



# **Department of Environmental Health and Safety (DEHS)**

## **WASTE DISPOSAL MANUAL**

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## Chapter 1 Introduction

The University of Louisville is committed to maintaining a safe and healthful work environment for its faculty, staff and students. This manual contains procedures for reducing or eliminating accidental illness, injury, death or environmental damage which can result from the improper management and disposal of wastes produced by the University.

This Disposal Guide has been developed to assist University personnel in the proper handling and disposal of chemicals and chemical products in the laboratory and other University work areas. Although the guide was specifically written to outline procedures for chemical wastes, it also contains useful information on many other types of wastes (i.e., radioactive, infectious, asbestos, PCB's, gas cylinders, empty containers, controlled drugs, and waste oils).

Each person in a supervisory or management capacity is responsible for providing and maintaining proper waste management in his or her respective area and for ensuring that all authorized and applicable guidelines contained in this manual are followed. It is of prime importance that all supervisory personnel understand and accept this responsibility, and take an active role in working with faculty and staff to provide necessary training, and by setting an example for them to follow.

Ultimately, it is individual faculty and staff who are responsible for implementing this Disposal Guide, so take personal responsibility for your area. Your attitude, knowledge, and actions will determine the success of our environmental programs.

### 1.1 Legal Obligation

Increased public concern over environmental issues led to a major expansion of the federal and state environmental laws in past years. Aggressive enforcement of these laws by regulatory agencies has also increased. The numerous environmental laws enacted have been documented in thousands of pages of regulations, creating an extremely complex scheme. Despite this complexity, liability for noncompliance with environmental regulations is not limited to major, intentional offenses that cause significant harm to public health or the environment. In fact, sizable penalties have been imposed for relatively minor, inadvertent violations.

Regulatory agencies and the courts assume that persons working with chemicals today are knowledgeable of the potential hazards involved with their work. Therefore, civil and criminal penalties can be imposed on institutions for non-compliance. Further, this liability can extend beyond the institution to individuals, based on the reasoning that all responsible personnel, from a lab instructor to a college president, share in the duty of ensuring compliance with the environmental laws.

It is quite clear that the University of Louisville and its employees need to meet the challenges posed by the environmental laws and regulations. This Disposal Guide contains the information that will enable University personnel to meet their responsibility for environmental compliance.

## Chapter 2 Just The Facts

This Chapter is designed to give users just the basics they need to know to manage Hazardous, Radioactive, and Infectious Wastes at the University of Louisville. It is for quick reference only and is by no means comprehensive. Users should read all the applicable portions of this Disposal Guide for full explanation of the waste disposal procedures at the University.

### 2.1 How to Comply with the Hazardous Waste Regulations

Except for two areas controlled solely by the Department of Environmental Health and Safety (DEHS) and 90-day central hazardous waste accumulation areas in School of Dentistry (1 x for clinical amalgam waste) and Belknap Academic Building (3 x Chemistry teaching labs) all other areas managed at the University of Louisville are considered satellite accumulation areas (SAAs). This is a regulatory designation which allows generators in these areas to operate under fewer regulatory requirements, but still imperative to protecting the human health and the environment. As such, the following four points, referred to as the 4Ls of chemical hazardous waste management are a must that generators need to know to operate in compliance with the law. It is critical that generators know and understand these points and that they manage their waste in accordance with them.

## 2.2 The 4Ls for Hazardous Waste Requirements

**L Location...** Hazardous chemical waste must be at or near the point of process generating waste (e.g. *same room waste is generated in*)

**L Label...** Each hazardous waste container must be clearly labeled as “Hazardous Waste” and “Indication of Hazard(s)” (i.e. Flammable, Toxic, Corrosive, Oxidizer, Water-Reactive, etc.)

**L Lid...** Each hazardous waste container must have a securely fitting lid. Also, lid must be CLOSED except when adding or removing waste

**L Limit...** The amount of hazardous waste accumulated, or stored, on-site must be less than 50 gal (200 L) or 400 lb (180 kg) of non-acute hazardous waste or 1 quart/1 kg of highly toxic [EPA P-Listed] hazardous waste.

Additionally, each hazardous waste collection container

- The container holding the hazardous waste must be in good condition. This means no cracks, no rust, and no leaks.
- The container holding the hazardous waste must be compatible with the waste and any waste mixtures in that container must also be compatible.

