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Operating Procedure

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Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting soil gas samples for field screening or laboratory analysis.

Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling soil gas samples in the field. On the occasion that LSASD field personnel determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to obtain a soil gas sample, the variant procedure will be documented in the field log book, along with a description of the circumstances requiring its use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD Local Area Network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on LAN and for maintaining records of review conducted prior to its issuance.

1.2 General Precautions

1.2.1 Safety

Proper safety precautions must be observed when collecting soil gas samples. Refer to the LSASD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines should be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.2.2 Procedural Precautions

The following precautions should be considered when collecting soil gas samples.

1.2.2.1 Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample.

1.2.2.2 Samples shall be custody sealed during long-term storage or shipment.

1.2.2.3 Custody seals should not be placed on the canisters due to VOCs that may out-gas from the adhesives. Custody seals should be placed on the outside of canister shipping containers.

1.2.2.4 Sample identification tags shall be attached to the canister using wire, cable tie, or string. Adhesive labels should be affixed to the tag and not be placed directly on the canister.

1.2.2.5 Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

1.2.2.6 If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.

1.2.2.7 Shipped samples shall conform to all U.S. Department of

Transportation (DOT) and/or International Air Transportation Association (IATA) hazardous materials shipping requirements.

1.2.2.8 Documentation of field sampling is done in a bound logbook.

1.2.2.9 Chain-of-custody (COC) documents shall be filled out and remain with the samples until custody is relinquished.

1.2.2.10 Canister Sample Identification Tags and COC and Field Logbook should list the unique canister serial number and the starting time that the sample was collected.

1.2.2.11 All shipping documents, such as air bills, bills of lading etc., shall be retained by the project leader and stored in a secure place.

2.0 Special Sampling Considerations

2.1 Special Considerations for Sampling

The tubing used as part of either of the described sampling systems should be Teflon® or stainless steel. As most current soil gas sampling will be conducted to investigate the presence or extent of organic compounds (not including PFAS compounds), Teflon® tubing is required to ensure the integrity of the sample.

Extreme care should be taken to protect all VOC sampling equipment whose surfaces will come in direct contact with the collection of the sample. For instance, a Geoprobe® or other drilling rig should not be used to carry or transport sampling equipment because of diesel and other VOC emissions. In addition, other field support vehicles should not be operated in the proximity of the sampling site shortly before or during sampling.

2.2 Special Precautions for Soil Gas Sampling

2.2.1 A clean pair of new, non-powdered, disposable gloves (gloves) will be worn each time a different location is sampled, and the gloves should be donned immediately prior to sampling. The gloves should be changed any time during sample collection when their cleanliness is compromised.

2.2.2 If possible, one member of the field sampling team should take all the notes and photographs fill out tags, etc., while the other member(s) collect the samples.

2.2.3 Using O-rings on all PRT tooling, adapters, and probe rods will ensure that the entire sampling train is air-tight. This will prevent soil ingress during installation and to maintain sample integrity by ensuring that no ambient air is introduced into the sample during collection.

2.3 Sample Handling Requirements

2.3.1 Soil gas samples will typically be collected by directly filling an evacuated, 6-liter passivated stainless-steel canister after sample delivery line purging.

2.3.2 The canister will be labeled and identified according to LSASD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples (LSASDPROC-209).

2.4 Quality Control

Quality control sampling for soil gas sampling investigations will consist of collection of the following types of samples, as appropriate.

2.4.1 Control Sample: If applicable to the study or investigation, a control (or background) sample should be collected from a location not affected by the possible contaminants of concern and submitted with the other samples.

2.4.2 Trip Blank: A canister trip blank, prepared prior to the investigation by LSB personnel, should follow alongside the traditional samples and be submitted with the sample set during the investigation.

2.4.3 Equipment rinsate blank: Equipment rinsate blanks should be collected if equipment, such as PRT adapters, probe rods, or other sampling equipment is field cleaned and re-used in the sample train to document that low-level contaminants were not introduced into the sample by the decontaminated equipment.

