

**Cover Sheet
Standard Operating Procedure**

Operation Title: Protocol for Collecting Samples from Containers

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1.0 Applicability

This Standard Operating Procedure (SOP) applies to all programs in the Maine Department of Environmental Protection's (MEDEP) Division of Remediation (DR). It may be utilized by other Divisions within MEDEP, as determined by the respective Division Directors or their designees.

This SOP is not a rule and is not intended to have the force of law, nor does it create or affect any legal rights of any individual, all of which are determined by applicable statutes and law. This SOP does not supersede statutes or rules.

2.0 Purpose

The purpose of this document is to describe the MEDEP/DR procedure for the handling and sampling of containers containing unknown and known hazardous chemicals and petroleum products. This includes drums of all sizes, tanks of all sizes, buckets, cans and any other type of vessel that may contain chemicals (in all phases) as well as petroleum. Such sampling has inherent physical and chemical exposure risks and requires proper planning to mitigate those risks. Staff may not conduct work in scope that is beyond their training, job classification, and health monitoring level.

3.0 Key Definitions

FID: Flame Ionizing Detector

PID: Photoionization Detector

Bomb Sampler: Tubular-shaped sampler attached to a rope or chain with a remote operated opening.

COLIWASA: composite liquid waste sampler

Drum Thief: Rigid length of tubing used to obtain a liquid sample from a drum or tank

PPE: Personal Protective Equipment

4.0 Responsibilities

All MEDEP/DR Staff must follow this procedure when performing this task. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this SOP. MEDEP/DR staff reviewing data by outside parties should ensure that this SOP (or an equivalent) was followed, depending on the specific Data Quality Objectives (DQOs) of the task.

Other MEDEP SOPs may also apply when performing this task, including, but not limited to MEDEP/DR SOP *RWM-DR-014 - Development of a Sampling and Analysis Plan* (SAP). The SAP should consider quality assurance and quality control (QA/QC) samples and measures, the specifics of which will depend on the DQOs for the task. Types of QA/QC samples are discussed in more detail in the DR Quality Assurance Plan (QAP). SAP development includes provisions for creating a Health and Safety Plan (HASP) associated with the activity, including compliance with [Dig Safe](#) notifications when disturbing soil with powered equipment or tools (i.e., not hand tools). Dig Safe notification does not include public utility clearance requests which must be completed separately (e.g., sewer and water lines). These utility marking requests typically do not extend onto marking private property (i.e., they may only mark lines in the public right of way), so hiring a private utility marking company may be necessary, depending on site specifics. Fieldwork and data collection tasks must be properly documented in accordance with applicable MEDEP SOPs and policies.

5.0 Guidelines and Procedures

5.1 Introduction

The situations in which containers of chemicals are discovered and require sampling for characterization is wide and varied. Situations can include: a few containers of unknown material in an abandoned residential garage; a cache of drums located in the basement of a mill; or mass burial of drums and tanks in a field. Each of these situations provides its own hazards, constraints, and sampling requirements. Therefore, this SOP will outline the items that need to be considered for planning and implementing container sampling. **It should be noted that personnel are not to conduct work in scope that is beyond their training, job classification, and health monitoring level.**

5.2 Planning /Site Reconnaissance

Planning and preparation are the keys to a safe and productive container sampling event. Prior to conducting any type of container sampling, a sampling and analysis plan (SAP) and a health and safety plan (HASP) must be developed. Protocol for the development of a Sampling and Analysis Plan can be found in MEDEP/DR SOP# RWM-DR-014 – Development of a Sampling and Analysis Plan. However, container sampling does have additional needs. A full reconnaissance of the site should be conducted prior to actual opening and sampling of containers. All containers should be identified, inventoried, and conditions noted prior to the actual sampling event. Additionally, all staging, sampling and storage areas should be inspected to ensure the areas are of suitable size, provide stable conditions, and adequately protect staff and containers during sampling and storage until disposal is arranged. It is better to make additional reconnaissance trips to ensure that all needed information is obtained, rather than be surprised during sampling when containers will be open and chemicals are exposed.

The SAP should address all of the following items:

- **Purpose of sampling.** Is sampling to determine what the material is, or for disposal purposes? What analysis will be run? How much material is needed for each sample? What are the data quality objectives?
- **Location and access of containers.** Where are the containers on the site located? Are they buried? Is it safe to excavate them? If located in a structure, is it safe for access? Will the structure require shoring? If the containers are not sealed or are leaking, have they created a hazardous situation where they are located?
- **Number of containers to be sampled.** How many containers are there? Have they all been identified, or will more be located? Is each one to be sampled? Can they be grouped together?
- **Type and size of containers to be sampled.** Are all containers of the same type and size, or are they different? Will you need different size/type of opening devices for containers?