## 2.3 How to get Chemical Hazardous Waste Picked Up

To have chemical hazardous waste container(s) picked up by DEHS, submit your pickup request via the online university-wide hazardous waste management program, Chematix, at <https://louisville.chematix.com/Chematix/Login>. If you have never used Chematix, contact DEHS at 852-6670 or [chematix@louisville.edu](mailto:chematix@louisville.edu) for further assistance and training. For existing users of Chematix, Quick Reference Guides and Videos are available at <https://louisville.edu/dehs/waste-disposal>

# Chapter 3 Chemical Waste Management System

## 3.1 Policy and Goals

The University of Louisville recognizes and accepts its responsibility to provide proper hazardous waste management for University operations such as its research, teaching and support functions that generate chemical waste. In meeting this responsibility, the University has charged the Department of Environmental Health and Safety (DEHS) with the primary responsibility for coordinating the hazardous waste management program. Hazardous waste management is not the exclusive

responsibility of any one individual. Every person employed by the University must assume and demonstrate by their action primary responsibility for his or her own chemical waste.

Each employee is personally responsible for complying with the requirements contained in this Disposal Guide. Employees generating chemical waste have moral and legal obligations to see that the waste is handled and disposed of in ways that minimize both short-term and long-term harm to human health and the environment. DEHS has defined five main goals for the University to fulfill this responsibility.

- Manage and dispose of hazardous waste in a manner which prevents harm to human health and the environment and protects the faculty, staff, and students.
- Manage and dispose of hazardous wastes in the most responsible, environmentally sound, and cost-effective manner.
- Reduce the quantity of hazardous waste generated by the University by encouraging prudent purchase of chemicals and training the University community in responsible work practices.
- Provide safe storage of hazardous waste pending disposition.
- Comply with all government regulations regarding hazardous waste management.

### 3.2 Program Overview

The primary goal in handling and disposal of hazardous waste is to do so in a manner which prevents harm to human health and the environment. Extensive federal, state, and local regulations govern hazardous waste management. The University is covered by these regulations, which are beyond the scope of this guide but, in general, they regulate the handling, transportation, storage, and disposal of waste. The regulations also require extensive record keeping and a “cradle to grave” tracking system which tracks hazardous wastes from their point of generation through disposal. This allows all waste to be accounted for at any stage between generation and disposal.

DEHS will collect all chemical wastes, hazardous waste and non-hazardous waste, from each generating location at the University upon receipt of a properly completed Chematix submitted Waste Chemical Pickup Request Form from the generators of this waste. The wastes are transported by DEHS via a truck designed for transportation of hazardous materials to the University’s Environmental Protection Services Center (EPSC). This facility has a hazardous waste permit and is engineered to meet building safety and fire codes. It is inspected annually by the Kentucky Department for Environmental Protection and the United States EPA to ensure compliance with applicable regulations.

The generating location, type, and quantity of each chemical is documented as wastes are shipped to the EPSC and this information is maintained by DEHS in a computer database. The wastes are then segregated according to compatibility groups and placed in the EPSC. Some wastes are treated to remove their hazardous waste designation and many liquid wastes such as solvents are consolidated with compatible liquids in larger containers. The wastes are stored in the EPSC and scheduled for removal and disposal to a permitted hazardous waste facility within one year of pick up.

### 3.3 Where is Hazardous Waste Generated?

Most colleges and universities generate hazardous waste and therefore are regulated as hazardous waste generators. Chemical use in laboratories results in the need for disposal of mixed solvents, reagents, reaction products, and excess chemicals of all types. In addition, a number of other fairly common activities at colleges and universities may result in the generation of hazardous waste. Examples include

an electrical shop that uses batteries that contain heavy metals and photography labs disposing of developing solutions that contain silver compounds. Listed below are some common points of generation at the University of Louisville.

Source	Waste Generated
Research & Teaching Labs	Waste solvents, reagents, experimentation residues, mercury
Electrical Maintenance	Used lamps, ballasts and batteries
Paint Shop	Waste solvents and old paint
Photographic Labs	Used developers and fixers
Buildings & Grounds Services	Used oil, out-dated products, aerosol products
Art Studios	Used solvents, thinners, pigments, inks, acids, glazes, et al

### 3.4 What is Hazardous Waste?

In general hazardous waste is either:

- Listed in one of four lists that the EPA has generated, or;
- Exhibits a characteristic that the EPA has identified as making it a hazardous waste.

The initial step toward proper chemical and hazardous waste management is to determine whether the waste is hazardous. This determination is important to meet environmental regulations and to properly complete the Chemical Pickup Request Form. A brief description of the process generating the waste is also required on the DEHS forms. This helps DEHS and the generator make the determination of whether the waste is a hazardous waste.

