. Dislodge the hammer from the sampler?			
15. Turn the sampler tube upside down, tap the head gently against the hammer and carefully recover the sample from the tube?			
16. Place the sample into the appropriate container?			
17. Cap and label the container?			

18. Initiate sample preservation methods, as appropriate?			
19. Complete the sampling preventing, minimizing and limiting cross contamination of samples?			
20. Clean/decontaminate sampling equipment between samples and after use?			
21. Record data in OEHMIS (DOEHRS or equivalent), if applicable?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT)

TRAINER NAME (PRINT)

ANSWERS

1. Why is a tube sampler such as the Veihmeyer a good sampling device to collect VOCs?

   A: A tube sampler (such as the Veihmeyer) provides the least disturbed collection method.

   (Source: 4B051 CDC)

2. What is the major limitation of the Veihmeyer tube sampler?

   A: It cannot penetrate stony or rocky soil.

   (Source: 4B051 CDC)

3. What depth range is associated with use of the Veihmeyer tube sampler?

   A: The Veihmeyer tube sampler is used at depths greater than one foot and can be used for depths up to 10 feet.

   (Source: 4B051 CDC)

STS Line Item 4.5.3.4.2: FT-IR (e.g., HazMatID)

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	Complete Computer Based Training.
Training References:	HazMatID Equipment User's Manual. 2009
Additional Supporting References:	ESOH service center HazMatID checklist
CDC Reference:	4B051
Training Support Material:	HazMatID Soil sample Scoop
Specific Techniques:	Conduct hands-on training and evaluation.
Criterion Objective:	Given a HazMatID, perform pre-operational check and operate instrument successfully completing all checklist items with NO trainer assistance.

Notes:
The HazMatID can be used for qualitative analysis of solids, powders, pastes, gels and liquids. The HazMatID is intended to provide initial determinations, presence and absence, of hazardous chemicals. The information obtained from the HazMatID is not an absolute or conclusive identification of unknown substances.

***WARNING:**

- The HazMatID is NOT intrinsically safe.
- DO NOT open battery compartment door in a contaminated environment.
- HazMatID CANNOT identify sulfur, phosphorus, ionic salts, sodium chloride and calcium chloride.
- CANNOT detect substances that are less than 10% of the sample composition.
- CANNOT DETECT BIOLOGICAL AGENTS! Only detects the presence of proteins.

TASK STEPS

START UP FROM OFF:

1. Open the battery compartment.[1]
2. Plug the power cable into the power connection in the battery compartment or into electrical outlet, if available.
3. Turn the black power switch to ON position.[2]

PREPARE FOR DATA COLLECTION:

4. Log on to the system.
5. Click **START** to proceed.
6. Clean the crystal with isopropyl alcohol.
7. Select **CONTINUE** to proceed to background collection.
8. Enter the Incident Name and Sample ID by using the Keyboard feature. [3,4]

PREPARE SOLID SAMPLES:

9. Apply the pressure arm so the pressure tip contacts the sample.
10. View the absorbance spectrum.[5]

PERFORM THE ANALYSIS:

11. Click on **Continue** to proceed.[6]
12. Select the **VISUAL COMPARE** button to compare the sample spectrum to spectra from the search list.[7]
13. Click **OVERLAY** to view the spectra over one another.
14. Accurately identify three criteria for positive identification.[8]

LOCAL REQUIREMENTS:

NOTES:

1. Lift the small round screw cover on the right of the battery compartment. Using a flat/slotted screw driver, turn the battery cover screw counterclockwise.

