# *FS 5000. WASTE SAMPLING*

1. INTRODUCTION: Use the procedures in FS 5000 to sample media and matrices of industrial origin.

1.1. Use the following DEP SOPs in conjunction with FS 5000:

- FA 1000 Regulatory Scope and Administrative Procedures for Use of DEP SOPs
- FC 1000 Cleaning / Decontamination Procedures
- FD 1000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FT 1000 – FT 2000 General Field Testing and Measurement

1.1.1. Use additional DEP SOPs as required for specific applications.

2. EQUIPMENT AND SUPPLIES: Refer to Table FS 5000-1 for approved waste sampling equipment.

3. PRESERVATION, TRANSPORT AND HANDLING OF WASTE SAMPLES

3.1. Do not preserve waste samples with chemical preservatives or cool waste samples where the potential for an inadvertent chemical reaction of samples with the preservative might occur, or where cooling might otherwise alter the original sample characteristics. Protect samples from sunlight in order to minimize any potential reaction due to possible light sensitivity of samples. Appropriate handling and storage precautions should be taken if samples have the potential to be shock sensitive.

3.2. After the samples have been collected and containerized, clean the outside of the containers with water, paper towels or other absorbent materials to remove any spilled sample from the exterior of the container.

3.3. Place each labeled container in a separate, resealable plastic bag and then repackage in a second resealable plastic bag. Apply an evidentiary custody seal to container closure before bagging, if applicable. If transporting the samples presents a possibility for breaking glass sample containers, pack the sample containers with non-combustible, absorbent cushioning material and place in a shipping container that has been lined with plastic. Waste samples that are suspected of being acutely toxic or extremely hazardous must be packed in paint cans or other suitable containers and filled with absorbent materials prior to being placed in a cooler.

3.4. See Table FS 1000-6 for preservation procedures.

4. DOCUMENTATION

4.1. See FD 5300 for a complete listing of documentation requirements specific to waste sampling.

4.2. Additional guidance on documentation requirements specific to each type of waste sampling is included in the associated DEP SOPs below.

## FS 5010. SAMPLING HAZARDS AND PERSONNEL SAFETY

Waste sampling requires specialized training, safety protocols and personal protective equipment (PPE). The degree and type of safety measures and PPE required depends on the unique characteristics of the waste to be sampled.

1. REFERENCE FOR REQUIRED SAFETY PROTOCOLS, TRAINING AND PPE: As applicable, adhere to safety procedures, training requirements and prescribed PPE described in Occupational Safety and Health Administration (OSHA) Rule 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response).

2. MINIMUM SAFETY PLANNING AND PROCEDURES: It is beyond the scope of this field sampling SOP to describe safety protocols for every contingency. Follow the listed minimum safety procedures below, where applicable:

2.1. Ensure that all personnel are appropriately trained and qualified per OSHA requirements.

2.2. Ensure that sampling personnel meet employer and OSHA medical requirements.

2.3. Conduct site reconnaissance and identify hazards.

2.4. Produce a written site safety plan and review with all personnel.

2.5. Designate a site safety and health officer.

2.6. Produce a written sampling plan and review with all personnel.

2.7. Provide appropriate PPE and sampling equipment to all samplers.

2.8. Establish site control (exclusion zones, access corridors, etc.).

2.9. Conduct preliminary and continuous on-site air monitoring (combustible gases, oxygen deficiency, toxic gases, radiation).

2.10. Establish decontamination areas for samplers.

2.11. Prepare for emergencies (backup personnel, spill containment, fire equipment, first aid, evacuations, etc.).

2.12. Follow additional health and safety procedures developed by the facility owner, as applicable.

## FS 5020. PRELIMINARY WASTE CHARACTERIZATION

1. Conduct a preliminary waste characterization prior to collecting samples for laboratory analysis. Use the waste characterizations to establish proper safety protocols and protections for sampling personnel, to make decisions regarding staging, bulking, compositing, segregation, shipping and disposal of wastes and to refine the selection of appropriate laboratory analyses for collected waste samples.

2. Classify the wastes into the following general categories: reactive wastes, explosives, acids, bases, ignitable wastes, heavy metals, pesticides, halogenated compounds, cyanides and oxidizers. In cases where sufficient information is not available, conduct further analyses to identify the material.

3. The field waste characterization tests listed below are designed to gain a quick, preliminary assessment of the types and levels of chemicals in the wastes. Perform the field methods below according to the manufacturers' instructions.