EPA has listed specific chemicals which are hazardous and must be handled in accordance with the hazardous waste regulations. They also identified certain chemical characteristics which can cause a waste to be designated as hazardous. This chapter discusses these lists and characteristics. For the purpose of this program, chemicals that should be considered waste are those which are contaminated or are spent and can no longer be used. Outdated chemicals, and chemicals in poor containers are also to be considered waste. Chemicals which have not exceeded their shelf life, are in good containers, and could be used by someone else are not classified as a waste. These chemicals should be collected by DEHS for placement in the redistribution program.

#### Listed Hazardous Wastes (F-List, K-List, P-List and U-List)

EPA has developed several lists of substances which have been shown to have toxic, carcinogenic, mutagenic, or teratogenic effects on humans or other life forms. Chemicals with physical characteristics such as ignitability, corrosivity, or reactivity are also listed. Because there are over 700 chemicals on these lists and the regulatory principles are not intuitive, determination whether or not a waste is hazardous using EPA lists is a complex task which requires some degree of familiarity with the regulations. Many chemicals which are at least moderately toxic, moderately corrosive or combustible do not appear on these lists. Therefore, any chemical suspected of having any toxic or hazardous properties should be handled by DEHS. Refer to the material safety data sheet, container label, or a reference book such as Merck Index to make determinations on toxicity. When in doubt about whether a material is hazardous, handle it as if it is or contact DEHS at 852-6670 for assistance.

F-List: These wastes are known as “Non-Specific Source Waste”. These are mostly spent organic solvents. Many of UofL’s laboratories and work shops generate these spent solvent wastes. Regulated F-listed spent solvents include:

**Halogenated solvents...**

Tetrachloroethylene, methylene chloride (*dichloromethane*), carbon tetrachloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, o-dichlorobenzene, trichlorofluoromethane and 1,1,2-trichloroethane;

**Non-Halogenated solvents...**

xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, methanol, cresols and cresylic acid, nitrobenzene, toluene, methyl ethyl ketone, carbon disulfide, isobutanol, and pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane;

**P-List (acutely hazardous) and U-List (moderately toxic)**

U and P listed wastes are discarded commercial chemical products, off-specification species, container residues, and spill residues thereof. In general, they are unused materials containing only one active ingredient. U of L generates many of these wastes during lab cleanouts or disposal of outdated chemicals.

The main differences between U-Listed and P-Listed hazardous waste is that the P-Listed wastes are acutely toxic and the empty containers which held their material must be triple rinsed, and the rinsate collected and shipped as hazardous waste. However, DEHS advised generators with empty P-listed chemical containers to reuse to collect hazardous waste or they must submit the empty container for DEHS waste pick up. The storage accumulation for generators are more stringent when storing P-Listed wastes, limited to only one quart or 1 kg (2.2 lbs). The P-Listed chemical wastes are attached at the end of this Waste Disposal guide.

**Characteristic Hazardous Wastes (D-List)**

Certain wastes which are not specifically listed are regulated as hazardous because they exhibit one or more of the following characteristics: ignitability, reactivity, corrosivity, or toxicity. If wastes exhibit any of these characteristics, they are regulated as hazardous, and arrangements for disposal must be made with DEHS. Material safety data sheets (MSDS), container labels, and reference manuals can be used to identify these characteristics.

**IGNITABLE WASTES**

The Ignitability characteristic applies to wastes that are:

- Liquids with a flash point  $\leq 140^{\circ}\text{F}$  ( $60^{\circ}\text{C}$ )
- Solids capable of spontaneous combustion under normal temperature and pressure
- Oxidizing materials
- Ignitable compressed gases

Examples include ethanol, sodium nitrate, hydrogen gas, aerosol products, xylene and acetone

**CORROSIVE WASTES**

The Corrosivity characteristic applies to wastes that are:

- Aqueous solutions with a pH less than or equal to 2 or greater than or equal to 12.5
- This does not apply to solid or non-aqueous materials (*generators must still submit waste chemicals that are corrosive solid for DEHS pick up*)
- Examples include hydrochloric acid, nitric acid, potassium hydroxide, ammonia, and sodium



## hydroxide

**IMPORTANT:** Due to local wastewater authority, Louisville Metropolitan Sewer District (MSD) restrictions, only aqueous solutions with a pH 5 -11 should be sink disposed.