2.4.4 Field Split: Field split samples, at a minimum frequency of one for every ten samples should be collected. Split samples are collected from one single sample port or installation by attaching the center leg of a Swagelok® “Tee” to the end of the sample tubing. The remaining legs of the “Tee” are connected to two sample containers (usually two flow controllers with roughly the same calibrated flow) which are opened and filled simultaneously.

2.5 Records

Information generated or obtained by LSASD personnel will be organized and accounted for in accordance with LSASD records management procedures found in the LSASD Operating Procedure for Control of Records (LSASDPROC-002). Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation according to the procedures found in LSASD Operating Procedure Logbooks (LSASDPROC-010) and LSASD Operating Procedure for Sample and Evidence Management (LSASDPROC-005).

3 Geoprobe® PRT System Installation

3.1 General

Single event or grab sampling may be conducted using the Post-Run Tubing System (PRT). Using this system, soil gas samples can be collected quickly and with a high degree of assurance that the samples are representative of the targeted depth.

The downhole components of the PRT system include:

- 3.1.1 Sample delivery tubing
- 3.1.2 Probe rods
- 3.1.3 PRT Adapter
- 3.1.4 Expendable point holder
- 3.1.5 Expendable point

O-ring seals are used on the PRT Adapter and the expendable point holder. O-rings can also be used at all rod joints, preventing soil ingress which can prevent air-tight docking of the PRT adapter.

3.2 PRT System Installation Procedures

The following procedures are used to collect soil gas samples using the Geoprobe® PRT system. The PRT system is available for 1.0-inch, 1.25-inch and 1.5-inch diameter probe rods. In LSASD practice, 1.25-inch rods are used. All parts or accessories used in the PRT system must be selected with the appropriate diameter probe rod in mind to ensure compatibility of all components.

- 3.2.1 Ensure that the sampling location has been cleared using the procedures detailed in the Site Safety Plan. The plan should stipulate that: prior to site arrival the proposed soil gas sampling locations will be cleared using the One Call utility locating service. Upon arrival at the site each individual soil gas sampling location will be cleared using a pipe scanner and metal locator.
- 3.2.2 Cut a 4-foot by 4-foot section of disposable plastic sheeting and place on the ground next to the sampling location.
- 3.2.3 Hand auger a 4-foot deep hole using a clean stainless-steel hand auger emptying the soil cuttings on the plastic sheeting.
- 3.2.4 Don a clean set of gloves. To ensure there is no thread damage to the internal threads of the expendable point holder or the PRT adapter, hand screw the PRT adapter counter-clockwise into the expendable point holder using only your fingertips. The two components should screw together smoothly. If they do not replace them and repeat the test. Note: PRT fittings are left-hand threaded; turn counterclockwise to tighten.
- 3.2.5 Place O-ring on PRT expendable point holder and attach to initial section of probe rod.
- 3.2.6 Place O-ring on expendable point and press into expendable point holder.