2. Allow the analyzer to warm up for 20 minutes. You will be prompted on the screen to “Please Log In”

3. See the “Testing a Material” section of the HazMatID Software User’s Guide for additional details.

4. The Sample ID name will have a date and time stamp added to the end of the name. Use names that you will be able to identify at a later date

5. An absorbance value of 0.1 or greater is necessary to acquire library surgical spectrum. If 0.1 is not achieved, use the view camera to visualize proper sample placement. Position and reanalyze the sample until an absorbance of 0.1 is achieved. Most solid samples will need to be crushed in order to achieve an absorbance value of 0.1 units

6. When the collection process is complete, your spectral data and library search results will be displayed.

7. The Compare Spectra dialog box is displayed.

8. Additionally, the following three criteria must be met for a positive identification:

   • Quality (correlation) over 0.95
   • Sample and library match VISUALLY
   • PHYSICAL properties match

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.4.2: FT-IR (e.g., HazMatID)

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
START UP FROM OFF:			
1. Open the battery compartment?			
2. Plug the power cable into the power connection in the battery compartment or into electrical outlet?			
3. Turn the black power switch to ON position?			
PREPARE FOR DATA COLLECTION:			
4. Log on to the system?			
5. Click **START** to proceed?			
6. Clean the crystal with isopropyl alcohol?			
7. Select **CONTINUE** to proceed to background collection?			
8. Enter the Incident Name and Sample ID by using the Keyboard feature?			
PREPARE SOLID SAMPLES:			
9. Apply the pressure arm so the pressure tip contacts the sample?			
10. View the absorbance spectrum?			
PERFORM THE ANALYSIS:			
11. Click on **Continue** to proceed?			
12. Select the **VISUAL COMPARE** button to compare the sample spectrum to spectra from the search list?			
13. Click **OVERLAY** to view the spectra over one another?			

14. Accurately identify three criteria for positive identification?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT)

TRAINER NAME (PRINT)

STS Line Item 4.5.3.5: Field analyze soil/solid samples

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.
Prerequisites:	Training Module 4.5.2.6.1 Detector Tubes or Chips (e.g. Drager CDS Kit) Training Module 4.5.2.6.2 PID/FID Training Module 4.5.2.6.3 Portable GC-MS (e.g. Hapsite) Training Module 4.5.2.6.4 Combustable Gas Meters Training Module 4.5.3.4.2 FT-IR (e.g. HAZMAT ID)
Training References:	Fundamentals of Industrial Hygiene, 6th Ed. Chp 17 OSHA Technical Manual TED 1-0.15A, Sec II, Chp 3 NIOSH Manual of Analytical Methods, Chp D Manufacturer's Instructions per specific equipment 886H Allowance Standard
Additional Supporting References:	ESOH Service Center website: CBRN Equipment page
CDC Reference:	4B051
Training Support Material:	• Training Scenario(s) • Lead Test Check kit, or similar available kit • Multi-gas meter • Drager Hand-Held Pump with Colorimetric Tubes • TVA-1000 FID/PID • HAPSITE • HazMatID • XRF
Specific Techniques:	Conduct hands-on training and evaluation.
Criterion Objective:	Given scenario(s) trainee will demonstrate the proper selection, preparation and operation of (selected) analysis equipment in successfully conducting field soil/solid sampling analysis while completing all relevant checklist items with NO trainer assistance.

Notes:

This training module focuses on equipment that is available to each BE flight throughout the AF - equipment items listed on the 886H Allowance Standard. This TRAINING MODULE has been designed to be completed as individual units or a compound scenario. Additional training requirements for equipment specific to your location may exist for this line item. Consult the Master Training Plan (MTP) for exacting item. For conducting training on additional items, the trainer may consider developing a separate TRAINING MODULE document based on this format.

NOTE: Operators of the Niton XRF Spectrum Analyzer must be certified to use the instrument through specific training requirements identified in the radioactive material (RAM) permit. The flight Master Training Plan should indicate which duty positions may be required to operate this equipment item. Consult the RAM permit and MTP to identify training requirements and amend the module in the Local Requirements section, if necessary.

TASK STEPS

The procedures should be noted and applied (depending on relevance or selection) to each instrument and its subsequent task steps:

1. Identify the purpose of conducting the sampling.
2. Determine the substance(s) being sampled, if applicable and possible.
3. Determine sampling location.
4. Perform initial operations check of instrument(s).
5. Collect sample as appropriate.
6. Select appropriate instrument(s) for sampling.
7. Analyze a sample using a Lead Test Check kit.[1]
8. Analyze a sample using a Multi-gas meter.[2]
9. Analyze a sample using a Drager hand-held pump, with colorimetric tube(s).[3]
10. Analyze a sample using TVA-1000 FID/PID (Quickstart method).[4]
11. Analyze a sample using the HAPSITE.[5]
12. Analyze a sample using the HazMat ID.[6]
13. Analyze a sample using a handheld Thermo Scientific Niton (XRF) analyzer.[7]
14. Compile data to render analysis report and, as applicable, identify concentration(s) of substance(s).[8]
15. Utilize OEHMIS (DOEHRS).