**REACTIVE WASTES**

The Reactivity characteristic applies to the following:

- Materials that react violently or generate toxic fumes when mixed with water
- Cyanide or sulfide bearing wastes which evolve toxic fumes when mixed with acids or bases
- Materials that are normally unstable or explosive
- Examples include sodium metal, reactive sulfides, potassium cyanide and picric acid

**TCLP TOXIC WASTES**

The Toxicity Characteristic applies to wastes that have the potential to contaminate groundwater if improperly disposed. These materials are regulated as hazardous waste due to their potential to leach out specific toxic substances in a landfill. Any waste which equals or exceeds a designated concentration of certain toxic compounds is regulated as a characteristically toxic hazardous waste. The test to determine these concentrations is known as the TCLP (Toxicity Characteristic Leaching Procedure). It determines the amount of the toxic compound that leaches from the waste, simulating what could leach into the environment [i.e. landfill] from an improperly disposed waste. Therefore, any waste with any of the TCLP compounds are assumed to be toxic. There are currently 40 contaminants on the list that include certain heavy metals, pesticides and organic compounds.

**EPA TCLP LIST**

Arsenic (As)	Barium (Ba)	Benzene	Cadmium (Cd)
Carbon Tetrachloride	Chlordane	Chlorobenzene	Chloroform
Chromium (Cr)	o-Cresol	m-Cresol	p-Cresol
Cresol	2,4-D	1,4-Dichlorobenzene	1,2-Dichloroethane
1,1-Dichloroethylene	2,4-Dinitrotoluene	Endrin	Heptachlor
Hexachlorobenzene	Hexachlorobutadiene	Hexachloroethane	Lead (Pb)
Lindane	Mercury (Hg)	Methoxychlor	Methyl ethyl ketone
Nitrobenzene	Pentachlorophenol	Pyridine	Selenium (Se)
Silver (Ag)	Tetrachloroethylene	Toxaphene	Trichloroethylene
2,4, 5-Trichlorophenol	2,4,6-Trichlorophenol	2,4,5-TP (Silvex)	Vinyl Chloride

**NON-REGULATED WASTES**

Many chemicals are not considered hazardous waste using the “Listed Waste” or “Characteristic Waste” criteria described above. However, these chemicals may be at least moderately toxic, moderately corrosive or combustible and should be collected by DEHS to ensure safe handling and disposal. No chemical or chemical mixture should be poured down the drain or thrown in the trash; DEHS approves sink disposal of innocuous aqueous waste, such as cell culture media inactivated with 10% bleach, sodium chloride and potassium chloride solutions.

Concentrated dyes or materials with strong odor must not be disposed of via the sewer but should be maintained in sealed containers and collected for waste pick up by DEHS. DEHS will manage the disposal of all university generated non-regulated and non-hazardous materials. This will allow the University to ensure compliance with the stringent sewer regulations, as well as the landfill.

## UNIDENTIFIED WASTES

All wastes to be picked up by DEHS must be accurately described or they cannot be properly segregated. This greatly affects the safety hazards involved with handling and storage of these materials. From a regulatory standpoint, DEHS is prohibited from accepting unidentified wastes for transportation or storage. When an unidentified material or waste is discovered, an attempt to identify its contents should be immediately undertaken. Usually the contents can be identified by consulting individuals who work in the area where the unidentified material was found. If this fails, the material will have to be analyzed with the cost of analysis being borne by the department in which the material was found. Some common analysis performed to identify chemicals are: pH, flashpoint, reactivity screen (mix small amount of chemical with water to see if reaction occurs), specific gravity.

Thorough maintenance of labels on chemical containers reduces the occurrence of unidentified chemicals. Periodic review of chemical stock and careful recordkeeping reduces the chance of discovering containers with missing labels. Unidentified or, unknown waste cannot be submitted into Chematix. Personnel that need assistance should contact DEHS Hazardous Waste at 502-852-6670.

### 3.5 Chemical Waste Handling in Lab and Other Work Areas (SAAs)

#### How To Comply With The Hazardous Waste Regulations

Except for two areas controlled solely by the Department of Environmental Health and Safety (DEHS), all areas where hazardous waste are managed at the University of Louisville are considered satellite accumulation areas (SAAs). This is a regulatory designation which allows generators in these areas to operate under fewer regulatory requirements. As such, the following five points are all that generators need to know to operate in compliance with the law. It is critical that generators know and understand these points and that they manage their waste in accordance with them.

**L Location...** Hazardous chemical waste must be at or near the point of process generating waste (*e.g. same room waste is generated in*)

**L Label...** Each hazardous waste container must be clearly labeled as "Hazardous Waste" and "Indication of Hazard(s)" (i.e. Flammable, Toxic, Corrosive, Oxidizer, Water-Reactive, etc.)