- 3.2.7** Add drive cap to probe rod and push PRT system through the augured hole into ground to the bottom of the sampling interval. Take special care to assure that the rods are in line with the push axis of the probe machine.
- 3.2.8** It is important to leave at least a 2-foot interval of undisturbed native soil between the augured hole and the top of the sampling interval. The native soil layer will be used to support the bentonite/soil layers described in Step 11.
- 3.2.9** At the bottom of the desired sampling depth, attach a point popper to an extension rod and insert extension rod string into rods so that the point popper rests on the expendable point. Using the rod puller and taking special care to maintain probe alignment with the rods, begin pulling the rods while maintaining pressure on the extension rods. The extension rods should drop when the pull is started, indicating that the expendable point has been ejected. The rods can then be pulled to expose the desired open sampling interval.
- 3.2.10** Using a properly decontaminated water level sounder, check, if conditions warrant, to make sure groundwater is not present at the bottom of the rod string. If groundwater is present, the sampling location should be properly abandoned, and an alternate sampling location determined. Soil gas samples should never be collected if there is a high possibility that groundwater may enter the sampling equipment. The groundwater will ruin the sampling and analysis equipment and invalidate the soil gas sample.
- 3.2.11** The drive rods that are contained in the augured hole will be “sealed” by first adding 12 inches of bentonite clay crumbles (not pellets) and hydrating with de-ionized water. Second, the augured hole will be filled with alternating layers of soil cuttings and hydrated bentonite clay crumbles while being hand packed with a clean stainless-steel auger handle or similar device.
- 3.2.12** Secure the PRT adapter to a length of Teflon® tubing sufficient to reach from the sampling interval to the surface, with several feet of excess tubing extending beyond the top of the probe rod to facilitate sampling. Straighten the first two feet of tubing above the adapter by pulling it between your thumb and forefinger. This will ease the docking of the tubing.
- 3.2.13** Run the tubing and adapter into the probe rod and, using steady downward pressure turn the tubing counter-clockwise to dock the adapter into the top of the expendable point holder. Tug gently on the tubing to ensure that the adapter engaged with the expendable point holder. Continue rotating the tubing until the adapter is firmly seated. Failure to dock could indicate that soil intruded during the push or that the expendable point was lost during the push.
- 3.2.14** At this point, the PRT system has been installed and is ready to be helium leak tested (Section 6) before sampling. If the sample cannot be collected immediately, the end of the tubing should be capped with a stainless-steel Swagelok® cap or crimped by bending over and securing with a cable tie. Sampling is conducted using one of the

procedures described in Section 7.

3.3 Decommissioning PRT Sample Locations

Because it is impractical to pump grout through the PRT adapter on the lead probe rod, the entire string of rod must be removed before decommissioning can commence. The following methods are available, depending on conditions related to sample depth and post-removal probe hole wall stability:

3.3.1 Direct Placement of Pellets or Grout - If the sampling depth was relatively shallow, on the order of ten feet or less, or the bore hole did not penetrate a water table, grouting/sealing the open hole can be accomplished by directly placing bentonite pellets, hydrated in lifts or pouring a 30% solids bentonite grout mixture from the surface. The acceptable maximum depth for this option is somewhat dependent on the stability of the hole and these methods may be used at slightly greater depths if the holes do not collapse after removal of the rod.

3.3.2 Re-entry Grouting - For locations where sampling was conducted at somewhat greater depths, where groundwater was penetrated, or where the surficial formations tend to collapse, the only viable option for grout placement may be to re-probe the entire depth with a new expendable point. After reaching the original sample depth, the expendable point is ejected and the hole is grouted by directly injecting grout through the inside of the rod string, as it is removed. Use of this option is dependent on the relative degree of hole stability.

4 Geoprobe® Permanent Soil Gas Implant Installation

4.1 General

Long-term soil gas sampling may be conducted using permanent soil gas sampling implants installed with the Geoprobe®. Stainless steel implants may be installed at any depth achievable by the Geoprobe® and may be installed using various diameters of probe rod. In LSASD practice, 2.25-inch probe rods are used. The implants may be installed in custom lengths, configured using a wide assortment of available implant lengths and connections. The implant screens are double-woven stainless steel mesh with 0.0057-inch (0.15 mm) pore openings.

Permanent soil gas sampling implants may also be installed using 2.125-inch diameter rods utilizing an advancing thin-walled corer to facilitate placement of the implant (see Geoprobe Systems, Direct Push Installation of Devices for Active Soil Gas Sampling & Monitoring, Technical Bulletin No. MK3098 for details of this application).

4.2 Installation of Permanent Soil Gas Sampling Implants (Typical)

The following procedures are used by LSASD to install a permanent soil gas sampling implant using the Geoprobe®. These are the general procedures which are used with 2.25-inch diameter probe rod.