- HazCat Chemical Identification System
- Dräger Tubes
- Clor-N-Oil Test Kit
- Spill-fyter Chemical Classifier Strips
- Setaflash (ignitability)

4. Record the results of the preliminary characterization, including the results of any field waste characterization tests performed.

## FS 5100. Drum Sampling

1. PRECAUTIONS FOR DRUM SAMPLING

1.1. Opening closed containers and drums of unknown content is a hazardous activity. Give maximum attention to sampling team safety by establishing and following clear and proper procedure and wearing appropriate personal protection equipment. *Remote sampling technique may be required for some situations*. ***Conduct all sampling activities using appropriate personal protective equipment (PPE) for the level of hazard encountered. See FS 5010. If the contents of drums or their hazards are unknown, use Level B protection at a minimum.***

1.2. Exercise caution when excavating, inspecting, staging and sampling drums because of the potential presence of explosive or flammable gases, toxic vapors or other hazardous materials. Assume that labeled drums are mislabeled. In general, assume that all drums contain hazardous material until the contents have been independently characterized.

1.3. Refer to 29 CFR Part 1910.120(j) for OSHA standards required for drum and container handling.

*2.* DRUM EXCAVATION: ***All excavation activities must include appropriate personal protective equipment for the level of hazard encountered. See FS 5010. If the contents of drums or their hazards are unknown, wear Level B protection, at a minimum.***

2.1. Utilize geophysical techniques to approximate buried drum locations and depths.

2.2. Locate all utility lines, poles and pipes above and below ground. Ensure adequate clearance between all utilities or structures and the drum excavation area.

2.3. Use heavy equipment and equipment operators with drum removal experience to excavate, remove or handle drums. Avoid digging directly into drums. Final excavation must be done manually, using non-sparking hand tools.

2.4. Monitor the area around exposed drums for volatile organic compounds, explosives or radioactive materials before proceeding.

2.5. Identify each drum that will be opened. Use paint sticks, spray paint, traffic cones, etc.

3. DRUM INSPECTION: ***All inspection activities must include appropriate personal protective equipment for the level of hazard encountered. See FS 5010. If the contents of drums or their hazards are unknown, wear Level B protection, at a minimum.***

3.1. Visually inspect all drums that are being considered for sampling for the following:

- Pressurization (bulging/dimples)
- Crystals around the drum opening
- Leaks, holes, stains
- Labels, markings, hazard warnings
- Composition and type (steel/plastic and open/bung)
- Dead vegetation around drum
- Condition, age, rust, potential shock sensitivity
- Sampling accessibility

3.1.1. Drums showing evidence of pressurization and crystals must be furthered assessed to determine if remote drum opening is needed. Do not tap or knock the drums to determine drum contents or volume.

3.2. Uniquely identify each drum with a tag, label, bands, spray paint or other means. Indicate drum category, as determined by visual inspection. Use color-coding as needed to distinguish categories of drums.

3.3. Record all observations made during drum inspection.

*4.* DRUM STAGING: ***All staging activities must include appropriate personal protective equipment for the level of hazard encountered. See FS 5010. If the contents of drums or their hazards are unknown, wear Level B protection, at a minimum.***

4.1. Use heavy equipment and qualified equipment operators with drum handling experience to stage drums, if necessary.

4.2. If ignitable, explosive or reactive characteristics are indicated by initial characterization of drum contents, locate the staging area away from the drum-opening area to prevent chain reaction should an opened drum explode or ignite.

4.3. The procedures for handling and sampling drums differ by drum category. Separate drums into the following categories, based on determination of contents:

- Liquids
- Lab packs
- Solids
- Empty

4.3.1. Segregate drums containing radioactive, explosive or shock-sensitive material from other drums and the drum-opening area. Place drums containing these hazards in a diked and fenced area where practical.

4.3.2. Separate drums containing acids or bases from each other. Similarly separate drums containing other wastes known to react with each other.

4.4. Move drums from the staging area to the opening area one at a time using forklift trucks equipped with drum grabbers or barrel grapplers or, move by roller conveyor or other means.

5. DRUM OPENING PROCEDURES:

5.1. <u>General Considerations</u>:

5.1.1. ***Wear personal protective equipment (PPE) as prescribed in the reference cited in FS 5010 for the level of hazard encountered with each drum.***

5.1.2. Use remote drum-opening procedures when possible to maximize personnel safety.

5.1.3. Use manual bung wrench or deheader drum-opening procedures only with structurally sound drums that are capable of withstanding the forces applied during bung opening or deheading.