**L Lid...** Each hazardous waste container must have a securely fitting lid. Also, lid must be CLOSED except when adding or removing waste

**L Limit...** The amount of hazardous waste accumulated, or stored, on-site must be less than 50 gal (200 L) or 400 lb (180 kg) of non-acute hazardous waste or 1 quart/1 kg of highly toxic [EPA P-Listed] hazardous waste.

#### Hazardous Waste Collection Container Selection Requirements

- Containers holding hazardous waste must be in good condition, have proper fitting lids, and be compatible with the waste stored.
- A good practice is to use the same container in which the chemical was purchased as a pure product.
- The container must always be closed during storage.
- Hazardous waste must not be placed in an unwashed container that previously held an incompatible material (**i.e. if using an empty solvent bottle to collect acid waste, TRIPLE RINSE the container prior**

to reuse) .

- All containers must be thoroughly washed and allowed to dry before being used for waste storage.
- If a container holding hazardous waste is not in good condition, or if it begins to leak, the material must be transferred to a new container or placed inside a larger container that meets all the necessary criteria.
- Attach a DEHS Hazardous Waste Label (contact DEHS to obtain or visit the DEHS Waste Disposal Web-page to download) - example pictured below



2.5 gallon (10 L) high-density polyethylene containers for accumulating waste solvents and other high-volume liquid wastes are available from DEHS at no cost to University departments. These containers are distributed based on waste type and volume. Contact DEHS at 852-6670 to obtain these containers for high volume liquid wastes.

### Waste Solvents

Waste solvents which are accumulated for collection by DEHS are to be segregated into halogenated and non-halogenated categories. Halogenated solvents contain a halogen compound such as chlorine or fluorine to reduce flammability. Non-halogenated solvents do not contain a halogen compound and are generally more flammable. The 2.5-gallon containers provided by DEHS for accumulation of solvents should be clearly marked "HALOGENATED" or "NON-HALOGENATED" and strictly limited to those types of solvents. These two categories of solvents are segregated for increased safety and efficiency.

### New Research, Abandoned Labs, and High Waste Volumes

- If a new research project that will generate large quantities of waste is going to begin, contact DEHS ahead of time to plan waste management.
- If an investigator or other person is leaving their employment with the University, the department chair should contact DEHS prior to that person's departure. Laboratories should not be abandoned with chemical wastes present.

If any activity that will generate large volumes of any type waste handled by DEHS (chemical, radioactive, infectious) will be commencing, contact DEHS prior to that activity's start up so that proper planning for waste disposal can be accomplished

### 3.6 Chematix: How To Get Chemical And Hazardous Waste Picked Up

Chematix is a chemical management software package designed for the academic environment. The Chematix system is used to create waste cards that are affixed to your waste containers, as well as to request chemical and hazardous waste pickups. Our hazardous waste facility staff work in Chematix daily to prioritize requests, prepare DOT paperwork and verify that the University's TSDf is in compliance with state and federal regulations.

To have chemical and hazardous waste container(s) picked up by DEHS,

- Submit your pickup request via the online university-wide hazardous waste management program, Chematix, at <https://louisville.chematix.com/Chematix/Login>.
- If you have never used Chematix, contact DEHS at 852-6670 OR [chematix@louisville.edu](mailto:chematix@louisville.edu) for further assistance and training.
- For existing users of Chematix, Quick Reference Guides and Videos are available at <https://louisville.edu/dehs/waste-disposal>

### 3.7 Waste Minimization

Effective hazardous waste management requires not only safe, sound practices, but also requires extensive efforts to reduce the volume and toxicity of hazardous wastes. The University's waste minimization efforts must also be reported annually to the Kentucky Division of Waste Management. Waste minimization efforts reduce disposal and the hazards and environmental impact associated with chemical wastes. The success in minimizing hazardous wastes depends on a conscientious effort by each individual at the University. These are some common waste minimization strategies:

#### REDUCING CHEMICAL PURCHASES

A substantial portion of hazardous waste produced at the University consists of unused, outdated chemicals. Careful planning of quantities of chemicals required can reduce costs to the laboratory and reduce waste volumes. Many chemicals may also degrade over time, so careful consideration of quantities purchased. Also, risk of accident and exposure to the chemical and space needs are less when handling the smaller container. Although it may seem less expensive to buy chemicals in larger quantities, it is in fact more expensive if the cost for disposal is taken into consideration. Some chemical manufacturers sell chemicals in smaller containers to help laboratories reduce the excess purchase of chemicals. When disposal cost are considered, it is more economical to purchase only the quantities of chemicals that will be used.