4.2.1 Ensure that the sampling location has been cleared using the procedures detailed in the Site Safety Plan. The plan should stipulate that: prior to site arrival

- the proposed soil gas sampling locations will be cleared using the One Call utility locating service. Upon arrival at the site each individual soil gas sampling location will be cleared using a pipe scanner and metal locater.
- 4.2.2 Cut a 4-foot by 4-foot section of disposable plastic sheeting and place on the ground next to the sampling location.
 - 4.2.3 Hand auger a 4-foot deep hole using a clean stainless-steel hand auger emptying the soil cuttings on the plastic sheeting.
 - 4.2.4 Don a clean set of gloves. To ensure there is no thread damage to the internal threads of the expendable implant anchor or the implant, hand screw the implant counter-clockwise into the expendable implant anchor using only your fingertips. The two components should screw together smoothly. If they do not replace them and repeat the test. Note: implant fittings are left-hand threaded; turn counterclockwise to tighten.
 - 4.2.5 Place o-ring on PRT expendable implant anchor and attach to initial section of probe rod.
 - 4.2.6 Add drive cap to probe rod and push PRT system through the augured hole into ground to the bottom of the sampling interval. Take special care to assure that the rods are in line with the push axis of the probe machine. Do not retract rod or removed expendable point yet.
 - 4.2.7 Using a properly decontaminated water level sounder, check, if conditions warrant, to make sure groundwater is not present at the bottom of the rod string. If groundwater is present, the sampling location should be properly abandoned, and an alternate sampling location determined. Soil gas samples should never be collected if there is a high possibility that groundwater may enter the sampling equipment. The groundwater will ruin the sampling and analysis equipment and invalidate the soil gas sample.
 - 4.2.8 Install an o-ring on the docking end of the implant. Next, secure the implant to a length of 1/4" Teflon[®] tubing sufficient to reach from the sampling interval to the surface, with several feet of excess tubing extending beyond the top of the probe rod to facilitate sampling. Use electrical tape or a cable tie to temporarily cap the end of the tubing. Straighten the first two feet of tubing above the adapter by pulling it between your thumb and forefinger. This will ease the docking of the tubing.
 - 4.2.9 Run the tubing and implant into the probe rod and, using steady downward pressure turn the tubing counter-clockwise to dock the adapter into the top of the expendable point holder. Tug gently on the tubing to ensure that the adapter engaged with the expendable point holder. Continue rotating tubing until the adapter is firmly seated. If docking is difficult, try running the implant and tubing thru an appropriate length of 1/2" PVC tremie pipe to better align the implant with the expendable point to facilitate docking. Remove the tremie pipe once docking is achieved. Failure to dock could indicate that soil intruded during the push or that the expendable point was lost

- during the push. If the implant does not dock, it is possible to salvage the installation by removing the implant and sealing the small hole on the bottom of the implant, if present, with foil or with a small sheet metal screw, then returning the implant to the hole.
- 4.2.10** After the implant has been docked, use a pull cap and pull the probe rod approximately one foot while applying slight downward pressure on the tubing connected to the implant. This should start to expose the implant in the sampling interval. Take care while moving the rod and observe the tubing to make sure that the anchor and implant remained in place and is not being pulled with the rod.
- 4.2.11** If the implant remained in place, slowly pour a measured amount of 60-100 mesh glass beads down the inside of the probe rod. The glass beads are used as a filter pack around the implant. The implant should be covered with beads to approximately six inches above the top of the implant. The volume of beads should be calculated based on the length of implant used, alternatively, a water level sounder can be used to measure the top of the bead layer. While pouring the beads, it is advisable to gently shake the tubing to prevent the beads from bridging inside the probe rod.
- 4.2.12** After placing the beads, the implant is sealed using a flowable mixture of the glass beads and fine-powdered bentonite. To accomplish this, at least 6 inches of rod is pulled, and the mixture is slowly poured into the rod above the bead-packed implant. As with the bead placement, similar care should be taken to avoid bridging of this mixture.
- 4.2.13** After placement of the seal, the rod string is removed, and the resultant annular space is grouted using the following procedures which are dependent on the depth and stability of the open hole.
- 4.2.14** If the resultant open hole is shallow (ten feet or less) and the hole walls are stable, the hole may either be filled with bentonite pellets, hydrated in lifts or grouted using a 30% solids bentonite grout, poured from the surface.
- 4.2.15** If the hole is deeper than ten to fifteen feet, better results may be obtained by using a tremie pipe to place a pumpable grout. One half inch PVC tremie pipe or Geoprobe nylon grout tubing is threaded down the annulus to the top of the bead/bentonite seal. The tremie is pulled off the bottom to prevent jetting out the seal and grout is pumped until the annulus is filled. Procedures are similar to those for well annular seals described in LSASDGUID-101, Section 2.3.5.
- 4.2.16** For permanent or long-term installations, the tubing should be protected by an appropriate surface completion, such as a flush vault or well protective casing, similar to well protective casings, as described in LSASDGUID-101. After the installation of the vault, cut off the end of the tubing with the previously installed electrical tape or cable tie and cap with a stainless-steel capping fitting.
- 4.2.17** After installation is complete the soil gas implant is sampled using one of the methods described in Section 7.