LOCAL REQUIREMENTS:

NOTES:

1. Analyze a sample using a Lead Test Check kit.
   1.1. Clean and remove all dust and dirt from the area to be tested.
   1.2. With a clean knife or scraper, cut a small ¬ in notch at a diagonal to expose all painted layers down to the bare surface.
   1.3. Activate a swab.
      1.3.1. Crush ampules with the swab tip pointing up.
      1.3.2. Shake and squeeze with the swab tip pointing down until the yellow liquid appears on the swab tip - the swab is now activated for testing.
   1.4. Rub the swab tip on the test area for 30 sec while squeezing gently.
   1.5. Observe for color change: pink indicates lead present.
   1.6. Record result.
   1.7. Proceed to additional task steps to conduct further testing OR continue to step 14.

2. Analyze a sample using a Multi-gas meter.
   2.1. Turn on mutli-gas meter in clean, fresh air environment.
   2.2. Observe reading to verify no gas present.
   2.3. Check battery condition.
   2.4. Perform calibration check.
      2.4.1. Attach the regulator to the cylinder.
      2.4.2. Connect the tubing to the regulator.
      2.4.3. Open the valve on the regulator and connect the other end of the tubing to the multi-gas meter inlet fitting.
      2.4.4. Compare readings on multi-gas meter with expected limits noted on the calibration cylinder.
   2.5. Attach sampling lines and related equipment (if available) and collecting a sample from a remote or inaccessible location (if needed).

2.6. Expose instrument to environment.
2.7. Record meter readings.
2.8. Proceed to additional task steps to conduct further analysis OR continue to step 14.

3. Analyze a sample using a Drager hand-held pump, with colorimetric tube(s).
3.1. Leak test pump before each series.
3.1.1. Insert unopened tube into tube holder.
3.1.2. Squeeze pump completely and release.
3.1.3. Observe pump after 15 minutes; pump is adequately leak-proof if the end-of-stroke indicator has not appeared.
3.1.4. Remove tube.
3.1.5. Reset stroke counter to zero.
3.2. Prepare tubes.
3.2.1. Select tube and read relevant instructions for use.
3.2.2. Open both ends of tube with tube opener.
3.2.3. Insert the tube into the pump with arrow towards the pump.
3.3. Begin measurement.
3.3.1. Determine number of strokes according to operating instructions for tube.
3.3.2. Expose instrument to environment to be sampled.
3.3.3. Hold pump between thumb and index finger so that end-of-stroke indicator and stroke counter are facing the user.
3.3.4. Squeeze pump fully.
3.3.5. Release pump until the number on the stroke counter matches the number of strokes recommended by the operating instructions for the tube.
3.4. Evaluate result IAW the instructions for the tube.
3.5. Record results.
3.6. Remove tube.
3.7. Flush pump with a few pump strokes in clean air.
3.8. Proceed to additional task steps to conduct further analysis OR continue to step 14.

4. Analyze a sample using TVA-1000 FID/PID (Quickstart method).
4.1. Connect sample probe.
4.2. Fill/install hydrogen tank.
4.3. Open the hydrogen valve.
4.4. Start the unit per the manufacturer's instructions.
4.5. Expose the instrument to the environment to be sampled.
4.6. Use the Control menu to turn pump. FID and PID ON/OFF as needed.
4.7. Read and record results.
4.8. Proceed to additional task steps to conduct further analysis OR continue to step 14.

5. Analyze a sample using the HAPSITE.
5.1. Determine sampling location.
5.2. Prepare the instrument.
5.2. Operate the instrument.
5.3. Collect sample.
5.4. Run test.
5.5. Read and record results.
5.6. Proceed to additional task steps to conduct further testing OR continue to step 14.