- **Condition of containers.** Are containers intact, or will they fall apart if moved?
- **Moving of containers.** Can containers be sampled where they are currently located, or must they be moved? How will they be moved? Do containers with non-compatible materials exist near each other?
- **Opening of containers.** How will containers be opened? Does the access port work, or is it rusted shut? Will we need to puncture containers to access contents?
- **Material within containers.** What most likely is the material to be sampled? Are there markings? From what industry did the material come from? Is it a solid, liquid, or gas? Might it be multiphase and layered? Which layers should be sampled? Are the contents unused chemicals in their original containers, or a waste chemical in a reused container?
- **Health risks posed by material.** How toxic is the material? Will it explode? Will it release toxic gases once opened? Do samplers have the correct personal protective equipment (PPE)?
- **Security of containers after sampling.** Can the containers be closed after opening? Will containers be safe from weather and people accessing site?
- **Surrounding area.** Is it residential, urban, industrial, or commercial? If containers leak or explode, will neighbors be affected? Can vandals break into the site and disturb containers after sampling?
- **Shipping of material to a lab.** Are there any rules or regulations that apply to shipping the material that has been sampled? Any special manifests or tamper proofing required? Is material safe to transport via standard shipping? What if a container breaks?
- **Decontamination.** Certain chemicals may require additional decontamination procedures. Will the site be able to support the required decontamination? Will a water supply or electricity be required that isn't currently available at the site location?

- **Documentation.** What level of documentation is required? Will documentation be needed to meet disposal requirements, or will documentation be used in an enforcement action? Will specialized forms be used?
- **Exposure to material.** What will happen to staff if exposed, and can local hospitals decontaminate accident victims if necessary?

The SAP should also include a map or description of the activities area showing staging areas, egress routes, hot/cold zones, decontamination areas, container storage areas, and any other areas of activity or hazard.

Please note: Container sampling situations exist that may require use of PPE that require specialized training and health monitoring

5.3 Equipment

Equipment for a container sampling event can be varied depending on the containers to be sampled, condition, and location, as well as the sampling objective. Required equipment may include:

- Personal protective equipment (PPE)
- Environmental monitoring equipment
- Container staging equipment
- Container opening equipment
- Sampling equipment
- Sampling containers
- Decontamination equipment

5.3.1 Personal Protective Equipment (PPE)

Container sampling provides additional health and safety risks beyond standard environmental sampling. Chemicals will be encountered in a non-diluted form, such as solid, liquid, or gas, and may pose additional dermal and respiratory risks. Additionally, physical hazards with accessing and opening containers, such as sharp edges, may also be present. Therefore, in addition to standard field PPE (steel toed/shank boots, coveralls, eye protection) additional PPE may be required, based on the expected chemicals to be sampled, and the environment in which the containers will be located during sampling. Additional PPE that may be required includes:

- Chemical protective boots or over boots
- Chemical specific coveralls
- Chemical specific gloves
- Face shields or other splash or vapor protection
- Respiratory Protection – air purifying respirators (APR) or self-contained breathing apparatus (SCBA); APRs and SCBAs can only be used by those participating in the DR's Respiratory Protection Program

It is imperative that selected PPE meet the needs of the sampling and that it is compatible with the chemicals expected to be encountered. PPE and chemical compatibility can be found from suppliers of PPE, manufacturers of PPE, and OSHA and USEPA websites and guidebooks. Guidance changes as new material for PPE is developed, and additional toxicological information is developed. It is imperative that up-to-date information be obtained. As stated earlier, PPE must be outlined in the sampling plan and references should be included from which compatibility is determined.

Respiratory protection is based on chemicals encountered and the environment of sampling. For example, opening and sampling of containers in a basement with no air exchange may require respiratory protection, whereas sampling of containers in a wide-open field may not. As with the case of PPE, health safety levels of chemical vapors can be found in various OSHA, NIOSH, and USEPA websites and guidebooks, and manufacturers of respiratory sampling equipment. Up-to-date information must be obtained to ensure appropriate respiratory protection decisions are made. The need and requirements for respiratory protection must be addressed on the sampling plan; references for determining levels of respiratory protection should be included.