4.2.18 Helium leak testing is not practical nor required for permanent soil gas installations.

5 Sub-Slab Soil Gas Sampling Port Installations

5.1 General

For soil gas samples that need to be collected under a current structure, sub-slab soil gas ports should be installed. Temporary or long-term installations may be installed depending on the project needs. Stainless steel screens may be installed if loose or unconsolidated soils lie underneath the slab. Extreme care should be taken in the location of the drilled sample ports.

5.2 Installation of Temporary Sub-slab Soil Gas Sampling Ports

The following procedures are used to install a temporary sub-slab soil gas sampling port.

- 5.2.1** Ensure that the sampling location has been cleared using the procedures detailed in the Site Safety Plan. As most if not all of these applications will be inside, a One Call utility locating service might not help. Upon arrival at the site, each individual sub-slab sampling location should be cleared verbally and visually with a site engineer or home owner, whoever is available with the most knowledge on the structure.
- 5.2.2** Don a clean pair of gloves and drill in the desired location with a 1/2" masonry bit. After drilling, make sure the bit is completely through the slab either by running something rigid along the inside of the borehole to feel the slab end or by visually observing soil cuttings on or from the drill bit. Ensure there is no water in the borehole before moving on. Again, soil gas samples should never be collected if there is a high possibility that groundwater may enter the sampling equipment. The groundwater will ruin the sampling and analysis equipment and invalidate the soil gas sample. If so, choose another sample location.
- 5.2.3** Cut a piece of Teflon® tubing to a length of the slab thickness, plus two feet for room to reach sampling equipment. Straighten the end of the tubing and place it down the borehole to a height just above the bottom of the slab. If there is unconsolidated soil present that could potentially clog the sampling inlet, a clean stainless-steel screen can be fastened to the end of the tubing.
- 5.2.4** After brushing away concrete dust, a VOC-free clay or putty like media is then used to secure the tubing and create an air tight seal at the slab interface. After a leak test is conducted according to Section 6.3, the end of the sampling tube is then connected to the sampling device or crimped and secured if sampling is to happen later.

After sample collection according to a method described in Section 7, the holes are immediately abandoned by filling the borehole with cement. A slightly thin mixture of cement will ensure no bridging of the mixture as it pours and makes a more solid patch. A small diameter piece of wire is good for working cement into hole. Check the cement patch for effectiveness before leaving the site.

5.3 Installation of Permanent Sub-slab Soil Gas Sampling Ports

The following procedures are used to install a permanent sub-slab soil gas sampling port.