6. Analyze a sample using the HazMat ID.
6.1. Clean the crystal prior to using the instrument.
6.2. Apply sample to the crystal.
6.5. Run test.
6.6. Read and record results.
6.7. Proceed to additional task steps to conduct further analysis OR continue to step 14.

7. Analyze a sample using a handheld Thermo Scientific Niton (XRF) analyzer.
7.1. Determine sampling location.
7.2. Prepare the instrument.
7.2. Operate the instrument.

7.3. Collect sample.
7.4. Run test.
7.5. Read and record results.
7.6. Proceed to additional task steps to conduct further analysis OR continue to step 14.

8. This will depend on the capabilities of the device(s) used to conduct the test(s).

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.5: Field analyze soil/solid samples

1. Why is the presence of interferent gases cause for concern?
2. When calibrating the MSA multi-gas meter, how do you determine the meter's sensitivity?
3. When using the PID/FID, a contaminant source is indicated if the number of ppm reading on the TVA-1000B equals or exceeds what number?
4. Along with providing real-time on-scene results, what is the biggest advantage of the HAPSITE chemical identification system?

5. List three possible scenarios for using the HAZMAT ID.

6. Why is it important to clean the sample interface?

7. List the elements identifiable by the XRF analyzer.

8. Match the field instrument(s) to the soil media it is best designed to screen. More than one may apply.

Volatiles	_____	A. HAZMATIDTM
Non-volatiles	_____	B. SAM935
Explosives	_____	C. TVA-1000B
Metals	_____	D. HAPSITE
Radiation	_____	E. ADM-300
		F. XRF

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.5: Field analyze soil/solid samples

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed.

DID THE TRAINEE…		YES	NO
1. Identify the purpose of conducting the sampling?			
2. Determine the substance(s) being sampled, if applicable and possible?			
3. Determine sampling location?			
4. Perform initial operations check of instrument(s)?			
5. Collect sample as appropriate?			
6. Select appropriate instrument(s) for sampling?			
7. Analyze a sample using a Lead Test Check kit?			
8. Analyze a sample using a multi-gas meter?			
9. Analyze a sample using a Drager hand-held pump, with colorimetric tube(s)?			
10. Analyze a sample using TVA-1000 FID/PID (Quickstart method)?			
11. Analyze a sample using the HAPSITE?			
12. Analyze a sample using the HazMat ID?			
13. Analyze a sample using a handheld Thermo Scientific Niton (XRF) analyzer?			
14. Compile data to render analysis report and, as applicable, identify concentration(s) of substance(s)?			
15. Utilize OEHMIS (DOEHRS)?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT) TRAINER NAME (PRINT)

ANSWERS

1. Why is the presence of interferent gases cause for concern?

   A: Interferent gases can adversely affect the sampling device, causing inaccurate readings.

   (Source: 4B051 CDC)

2. When calibrating the MSA multi-gas meter, how do you determine the meter's sensitivity?

   A: Sensitivity must be tested on a known concentration of calibration gas equivalent to 25 to 60% of full scale concentration. Accuracy must be within -0 to +20% of actual.

   (Source: USAF ESOH MSA PASSPORT Fact Sheet)

3. When using the PID/FID, a contaminant source is indicated if the number of ppm reading on the TVA-1000B equals or exceeds what number?

   A: A contaminated source is considered present if the PID/FID reading equals or exceeds 5.0 ppm.

   (Source: 4B051 CDC)

4. Along with providing real-time on-scene results, what is the biggest advantage of the HAPSITE chemical identification system?

   A: The biggest advantage the HAPSITE brings to the table is its ability of detecting contaminants of concern at levels below other detector's threshold levels. The detection range of the HAPSITE extends into the parts-per-trillion (ppt) range.