5.3.2 Environmental Monitoring Equipment

It may be necessary to conduct monitoring of the ambient air prior to, during, and after sampling to ensure a safe environment, and to determine the appropriate levels of PPE that are required. MEDEP/DR and Maine Department of Environmental Protection Division of Technical Services (MEDEP/TS) maintain various environmental monitoring equipment, including but not limited to:

- Flame ionization detector (FID)
- Photoionization detectors (PIDs) with parts per million and parts per billion detection limits,
- Multi-gas meters (methane, oxygen, hydrogen sulfide, and carbon dioxide)

Staff should receive training on the proper use of monitoring equipment prior to using it in the field and review the SOPs for that equipment's use. Please refer to SOP# DR-019-Protocol for the Use of Portable Air Monitors.

It must be documented in the HASP that the field monitoring equipment selected for a sampling event will detect the chemicals of concern at the chemicals' health and safety guidance levels. Information regarding the use and detection limits of specific monitoring equipment is provided by the manufacturer. Detection limits and health levels, including action levels for determining appropriate PPE, can be found at USEPA, NIOSH, and OSHA guidebooks and websites.

Given the potential sampling situation, it may be necessary to rent additional equipment to provide monitoring that MEDEP equipment cannot. All users of rented equipment must be appropriately trained for its use and interpretation of the results.

5.3.3 Container Staging Equipment

If containers need to be moved to be staged or stored, the equipment necessary for moving the containers must be determined prior to the sampling event. This may include items for manual moving, such as drum dollies or other hand carts, and mechanized equipment, such as pallet jacks, bobcats, and excavators with appropriate container grappling equipment. The Sampling and Analysis Plan will outline the method for moving and securing containers.

5.3.4 Container Opening Equipment

Devices for opening containers depend on the type of containers to be opened, the condition the containers are in, and the material within the container. Some containers have bungs requiring a specific bung wrench; others may be opened with a standard adjustable wrench. Many containers in which the entire top is

removed may require only a flat screwdriver. Tool requirements for opening containers should be determined during site reconnaissance. Depending on the suspected material in the container, it may be necessary to utilize non-sparking tools constructed from a copper alloy to prevent sparks. Due to corrosion, many containers entry points may be corroded shut. In these instances, puncturing the drum with a hammer and spike, or a spike attached to a hydraulic arm (such as on an excavator or backhoe) may be necessary. Many tools are available that are constructed from copper alloys to prevent sparks igniting combustible atmospheres.

Possible tools that may be used for opening containers include:

- Bung Wrench, standard and non-sparking
- Adjustable wrench, standard and non-sparking
- Flat screwdriver, standard or non-sparking
- Hammer, standard or non-sparking
- Spike or other puncturing tool, standard or non-sparking
- Crowbar, standard or non-sparking
- Excavator, backhoe, or other powered machinery for more puncturing power

5.3.5 Sampling Equipment

There are numerous types of sampling devices that are available for the sampling of containers including: drum thieves, bomb samplers, composite liquid waste samplers (COLIWASA), etc. Each device collects samples in a different way; samplers should be selected based upon the expected material and its physical characteristics, phase, viscosity, etc. Standard sampling tools such as dippers, scoops, and even shovels and crow bars may be viable tools for collecting samples from containers.

The following describes the sampling tools specific to containerized chemical sampling:

- **Bomb Sampler :** A bomb sampler is a tubular-shaped sampler attached to a rope or chain with a remote operated opening. Bomb samplers are made from a variety of materials, such as plastic, Teflon, or stainless steel, so the appropriate sampler can be selected for compatibility with expected material to be

sampled. Bomb samplers are used to extract liquid samples (typically between 4 and 32 ounces) from tanks, ponds, or larger drums, at specific depths. The bomb sampler requires two lines; one to lower and raise the device, and one to open the plunger, which allows the liquid to flow into the sampler.