#### SUBSTITUTION

A non-hazardous chemical can often be used in place of a hazardous chemical. For example, some academic laboratory procedures still specify benzene or carbon tetrachloride as reagents or solvents. These compounds often can be replaced by less hazardous materials. This results not only in safer procedures, but also in wastes that may be hazardous in some respects. Additionally, many commercial, non-hazardous glass cleaners are available in lieu of toxic and corrosive chromic acid. Similarly, different procedures may be available which do not require the use of hazardous chemicals. For more chemical product substitution information visit MIT's Green Wizard.

#### LABEL CONTAINERS

Keeping all of the containers in your lab labeled with their contents will result in safer work practices

as well as removing the need to dispose of unidentified chemicals.

### 3.8 Chemical Exchange/Redistribution

Chemical purchases can often be reduced by borrowing and sharing chemicals between laboratories. Departments are encouraged to exchange chemicals whenever possible and utilize the DEHS Chemical Redistribution Program as much as possible.

Not all the chemicals picked up by DEHS are a waste. Many are only partially used and have not exceeded their shelf life or been altered in anyway. Others are unused and still in the original sealed container. In some cases, these chemicals can be used by someone else at the University. Reusable chemicals collected by DEHS are brought to the central accumulation area, recorded, segregated, and held for redistribution instead of disposal.

The redistribution program can mean a real cost savings for the University in two ways. First, utilizing chemicals from the redistribution program decreases the amount of new chemicals purchased. Secondly, chemicals which are redistributed do not require disposal, avoiding the extremely high cost associated with that service. Each chemical may be reviewed prior to acceptance. The person who receives the chemical is responsible to determine the suitability of the chemical for their use.

## Chapter 4 Radioactive Waste

### 4.1 Responsibility

All use of radioactive material must be authorized by the University Radiation Safety Committee and monitored by the University Radiation Safety Office (URSO). Proper disposal of radioactive waste is mandatory. Record the date and disposal activity of all radionuclides on the "Radioactive Material Usage Record" form. Copies of this record must be sent to URSO monthly if material is used. The following information outlines general disposal instructions. For further clarification or specific instructions, contact URSO (852-5231).

### 4.2 Solid Waste Disposal

Dry solid waste (gloves, plastic, glassware, and paper) can be classified as "long half-life" (greater than 120 days), "short half-life" (less than or equal to 120 days) or de minimis. De minimis waste, as stated in 902 KAR 100:021-2, is:

- 0.05 microcurie or less of H-3, C-14, or I-125 per gram used for liquid scintillation counting or in vitro clinical or in vivo laboratory testing; and
- 0.05 microcurie or less of H-3, C-14, or I-125 per gram of animal tissue averaged over the weight of the entire animal.

Due to the high cost of waste disposal, it is imperative users of radioactive material establish and practice procedures to minimize

radioactive solid waste. The following page contains some suggested practices to use to minimize waste production, if possible.

Some Suggested Waste Reductions Methods:

- Recycle or reclaim
- Source reduction--substitute short-lived material
- Modify process to reduce waste
- Keep down contamination
- Clean contaminated items and dispose of as clean
- Concentrate by ion exchange or charcoal absorption
- Compact commercial waste
- E-Mail the [Radiation Safety Officer](#) or call at 852-5231 for more information concerning waste reduction methods.

Disposal Summary For Solid And Deminimus Waste

- Solid waste will consist of gloves pipette tips, bench paper, etc.
- Solid waste containers will be clearly marked with the yellow "RADIOACTIVE WASTE" stickers and radiation symbol on each side of the container.
- Waste will be in a shielded container if necessary.
- All waste must have any radiation symbols defaced before it is put into the proper waste container
- All waste must be in clear plastic bags, and different nuclides must be stored separately.
- Each bag must have a Radioactive Waste Card attached with the Authorized user name, date, nuclide, chemical form, and amount of nuclide.
- Deminimus waste is defined as H-3, C-14, or I-125 that is calculated to contain less than 0.05 uCi/gm
- For waste pickup, follow the procedure listed at the end of this chapter.

### **4.3 Liquid Waste Disposal**

Liquid waste consists of stock solution and liquid scintillation vials. Relatively small volumes (a few ml's) of aqueous liquid may be transferred onto absorbent material and disposed of per the solid waste procedures. Record the date and activity of all disposals

of liquid in the appropriate column on the Radioactive Material Usage Record form. When material is disposed, copies of this form must be sent to URSO monthly.

In some instances it may be necessary to dispose of radioactive material or wash contaminated items in a designated disposal sink. The disposal must be accurately recorded on your usage record. The water must be run for a half hour and the sink surveyed and wipe tested for residual contamination.