   (Source: 4B051 CDC)

5. List three possible scenarios for using the HAZMAT ID.

The HAZMATID™ instantly compares a sample's infrared fingerprint against onboard databases to provide the identity of the unknown. Therefore, it can be used in the following scenarios:

A:

- ID of weapons of mass destruction (WMD) (e.g., nerve and blister agents

- ID of toxic industrial chemicals (TICs)
- ID of forensic drugs and Clan Lab precursors
- ID of white powders
- ID of explosives
- ID of WMD precursors
- ID Common chemicals

(Source: 4B051 CDC)

6. Why is it important to clean the sample interface?

   A: Because soil may accumulate on the detection window

   (Source: 4B051 CDC)

7. List the elements identifiable by the XRF analyzer.

   A: Niton XRF analyzers can quantify elements ranging from magnesium (element 12) through uranium (element 92).

   (Source: 4B051 CDC)

8. Match the field instrument(s) to the soil media it is best designed to screen. More than one may apply.

   A:

Volatiles	(D, E)	A. HAZMATIDTM
Non-volatiles	(A)	B. SAM935
Explosives	(A)	C. TVA-1000B
Metals	(F)	D. HAPSITE
Radiation	(B, F)	E. ADM-300
		F. XRF

   (Source: 4B051 CDC)

STS Line Item 4.5.3.6: Interpret soil sample results

TRAINER GUIDANCE

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed
Prerequisites:	None
Training References:	• USAPHC reference document 230 Methodology for Determining Chemical Exposure Guidelines for Deployed Military Personnel 2013 Revision. • CDC lesson cited below.
Additional Supporting References:	
CDC Reference:	4B051
Training Support Material:	None
Specific Techniques:	Conduct hands-on training and evaluation.
Criterion Objective:	Given a list of hazardous chemicals in soil and soil sample results, identify the appropriate military exposure guideline (MEG), determine degree of contamination, and make recommendations, successfully completing all checklist items with NO trainer assistance.

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Notes:

Trainers must provide trainee with a scenario, including results, for trainee to interpret.

Scenario: You are deployed to an FOB which is undergoing expansion. CE is building a new structure, and you've sampled for beryllium and chromium VI in a bulk soil samples. Your first sample was collected by scooping loose soil from the top layer and showed 0.000074 mg/kg of beryllium. Your second sample was collected 6 inches deep and showed 0.0028 mg/kg chromium VI.

TASK STEPS

1. Read soil sample results, determine appropriate MEGs.[1]
2. Compare results to MEGs.[2]
3. List hazards associated with chemical.[3]

LOCAL REQUIREMENTS:

NOTES:

1. Trainees must identify results, and locate MEGS for chemicals sampled to include type and location of sample.

2. Make sure both numbers are in same unit of measurement. Soil sample MEGS are listed in mG/kG.

3. Trainees must determine if sample is above or below MEG, route of entry, and hazards posed by chemical.

TRAINEE REVIEW QUESTIONS

STS Line Item 4.5.3.6: Interpret soil sample results

1. What is the standard exposure for a soil MEG?
2. What is the difference between a soil MEG for dermal absorption and inhalation?
3. What other information do you need besides levels of contamination to make recommendations?

PERFORMANCE CHECKLIST

STS Line Item 4.5.3.6: Interpret soil sample results

Proficiency Code:	3c
PC Definition:	Can do all parts of the task. Needs only a spot check of completed work. Can identify why and when the task must be done and why each step is needed

DID THE TRAINEE…		YES	NO
1. Read soil sample results, determine appropriate MEGs?			
2. Compare results to MEGs?			
3. List hazards associated with chemical?			
Did the trainee successfully complete the task?			

TRAINEE NAME (PRINT)

TRAINER NAME (PRINT)

ANSWERS

1. What is the standard exposure for a soil MEG?

   A: A daily exposure for up to 1 year through ingestion, dermal absorption, and inhalation.

   (Source: USAPHC Reference document 230)

2. What is the difference between a soil MEG for dermal absorption and inhalation?

   A: Inhalation only takes into account surface soil at the top 2 cm from dusts or VOCs from deeper samples. Dermal absorption can be at any depth but is only used when the chemical contains a dermal hazard.

   (Source: USAPHC Reference document 230)

3. What other information do you need besides levels of contamination to make recommendations?

   A: Type of sample and soil to determine applicable routes of entry (inhalation, ingestion, dermal)

   (Source: USAPHC Reference document 230)