5.1.4. Do not attempt to use a manual bung wrench or deheader on drums that contain shock-sensitive, reactive, explosive or flammable materials.

5.2. Procedures Required Prior to Drum Opening: Before opening, ground each metal drum that is not in direct contact with the earth using grounding wires, alligator clips and a grounding rod or metal structure. If a metal drum is in an overpack drum, ensure the metal drum is grounded.

5.2.1. Touch the drum opening equipment to the bung or lid and allow an electrically conductive path to form. Slowly remove the bung or drum ring and/or lid with spark resistant tools (brass/beryllium).

5.2.2. Screen drums for explosive gases and toxic vapor with air monitoring instruments as bung or drum lid is removed.

5.2.3. Record the results of all monitoring of drums.

5.3. Tools for Opening Drums: See specific instructions below for use of various drum opening tools.

***All manual procedures require appropriate personal protective equipment (PPE) for all personnel working with the drum. The puncture or deheading of any drum may present a chemical splash hazard. The level of protection required is described in the reference cited in FS 5010 for the type of hazards encountered with each drum. If drum contents or hazards are unknown, wear Level B protection, at a minimum.***

5.3.1. Manual Bung Wrench

5.3.1.1. ***Wear appropriate protective gear per FS 5010.***

5.3.1.2. Position top or side mounted bungs in upright position.

5.3.1.3. Pull slowly and steadily across the drum.

5.3.1.4. Use a handle extension for increased wrench leverage where necessary.

5.3.1.5. Watch for sparking even when using non-sparking bung wrenches.

5.3.2. Manual Drum Deheader

5.3.2.1. Position the cutting edge of the deheader just inside the top chime and tighten the deheader adjustment screw to hold the device tight against the side of the drum.

5.3.2.2. Slowly make an initial cut into the drumhead to release pressure (or use remote techniques to relieve pressure prior to deheading procedures).

5.3.2.3. Move the deheader handle up and down while sliding the device along the chime.

5.3.2.4. Decontaminate the drum deheader between drums, if contact between the deheader and drum contents have occurred. See FC 1000.

5.3.3. Hand Pick, Pickaxe and Hand Spike

5.3.3.1. Anticipate potential splashing with the use of these tools. ***Wear proper personal protective gear per FS 5010.***

5.3.3.2. Use these devices where the bung cannot be opened or the drumhead cannot be removed.

5.3.3.3. Decontaminate hand tools between drums. See FC 1000.

5.3.4. Remote Opening Using a Backhoe Spike: Use this procedure for greater personal safety. Mount a splash shield in front of the backhoe operator cage**.** ***The operator must wear appropriate personal protection gear per FS 5010.*** Provide air supply gear to the operator, if applicable.

5.3.4.1. Place drums in rows such that the backhoe can be maneuvered between them.

5.3.4.2. Punch a hole in the drumhead with the backhoe spike.

5.3.4.3. Decontaminate the backhoe spike between drums. See FC 1220.

5.3.5. Remote Opening Using Hydraulic Devices

5.3.5.1. Follow manufacturer's instructions to puncture the drum.

5.3.5.2. ***This procedure presents a splash hazard. Wear personal protective gear per FS 5010, as applicable.***

5.3.6. Remote Bung Opening Using Pneumatic Devices: ***This procedure does not allow slow release of accumulated pressure in the drum. Wear personal protective gear per FS 5010 and take safety precautions during this procedure, as applicable.***

5.3.6.1. Do not attempt to remove rusted bungs with this device.

5.3.6.2. Place drums in level, upright position.

5.3.6.3. Follow manufacturer's instructions to fit the opener to the bung, remotely remove the bung and detach the device.

5.4. Inspecting Drum Contents

5.4.1. Note the state, quantity, phases, and color of the drum contents.

5.4.2. Review the screening results with any pre-existing data to determine which drums will be sampled.

5.4.3. Monitor headspace gases from opened drums. Use an oxygen meter and explosimeter first, followed by organic vapor analyzer (OVA) monitoring.

5.4.4. Record all results from the inspection of drums.

5.5. General Instructions for Drum Sampling

5.5.1. If applicable for the sampling plan, account for any stratification of drum contents by appropriate choice of sampling tools and techniques. If the entire depth of the drum must be represented by the sample(s), collect all phases and strata of the drum either as a composite or as discrete phase and stratum samples, as required. Only profiling

samplers such as COLIWASA (COMPOSITE LIQUID WASTE SAMPLER), thiefs, sludge judges, etc. allow proportional sampling of strata and phases.