- **Composite Liquid Waste Sampler:** A composite liquid waste sampler (COLIWASA) is a “tube” of varying size and material with a means of opening and closing the lower end to allow the material to enter the tube, then close the tube to keep the sample from escaping. A COLIWASA is designed to take a composite (from top to bottom) sample. This sampler was originally developed to obtain samples from drums, but is currently available in many sizes and materials to allow use for sampling drums, tanks, pails, tank cars, etc. Available construction material includes glass, plastic, acrylic, and Teflon.
- **Drum Thief:** A drum thief is a rigid length of tubing, which is used to obtain a liquid sample from a drum or tank. A thief differs from a COLIWASA in that it relies on capillary pressure to hold the sample within the tube. Drum thief samplers are manufactured in both glass and plastic and come in varying sizes.
- **Peristaltic Pump:** A peristaltic pump is a vacuum pump that may be used to obtain a sample from a drum by lowering the tubing from the pump into the container and removing the sample at the desired depth. Peristaltic pump tubing comes in a variety of materials.
- **Sampling Containers:** Sampling containers will be based on the requirements of the laboratory conducting the analysis. Project managers must communicate with the laboratory conducting the analysis to ensure appropriate chemical analysis is being conducted and appropriate containers are procured. Additionally, requirements for sample preservation should also be determined and included in the sampling plan.
- **Decontamination Equipment**
Decontamination procedures can be found in MEDEP/DR SOP# RWM-DR-017 –Equipment Decontamination Protocol and must be

outlined in the SAP. Sampling tools, such as drum thieves and COLIWASAs, are considered one use/disposable and will not be decontaminated. Other devices, such as bomb samplers, may be decontaminated. Similarly, PPE, such as gloves, coveralls, booties, etc. are also considered one use/disposable items. However, it may be necessary to remove gross contamination or to neutralize reactive chemicals prior to removal of PPE.

5.4 Sampling Procedure

1. **Conduct Site Reconnaissance/ Inventory Containers.** As discussed earlier, a complete reconnaissance/inventory of the containers and possible contents must be conducted.
2. **Draft Sampling Plan.** Using information obtained during site reconnaissance, research into site activities, possible sources of containers, PPE requirements, and sampling needs, draft an appropriate Sampling and Analysis Plan (SAP), and Health and Safety Plan (HASP). All staff involved in sampling activities must read the SAP and HASP prior to conducting any field event.
3. **Mobilize to Site.** Prior to conducting any activities, conduct a field team meeting with all staff involved to ensure all staff understand their roles and responsibilities. Set up hot/cold zones, decontamination zones, and post-sampling container storage areas, and any other site-specific preparation activities as outlined in the SAP.
4. **Set up environmental monitoring equipment (if necessary).** As outlined in the SAP, calibrate and set up all required environmental monitoring equipment, following appropriate SOPs and the operator's manual for the specific monitoring device.
5. **Don appropriate PPE.** Don all appropriate PPE as outlined in the SAP/HASP.
6. **Stage containers.** If determined necessary, move containers to a safe and secure location for conducting the sampling.
7. **Open containers.** Using the appropriate tools as outlined in the SAP, open the containers to access material. Conduct monitoring of breathing zones with monitoring equipment, as outlined in the SAP. Results of

monitoring should be documented in a field book, as well as any other observations made such as odors, visible emissions from containers, etc.

8. **Collect Samples with selected equipment.** Utilizing the chosen equipment, collect samples from containers. Prior to collection, an attempt should be made to determine if contents have separated into different layers that may require multiple collection from one container. Be sure to close containers tightly after sampling to prevent any leakage. Sampling should be documented in field notes as outlined in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Activities and Development of a Trip Report, and any other requirements as outlined in the SAP. Any observations regarding layers, odors, etc. should be documented in field notebooks, as well as any other observations considered important. It should be noted that during the act of sampling, situations may arise that were not planned for. It is better to back away and sample another day than risk injury by improvising.
9. **Seal and secure containers.** Replace bungs/covers, or if damaged or samples were collected through punctures, seal up containers to prevent any leakage from containers. Secure containers to prevent unauthorized access.
10. **Prepare sampling containers/jars for transport.** Clean any chemicals from sides of jars. It may be necessary to “double wrap” containers to prevent sample container handlers from contacting spilled material on sides of jars. Pack sample jars in cooler or other appropriate carrier to prevent damage while shipping. If transporting containers to lab via a public courier such as UPS or FEDEX, make sure appropriate DOT requirements for the potential chemicals are followed.
11. **Decontaminate Staff/Equipment.** Following the protocol outlined in MEDEP/DR SOP# RWM-DR-017 –Equipment Decontamination Protocol and in the Site-Specific SAP, decontaminate equipment and staff as necessary. If using disposable equipment/PPE, collect material and arrange for appropriate disposal. It may be necessary to store the equipment until results of the sampling have been received. Be sure to find a secure location to store this material.

12. **Secure Containers/Site.** Prior to leaving the Site, make sure containers are closed and secure, along with any waste generated that is not being immediately removed. Be sure to secure the site to prevent unauthorized access.

6.0 References

None