#### Disposal Summary For Liquid Waste

- Stock solution must be stored in separate containers per nuclide and the container must be compatible with the waste stored.
- Liquid scintillation vials must be stored separately according to nuclide, and packaged in easily movable containers (i.e. the plastic, blue tubs).
- Each bottle or container of liquid scintillation vials must have a Radioactive Waste Card attached with the authorized user name, date, nuclide, chemical form, and amount of nuclide.
- All liquid must also be labeled as biodegradable or organic material.
- Any liquid containing the organic material must be stored in plastic tubs labeled that are labeled as hazardous material.
- Each bottle of stock solution or container of liquid scintillation vials must have a Radioactive Waste Card attached with the authorized user name, date, nuclide, chemical form, and amount of nuclide.
- For waste pickup, follow the procedure listed at the end of this chapter.

#### 4.4 Animal Carcasses

When using radioactivity in animals or animal tissues, the Authorized User must provide an auxiliary protocol. This protocol must detail the kind and quantity of radioactivity to be used, methods of disposal, and contamination control. An "Animal Use Proposal Clearance Form" (see Appendix U) will be provided by Research Resources, or can be obtained from Radiation Safety. Before this protocol is presented to Research Resources it must be approved by the University Radiation Safety Office. All animals which have been given radioactive material should be isolated from animals that do not contain radioactive material. The cages which house the animals containing radioactive materials must be labeled with an appropriate radioactive materials warning sign. The cages must be locked, or otherwise secured unless attended. Surveys and contamination checks must be performed of the area which includes the bedding and animal housing. All contaminated items must be handled per the Radioactive Material Users Guide.

#### Disposal Summary For Animal Carcasses

- Animals receiving de minimus levels of radioactive material must be prepared for disposal as infectious waste and then brought to Radiation Safety for disposal.
- If the material in animals has a half life greater than 90 days, the animals must be prepared for disposal as infectious waste, then brought to Radiation Safety to be disposed.
- If the material in the animals has a half life less than or equal to 90 days, the animal must be stored in the lab in an appropriate area for 10 half lives, labelled as infectious waste, then brought to Radiation Safety to be disposed.
- Yellow Radioactive Waste Card must accompany all bags that will be taken by Radiation Safety.

#### **4.5 Radioactive Waste Pick-Up Request**

- When containers become full and need to be picked up by Radiation Safety, complete the Radioactive Waste Pick-up Request Form.
- Upon receipt of the pick-up request form, Radiation Safety will contact the lab to set up a time for pick-up.
- A Radioactive Waste Card must be attached to each bag or container before Radiation Safety will pick-up the waste.

Waste Will Not Be Picked Up By URSO Personnel If Any Of The Following Situations Occur:

- The waste is not properly identified on the waste receipt form.
- Area was locked or no one was present to identify the waste to be taken.
- The liquids contains organic material and an approved container is not available to use for transport.

### **Chapter 5 Medical Waste (aka infectious waste, biohazardous waste)**

Regulations imposed by local, state, and federal agencies dictate that infectious waste must be segregated, packaged, and disposed of in a specific manner. The primary purpose of the regulations is to limit on-the-job exposure to blood and other potentially infectious materials. Waste minimization should be encouraged to reduce the amount of infectious waste that must be treated and disposed. Normal refuse that is not contaminated should be placed in the trash can.

#### **5.1 Types of Medical Waste**



All wastes listed in this section must be segregated as needed, packaged, and disposed of in accordance with DEHS procedures. Biomedical waste consists of all biological, pathological and infectious wastes which include:

- **Anatomical Material (must be destroyed by medical waste incineration)**

Human or animal body parts including tissues and organs or whole animal carcasses (*except those containing radioactive materials*).

**IMPORTANT NOTE:** Animal or human tissue contained in a liquid chemical preservative (pourable liquid is observed in specimen container) must be managed as chemical hazardous waste and submitted for DEHS pick up. Do not decant preservative from specimen containers. It is acceptable to place all closed specimen containers in box[es] (do not exceed the size of a copy paper box) and submit as one waste container.

- **Blood**

Human or animal, whole or blood components, serum, plasma, et al

- **Blood-soiled Articles**

Any article that contains blood in any form as a result of contact with blood.

- **Sharps**

Syringes, needles, glass slides, surgical instruments such as scalpels, razor blades or other articles which have cut or punctured human skin or have come in contact with an infectious agent. *Any sharps contaminated with radioactive material should go through the radioactive waste stream.*

- **Unused cultures and stocks of infectious agents**

- **Biologically Contaminated Laboratory Materials**

Any article that is contaminated with or has come in contact with a pathogenic or infectious organism such as Petri dishes, glassware, etc. This category includes microbiological cultures, clinical specimens (*urine, feces, etc*), and contaminated animal bedding.