5.5.1.1. Filling Multiple Sample Containers Where Strata or Phases are Composited: Using a proportional sampler, dispense an entire sampler volume of waste into each required sample container in succession until all containers are adequately filled.

5.5.1.2. Filling Multiple Sample Containers Where Discrete Stratum or Phase Samples are Required: Fill the required number of containers in succession using a discrete sampler to collect samples from the appropriate phase or stratum.

5.5.2. Account for sludge depth in the drum by measuring depth to apparent bottom and subtracting from drum total depth (height).

5.5.3. Select the appropriate sampling equipment based on the physical state of the material and the type of container. Sampling equipment must be made of non-reactive materials that will not alter the chemical or physical properties of the material that is to be sampled.

5.5.4. Place absorbent pads, sampling equipment and sample containers near drum(s) to be sampled.

5.5.5. Record all observations made during sampling. Document sampling per FD 5300.

***CONDUCT AIR MONITORING FOR TOXIC VAPORS, EXPLOSIVE GASES AND OXYGEN-DEFICIENT ATMOSPHERES DURING DRUM SAMPLING.***

## FS 5110. SAMPLING LIQUIDS FROM DRUMS

1. GLASS THIEF (TUBE)

1.1. General Considerations for Glass Thief

1.1.1. Use disposable glass tubes only.

1.1.2. Typical dimension for the glass thief is 6mm-16mm I.D. and 48 inches long.

1.2. Sampling Procedure for Glass Thief

1.2.1. Remove cap from sample container.

1.2.2. Insert thief into drum almost to bottom or until solid layer is reached. Allow one foot of tubing to extend out of the top of the drum.

1.2.3. Let the waste in the drum rise to its natural level in the thief.

1.2.4. Cap the top of the thief with a stopper or gloved thumb. Do not let waste liquid contact the stopper or thumb.

1.2.5. Withdraw the thief from the drum.

1.2.6. Insert open end of thief into the sample container and allow thief contents to drain into the container. Fill container 2/3 full.

1.2.7. When finished with the thief, break the thief into pieces and insert into the drum (if permitted by the sampling and disposal plans).

2. COLIWASA (COMPOSITE LIQUID WASTE SAMPLER)

2.1. General Considerations for COLIWASA Sampling

2.1.1. Use the COLIWASA to collect representative multiphase samples from the full depth of a drum, as applicable.

2.1.1.1. If it is not a disposable model, the COLIWASA may be too expensive for some applications and cannot be easily decontaminated in the field.

2.1.1.2. Variations in design of this sampling device may be available from different vendors but the operational principle is the same.

2.2. Sampling Procedure for COLIWASA

Follow manufacturer's directions for use if different from the following:

2.2.1. Configure the COLIWASA in the open position by lifting the stopper rod several inches above the closed position.

2.2.2. Slowly lower the sampler into the liquid waste at a rate that permits the levels of liquid inside and outside the sampler tube to rise to about the same heights. Failure to maintain equal heights inside and outside the tube will affect the representativeness of the sample. If the liquid level inside the tube is lower than the waste level outside the tube, the sampling rate is too fast.

2.2.3. When the sampler stopper hits the bottom of the drum, push the stopper rod to the closed position.

2.2.4. Slowly withdraw the sample from the waste liquid and simultaneously wipe the outside of the device with a disposable wipe.

2.2.5. Position the lower end of the COLIWASA in the sample container. Lift the stopper rod and carefully drain the waste liquid into the container.

2.3. Sampling Procedures for Other Devices: (Reserved)

## FS 5120. SAMPLING SOLIDS AND SLUDGES FROM DRUMS

1. GENERAL CONSIDERATIONS

1.1. Use a long-handled dipper, push tube or other coring device, scoop, spoon, bucket auger, screw auger or, if conditions necessitate, a pneumatic hammer/drill to obtain samples of solids in drums.

1.2. If necessary for the sampling plan, take multiple samples from different areas of the drum.

2. PROCEDURE FOR CORING DEVICE OR PUSH TUBE

2.1. Insert device to bottom of drum. T-handle and extension attachments, where applicable, must extend above the top of the drum.

2.2. Rotate the corer or push the sampling tube to cut a core of material.

2.3. Slowly withdraw the device to retain the sample.

2.4. Use stainless steel laboratory spatulas or scoops to transfer the sample to containers.

3. PROCEDURES FOR OTHER SAMPLING DEVICES: (Reserved)

### FS 5130. CLOSING DRUMS AND SEGREGATION OF EQUIPMENT AND WASTES AFTER SAMPLING

1. Close each drum when sampling of the drum is complete.

2. Segregate contaminated sampling equipment and investigation-derived wastes (IDW) containing incompatible materials as determined by the drum screening procedure.