- 5.3.1** Each sample location should be cleared to the best of the sampling team's ability following step 1 in Section 5.2 above.
- 5.3.2** Don a clean pair of gloves and drill in the desired location with a 1" masonry bit to a depth needed to just submerge the permanent sample port body into the concrete to have a flush final product. Finish drilling the remainder of the slab thickness with a 1/2" masonry bit. After drilling, make sure the bit is completely through the slab either by running something rigid along the inside of the borehole to feel the slab end or by visually seeing soil cuttings on the drill bit. Ensure there is no water in the borehole before moving on. If so, choose another sample location.
- 5.3.3** The port should be made of stainless steel with an air tight connection to a length of stainless steel 1/4" tubing long enough to reach down to just above the bottom of the slab and have a cap or plug that can make an air tight seal when left between sampling events. Again, a clean stainless-steel screen can be added to the end of the sample tube if needed to prevent soil from penetrating the sample inlet.
- 5.3.4** Place the permanent sample port into the drilled borehole with a piece of malleable VOC-free media to seal the hole where it narrows (to keep the cement off the sample inlet). Seal the sample port in place using anchor cement and allow to set overnight.
- 5.3.5** After port is set, perform a leak test as described in Section 6.3. If the sample port passes the leak test, samples may then be collected by one of the methods described in Section 7. Leak tests should be completed for every sampling event, as torquing the plug can crack the anchor cement over time.

6 Helium Leak Testing of PRT Soil Gas Sampling Installations

6.1 General

Leak testing of soil gas sampling installations should be conducted if the sampling equipment has a connection that if compromised would emit ambient air into the soil gas sample. For sub-slab soil gas sample ports, it is most important to leak test temporary sample ports as the integrity of the seal made by the malleable VOC-free media used can be easily damaged.

6.2 Helium Leak Testing Procedures for PRT Soil Gas Sampling Installations

- 6.2.1** The sampling system will be leak checked by inserting a 1/8" diameter Teflon® tubing into the drive rod next to the 1/4-inch diameter Teflon® sampling tubing, until it bottoms out a few inches above PRT adaptor. The 1/8" diameter tubing will be connected to a 99.999% pure helium source.
- 6.2.2** A second length of 1/4" Teflon® tubing will be inserted into the drive rod to a point

approximately one foot below the top of the rod. The free end of this tubing will be connected to a helium meter that will monitor the helium content of the drive rod during the leak test.

- 6.2.3** The top of the drive rod and tubing will be sealed with Parafilm® to retain the helium for the leak test. The drive rod will be filled with helium to a concentration of greater than 90%, while a soil gas sample is collected into a Tedlar® bag through the 1/4" Teflon® sample tube for on-site sample analysis of helium content. When the Tedlar® bag is disconnected from the sample tubing the sample tubing is crimped and held with a rubber band or cable tie, to prevent ambient air from entering the sample tube. The helium concentration in the Tedlar® bag must be less than 10% of the helium concentration in the drive rod to insure integrity of the soil gas sampling well. When the leak test is complete, the Parafilm®, helium supply, and monitoring tubes will be removed, leaving the sample tube.

6.3 Helium Leak Testing Procedures for Sub-slab Soil Gas Sample Ports

- 6.3.1** The sampling system will be leak checked by covering the sample port with a shroud that can be filled from a 99.999% pure helium source. The shroud will allow two other ports where the leak check sample can be pulled and the helium concentration in the shroud can be testing similar to the set-up in Section 5.2 above.
- 6.3.2** The shroud will be filled with helium to a concentration of greater than 90%, while a soil gas sample is collected into a Tedlar® bag through the 1/4" Teflon® sample tube for on-site sample analysis of helium content. When the Tedlar® bag is disconnected from the sample tubing the sample tubing is crimped and held with a rubber band or cable tie, to prevent ambient air from entering the sample tube. The helium concentration in the Tedlar® bag must be less than 10% of the helium concentration in the shroud to insure integrity of the soil gas sampling port. When the leak test is complete, the shroud, helium supply, and monitoring tubes will be removed, leaving the sample tube connected to the port.
- 6.3.3** For temporary sub-slab sample ports, if the leak test fails, the malleable VOC-free media can be reinserted, added to, or shifted and tested again. After the sample port passes, take care in not moving or shifting the seal media before sample collection.

7 Sampling Soil Gas Installations

7.1 Soil gas samples may be collected from PRT and permanent soil gas implant installations using one of several methods, listed below. Canister sampling is the most common method utilized by LSASD.