3. Handle and dispose of IDW and contaminated disposable equipment according to local, state and federal regulations.

4. As required, wrap or bag contaminated reusable equipment in protective material or store in containers until cleaned.

## FS 5200. Tank, Sump and Leachate Sampling

1. INTRODUCTION: Some procedures for tank, sump and leachate sampling will be identical to those for drum sampling. The depth or physical configuration of some waste units will prevent the use of some equipment or techniques, depending on the unit to be sampled.

2. EQUIPMENT AND SUPPLIES: See Table FS 5000-1 for approved sampling equipment.

### FS 5201. *Presampling Considerations and Procedures for Tanks*

1. PRESAMPLING CONSIDERATIONS FOR TANKS

1.1. Sampling tanks is considered hazardous due to the potential for tanks to contain large volumes of hazardous materials. Follow appropriate safety protocols. Some tank sampling requires physical agility and manual dexterity in order to access the tank sampling points, carry equipment and supplies, open tank hatches and collect and containerize samples while wearing personal protective equipment. Personnel must be able to perform the appropriate procedures under these conditions.

1.1.1. **Wear p*ersonal protective equipment (PPE) as prescribed in the reference cited in FS 5010 for the level of hazard encountered with each tank. If the contents of a tank or its hazards are unknown, wear Level B protection while working in proximity to the tank.***

1.2. Unlike drums, tanks may be compartmentalized or have complex designs. Review preliminary information about the tank contents and configuration prior to the sampling operation to ensure the safety of sampling personnel and to ensure that study design objectives can be achieved.

1.3. In addition to having discharge valves near the bottom, most tanks and bulk storage units have hatches at the top. Collect samples from the top hatch because of the potential for tank contents to be stratified. *Do not collect samples from valves unless necessary and only if part of the sampling plan. See section 1.4 below*.

1.4. When sampling from the discharge valve, there is a possibility of a stuck or broken valve that could cause an uncontrolled release. Do not utilize valves on tanks or bulk storage devices unless the owner or operator of the facility operates them, or a containment plan is in place should the valve stick or break. If a tank must be sampled from a discharge valve, clearly understand the valving arrangement of the particular tank to ensure that the compartment of interest is sampled. Make sure that sampling from valves is specified in the sampling plan. *Valve sampling will not allow sampling of individual strata in the tank*.

1.5. If stratification of tank contents must be accounted for, choose appropriate sampling tools and techniques so that the entire depth of the tank is represented by the sample(s) collected. Sample all phases and strata of the tank either as a composite or as discrete phase and stratum samples, as required by the sampling plan. Only profiling samplers such as COLIWASA, thiefs, sludge judges, etc. allow proportional composite sampling of strata and phases. If proportional composite sampling of a tank is not practical, collect discrete samples from each phase or stratum in order to characterize the entire contents of the tank. If the sampling plan requires only approximate sampling or screening, collect a simple grab sample from the contents of the tank.

2. PRESAMPLING PROCEDURES FOR TANKS

2.1. Perform a structural integrity survey of the tank. Inspect the ladder, stairs, and catwalk that will be used to access the top hatch of larger tanks to ensure that they will support the combined weight of personnel and equipment.

2.2. Evaluate tank sampling points for safety, accessibility and sample quality.

2.3. Before opening, ground each metal tank using grounding wires, alligator clips and a grounding rod or metal structure.

2.4. Remove all sources of ignition from the immediate area.

2.5. Open any vents or pressure release valves slowly to allow the unit to vent to atmospheric pressure.

2.5.1. ***Monitor for explosive or flammable gases and toxic vapors during venting. If dangerous concentrations of gases evolve from the vent or the pressure is too great, close the system and leave the area immediately*.**

2.6. Touch tank opening equipment to the bolts in the hatch lid and allow an electrically conductive path to form. Slowly remove bolts and/or hatch with spark resistant tools (brass/beryllium).

2.6.1. ***If a pressure build up is encountered or detected, cease opening activities and leave the area.***

2.7. ***Screen the interior of tanks for explosive or flammable gases and toxic vapors with air monitoring instruments*.**

2.8. Depending on the study objectives and site conditions, conduct characteristic screening (e.g., pH, halogen, etc.) as required. Collect a small volume of sample for flash point testing, if warranted.

2.8.1. Note the state, quantity, number of phases and color of the tank contents.

2.8.2. Compare the screening results with any pre-existing data to determine if the tank should be sampled.

2.9. Determine depth of any and all liquids, solids and liquid/solid interfaces. Measure depth of any sludge. Use weighted tape measures, probe lines, sludge judges or other appropriate equipment to characterize tank stratification with depth.

2.10. Determine the inside diameter of the tank and calculate the volume of wastes in the tank using the depth measurements above. Do not assume that the external diameter of the tank approximates the inside diameter, since the tank construction may have insulation or support structures hidden under the external surface.

2.11. Record all observations, measurements and calculations made at the time of tank inspection. See FD 5300.

## FS 5210. GENERAL SAMPLING INSTRUCTIONS FOR TANKS

1. GENERAL CONSIDERATIONS: Because of the many different types of designs and materials that may be encountered, only general sampling procedures that outline sampling a tank from the top hatch are listed below:

CONDUCT CONTINUOUS AIR MONITORING FOR TOXIC VAPORS, EXPLOSIVE GASES AND OXYGEN DEFICIENT ATMOSPHERES DURING TANK SAMPLING

1.1. Select the appropriate sampling equipment based on the physical state of the material and the type of tank. Use sampling equipment constructed of non-reactive materials that will not alter the chemical or physical properties of the material that is to be sampled. See Table FS 5000-1.

1.2. ***Wear required personal protective equipment (PPE) as prescribed in the reference cited in FS 5010 for the level of hazard encountered with each tank. If tank contents or hazards are unknown, wear Level B protection, at a minimum*.**

1.3. Where tanks are compartmented, collect at least one sample from each compartment.

1.4. Place absorbent pads, sampling equipment and sample containers near tanks(s) to be sampled.

1.5. Document all observations and procedures associated with sample collection per FD 5300.

2. SAMPLING LIQUIDS FROM TANKS

2.1. Collect liquid samples according to the objectives of the sampling plan, using appropriate samplers.

2.2. Slowly lower the bailer, bacon bomb, Dipstick™, COLIWASA, or Teflon® tubing to the desired sampling depth. ***In work areas where explosive or flammable atmospheres could occur, do not use peristaltic pumps powered by batteries.***

2.2.1. Close the sampling device or start pump.

2.2.2. Slowly remove the sampling device from the tank.

2.2.3. Release or pump the sample from the device into the sample container(s).

2.2.4. Repeat the procedure until a sufficient sample volume is obtained.

2.3. Inspect samples for phase differences or stratification.

2.3.1. If separate phases or strata are observed in any sample container, perform repeated iterative sampling, if discrete phase or stratum sampling is required by the sampling plan. Systematically collect additional samples by halving the depth between two discreet sampling points to determine the next sampling depth. Repeat this procedure until no phase difference or stratification is noted in the sample. Calculate phase and stratum boundary depths from these samplings.

2.3.2. If discrete phase or stratum sampling is not required by the sampling plan, collect composite samples using appropriate profiling samplers or collect simple grab samples, depending on sampling plan objectives.

2.4. If additional sampling ports are available, verify phase and stratum information with additional samples from the other ports, if practical.

2.5. If more than one sample container will be used to collect for the analytes of interest, use the following procedures for filling multiple sample containers.

2.5.1. Filling Multiple Sample Containers Where Strata or Phases are Composited: Using a proportional sampler, dispense an entire sampler volume of waste into each required sample container in succession until all containers are adequately filled.

2.5.2. Filling Multiple Sample Containers Where Discrete Stratum or Phase Samples are Required: Fill the required number of containers in succession using a discrete sampler to collect samples from the appropriate phase or stratum.

3. SAMPLING SOLIDS/SEMI-SOLIDS FROM TANKS

3.1. Use a long-handled dipper, push tube, bucket auger, screw auger, Mucksucker™, or if conditions permit, a pneumatic hammer/drill to obtain the sample. See specific instructions for each applicable sampling device in FS 5211 below.

3.2. Carefully extrude the sample from the sampling device or use a clean stainless steel spoon to place the sample into containers for analyses.

3.3. Close the tank when sampling is complete.

4. WASTE DISPOSAL AND CONTAMINATED EQUIPMENT

4.1. Segregate contaminated sampling equipment and investigation-derived wastes containing incompatible materials.

4.2. Manage all waste according to applicable local, state and federal regulations.

## FS 5211. *Tank Sampling Instructions for Specific Sampling Devices*

Select the equipment described below for use based on the specific sampling requirements of the tank.