- 7.1.1** Canister Sampling for Laboratory Analysis – After installation is complete and immediately prior to sampling, a flow-limiting device, consisting of a Nupro® 7-micron sintered stainless steel filter, a critical orifice and gauge is attached to an evacuated canister for sampling. A sampler leak check is conducted by plugging the inlet of the flow control device and opening the canister valve momentarily. After the valve

has been closed the needle on the gauge should not move (remain at full vacuum) indicating that at the sampler is leak free.

- 7.1.2** Once the PRT installation or the sub-slab sample port has passed the helium leak test as described in Section 5 and the sampler leak check has been completed, the Teflon® sample tube is connected to the flow-limiting device using a Swagelok® or other suitable secure connection. After connection, the rubber band (if used) is cut and the crimp in the Teflon® tubing straightened and the valve on the canister is opened, pulling soil gas from the implant into the canister. Typically, the sample is collected over a one-hour period (depending on soil conditions), at which time the canister valve is closed, and the canister tagged with pertinent sampling information. When using this type of device, it is advisable to check the canister vacuum throughout the sampling period to verify filling. The initial and final gauge pressure/vacuum reading should be recorded in the project logbook.
- 7.1.3** Real-time Field Analytical Methods – Real-time analytical measurements may be obtained from PRT, soil gas implant, or sub-slab port installations using appropriate instrumentation. The soil gas to be analyzed may be drawn directly into the instrument by the instrument pump or the instrument may be placed in line and the sample drawn into the instrument using a suitable pump connected to the discharge side of the instrument. Results may be qualitative, such as those obtained with flame ionization or photoionization detectors, or they may be quantitative, for instruments which can be calibrated to specific compounds.

8 References

Geoprobe® Systems Tools and Equipment Catalog, Kejr Engineering, Inc., Salinas, Kansas, 1997.

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

LSASD Operating Procedure for Control of Records, LSASDPROC-002, Most Recent Version

LSASD Operating Procedure for Equipment Inventory and Management, LSASDPROC-104, Most Recent Version

LSASD Operating Procedure for Field Equipment Cleaning and Decontamination, LSASDPROC-205, Most Recent Version

LSASD Operating Procedure for Field Sampling Quality Control, LSASDPROC-011, Most Recent Version

LSASD Operating Procedure for Logbooks, LSASDPROC-010, Most Recent Version

LSASD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples, LSASDPROC-209, Most Recent Version

LSASD Operating Procedure for Sample and Evidence Management, LSASDPROC-005, Most Recent Version

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9 Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Quality Assurance Coordinator on the LSASD local area network (LAN).

History	Effective Date
Replaced Chief with Supervisor; General formatting revisions.	April 22, 2023
<p>LSASDPROC-307-R4, <i>Soil Gas Sampling</i>, replaces LSASDPROC-307-R3</p> <p>General: Corrected any typographical, grammatical, and/or editorial errors. Soil gas sampling procedures were updated, and helium leak testing and sub-slab sampling procedures were added to the document. SESD updated to LSASD.</p> <p>Cover Page: Changed the Author from Tim Slagle to Landon Pruitt. Changed Enforcement and Investigation Branch to Applied Sciences Branch. Changed Science and Ecosystem Support Division to Laboratory Services and Applied Science Division. Quality manager Bobby Lewis was changed to Stacy Masters.</p> <p>Revision History: Changes were made to reflect the current practice of only including the most recent changes in the revision history.</p>	February 7, 2020
LSASDPROC-307-R3, <i>Soil Gas Sampling</i> , replaces LSASDPROC-307-R2	May 14, 2014
LSASDPROC-307-R2, <i>Soil Gas Sampling</i> , replaces LSASDPROC-307-R1	September 8, 2010
LSASDPROC-307-R1, <i>Soil Gas Sampling</i> , replaces LSASDPROC-307-R0	November 1, 2007
LSASDPROC-307-R0, <i>Soil Gas Sampling</i> , Original Issue	February 05, 2007