1. BACON BOMB SAMPLER: Use the bacon bomb sampler for discrete depth sampling in a tank.

1.1. Attach sampler retrieval line and plunger line, if necessary. The sampling line must be measured and marked for the predetermined collection depth required.

1.2. Slowly lower the bacon bomb to the required depth in the tank and pull and hold the plunger line to actuate filling of the sampler. Release the plunger line to stop filling and seal the sampler closed.

1.3. Retrieve the sampler by the sample line. Do not pull on the plunger line, or the sample will be lost or exchanged with the contents of the tank or a different phase or stratum. Wipe or rinse the exterior of the sampler before filling sample containers. Collect any rinsate for proper disposal.

1.4. Release contents into the sample container by pulling on the plunger line.

2. SLUDGE JUDGE: Use the sludge judge to obtain an accurate reading of the depth of settleable solids in any liquid and for collection of the sample for laboratory analysis.

2.1. Lower the sludge judge to the bottom of the tank and allow the sampler to fill to surface level and seat the check valve on the sampler.

2.2. Retrieve the sludge judge and raise it completely out of the tank liquid for determination of sludge depth.

2.3. Actuate release pin at the bottom of the sampler to release contents or fill a sample container.

3. SUBSURFACE GRAB SAMPLER: Use the subsurface grab sampler to collect samples at discreet depths in the tank.

3.1. Screw sample bottle onto the sampler head assembly.

3.2. Lower the sampler to the required depth and actuate the plunger mechanism.

3.3. Release the plunger to close the sampling head after filling the sample bottle and retrieve the sampler from the tank.

3.4. Remove and cap the sample bottle.

3.5. Decontaminate the exterior of the sample bottle.

4. GLASS THIEF (TUBE)

4.1. General Considerations for Glass Thief

4.1.1. Use disposable glass tubes only.

4.1.2. Typical dimension for the glass thief is 6mm - 16mm I.D. and 48 inches long.

4.1.3. Tanks greater than about 3 feet in depth cannot be sampled with a glass thief.

4.2. Sampling Procedure for Glass Thief

4.2.1. Remove cap from sample container.

4.2.2. Insert thief into tank almost to bottom or until solid layer is reached. Allow one foot of tubing to extend out of the top of the tank.

4.2.3. Let the waste in the tank rise to its natural level in the thief.

4.2.4. Cap the top of the thief with a stopper or gloved thumb. Do not let waste liquid contact the stopper or thumb.

4.2.5. Withdraw the thief from the tank.

4.2.6. Insert open end of thief into the sample container and allow thief contents to drain into the container. Fill container 2/3 full.

4.2.7. When finished with the thief, break the thief into pieces and insert into the tank (if permitted by the sampling and disposal plans).

4.2.8. Close tank cover.

5. BAILER

5.1. Slowly lower bailer into tank contents using non-reactive bailer line. Do not splash bailer into the liquid.

5.2. Retrieve the bailer after the bailer fills completely.

5.3. Slowly pour bailer contents into the sample container.

5.4. Close tank cover.

6. COLIWASA:

Follow manufacturer's directions for use if different from the following:

6.1. Configure the COLIWASA in the open position by lifting the stopper rod several inches above the closed position.

6.2. Slowly lower the sampler into the liquid waste at a rate that permits the levels of liquid inside and outside the sampler tube to rise to about the same heights. Failure to maintain equal heights inside and outside the tube will affect the representativeness of the sample. If the liquid level inside the tube is lower than the waste level outside the tube, the sampling rate is too fast.

6.3. When the sampler stopper hits the bottom of the drum, push the stopper rod to the closed position.

6.4. Slowly withdraw the sample from the waste liquid and simultaneously wipe the outside of the device with a disposable wipe.

6.5. Position the lower end of the COLIWASA in the sample container. Lift the stopper rod and carefully drain the waste liquid into the container.

7. ADDITIONAL SAMPLING DEVICES: Reserved

### FS 5220. LEACHATE AND SUMP SAMPLING

1. As applicable, follow DEP SOP procedures for tank, drum, groundwater, surface water and sediment sampling. See FS 5100 and FS 5200 above, as well as FS 2100, FS 2200 and FS 4000.

2. Document leachate and sump sampling according to the documentation requirements for the respective DEP SOPs employed to collect samples, per the above. Document additional items per FD 1000.

## FS 5300. Waste Pile Sampling

1. The number of samples, the type of sample(s) and the sample location(s) or sampling point(s) for waste pile sampling will be based on sampling plan objectives as determined by permitting or other regulatory criteria and according to the size, shape, material composition, compactness or other characteristics of the pile and the distribution of analytes, analyte concentrations and strata in the waste pile.

2. Follow directives of the sampling plan specific to the project.

3. Document waste pile sampling according to associated regulatory requirements for the project. Document additional items per FD 1000, as applicable.

4. Refer to FS 3000 for soil sampling procedures applicable to waste pile sampling.

## FS 5400. Impoundment and Lagoon Sampling

1. Surface impoundments vary in size, shape, and waste content, and may vary in distribution of hazardous constituents and characteristics (strata). The number of samples, the type of sample(s), and the sample location(s) will be based on the sampling design objectives.

2. Commonly used equipment to collect samples from surface impoundments are listed in Table FS 5000-1. All equipment must be compatible with the waste to prevent any alteration of the sample.

**3. *Because of the potential danger of sampling waste units suspected of containing elevated levels of hazardous constituents, do not attempt to sample surface hazardous waste impoundments from a boat. Conduct all sampling from the banks or piers of surface impoundments. Any exception must be approved per specific provisions in the applicable health & safety plans and sampling plans*.**

4. Refer to FS 2100 and FS 4000 for general surface water and sediment sampling procedures applicable to waste impoundment sampling.

4.1. Additionally, some procedures and equipment applicable to drum and tank sampling may be useful for waste impoundment sampling. See FS 5100 and FS 5200 above.

5. Document impoundment and lagoon sampling procedures and observations per FD 1000 for the applicable procedures employed.

## Appendix FS 5000

## Tables, Figures and Forms

Table FS 5000-1 Waste Sampling Equipment

## Table FS 5000-1 Waste Sampling Equipment

| Equipment | Construction Material[1] | Phases | Waste Units or Sources | Limitations |
|---|---|---|---|---|
| Scoop with bracket and handle | Stainless Steel | Liquids, Solids, Sludges | Impoundments, Piles, Drums and Containers, Tanks | Depth constraint. Cannot collect deeper phase or stratum in stratified waste |
| Spoon | Stainless Steel | Solids, Sludges | Impoundments, Piles, Drums and Containers, Tanks | Depth constraint. Cannot collect deeper strata |
| Push Tube | Stainless Steel | Cohesive Solids, Sludges | Impoundments, Piles, Drums and Containers, Tanks | Depth constraints. Do not use to sample solids with dimensions >½ the diameter of the tube |
| Auger | Stainless Steel | Solids | Piles | Unusable for solidified wastes |
| Sediment Sampler | Stainless Steel | Solids, Sludges, Sediment | Impoundments, Piles | Do not use to sample solids with dimensions >½ the diameter of the tube |
| Ponar Dredge | Stainless Steel | Solids, Sludges, Sediments | Impoundments | Deployment constraints. Must have means to position equipment to desired sampling location. Difficult to decontaminate |
| COLIWASA, Drum Thief | Glass | Liquids, Sludges | Impoundments, Drums and Containers, Tanks | Depth constrained to length of sampling device. Not effective with viscous wastes |
| Mucksucker™ Dipstick™ | Teflon | Liquids Sludges | Impoundments, Drums and Containers, Tanks | Not recommended for tanks >11 feet deep |
| Bacon Bomb | Stainless Steel | Liquids | Impoundments, Tanks | Not effective with viscous wastes |
| Bailer | Stainless Steel Teflon | Liquids | Impoundments, Tanks | Do not use with heterogeneous wastes. Not effective with viscous wastes |
| Peristaltic Pump with Vacuum Trap Assembly[2] | Teflon Glass | Liquids | Impoundments, Drums and Containers, Tanks | Do not use in flammable atmospheres. Not effective with viscous wastes |
| Backhoe Bucket | Steel | Solids Sludges | Piles | May be difficult to access desired sampling location. Difficult to clean. Loss of VOCs possible |
| Split Spoon | Stainless Steel | Solids | Piles | Requires drill rig |
| Roto-Hammer | Steel | Solids | Piles, Drums, Containers | Physically breaks up sample. May release volatiles. Not for flammable atmospheres |

[1] If disposable equipment of alternative material construction is used, ensure that the equipment is compatible with the chemical composition of the waste and will not alter the characteristics of the waste sample in any way.

[2] A peristaltic pump may be used without an optional vacuum trap assembly if the flexible tubing used in the pump head is one foot or less in length. Do not pump samples for VOCs through the pump head or into a vacuum trap.