- **Trace Chemotherapy (must be destroyed by medical waste incineration)**

Trace chemotherapy wastes are materials that have come into contact with or may contain only a residual amount of a chemotherapy agent. This includes empty drug bottles or IV bags, as well as gloves and other Personal Protective Equipment (PPE) used during administering chemotherapy drugs.

**IMPORTANT NOTE:** Bulk chemotherapy wastes are materials that have been saturated with chemotherapy agents or are over 3% hazardous material by weight. This might include expired or unwanted chemo drugs, materials used to clean spills, IV bags that are not empty or PPE that is soaked in these drugs. Bulk chemotherapy waste must be submitted for DEHS chemical waste pick up

## **5.2 Medical Waste Segregation**

At the point of generation, medical waste is to be segregated by type (for off-site steam-sterilization or medical waste incineration) and placed into separate containers for shipment. Laboratories and other medical waste generator areas will collect medical waste stream into the University's medical waste vendor provided DOT-approved containers (currently, medium fiberboard boxes, gray hinged-lid tote, and red barrels) lined with vendor provide red biohazard bag. It will be the responsibility of all University employees or students that generate medical waste to segregate the waste accordingly.

### **Medical Waste and Sharps Segregation**

Medical waste consisting of microbiological waste, human blood and blood products, potentially infectious medical/laboratory glassware, transgenic plant material and sharps will be managed in the following manner:

Medical waste will be placed in University's medical waste disposal vendor provided waste container lined with an approved biohazard bag. All sharps must be placed in an approved sharps container. The sharps container must be rigid, leak-proof, puncture resistant, and be marked or labeled with the universal biohazard symbol. When the sharps container is full, it must be securely closed and placed into a red-bagged lined vendor provided medical waste container. Again, the container lined is with an approved biohazard bag. When the medical waste container is full, laboratory or clinical staff will tie the inside red bag securely closed,.

Any Category A infectious material or Category A contaminated material must be inactivated PRIOR to discard into medical waste container.

### **Pathological Waste (destroyed by medical waste incineration)**

Pathological waste consisting of human organs, body parts, surgical specimens, contaminated animal parts/tissues and carcasses, and trace chemotherapy waste will be managed in the following manner:

Pathological waste will be placed in a University medical waste disposal vendor , DOT approved shipping containers lined with an approved biohazard bag.

## **5.3 Medical Waste Containers**

The current University's contracted medical waste disposal vendor is Stericycle, LLC. University personnel must use a Stericycle provided medical waste container and Stericycle provided red biohazard bag as the primary medical waste container liner when collecting medical waste. Smaller red bags can be used and placed within waste container; just ensure the primary (outer) liner is a Stericycle red bag. Stericycle's containers are all DOT-approved for highway transport. Stericycle provides the following types of medical waste containers:

Medium box (US43)	Maximum weight 50 lbs
Gray tote	Maximum weight 50 lbs
Red barrel	Maximum weight 50 lbs

Additionally, 2" wide clear tape must be used to tape Stericycle cardboard Box. To obtain roll of clear tape please contact DEHS at 852-6670. HSC Campus personnel can visit the DEHS Radiation Safety Office.

#### 5.4 Medical Waste - Stericycle Bar Code Label Selection

White-colored Bar Code label: Indicates that the biohazardous/medical waste DOES NOT CONTAIN human or animal parts, trace chemotherapy waste, infectious Category A, or BSL-3 materials. Acceptable waste includes: tissue culture, microbial cultures and stocks of etiologic agents or recombinant nucleic acids or transgenic materials (plant or animal) and sharps.

Yellow-colored Bar Code label: Indicates that the biohazardous/medical waste DOES CONTAIN human or animal tissue, trace chemotherapy waste, inactivated infectious Category A, or BSL-3 materials. These labels are available only upon request. Contact DEHS Hazardous Waste or Biosafety.

#### 5.5 Medical Waste – Stericycle Packing Instructions

1. Do not deface any markings on the outside of the Stericycle fiberboard box, barrel or tote.
2. For the medical waste box, You must securely tape the bottom with at least two-inch wide clear packaging tape. Best to use at least three strips of tape to adequately secure center seam. Be sure to also tape the bottom side seams. NO DUCT TAPE, COLORED TAPE, OR MANILLA TAPE.
3. For the medical waste box, turn box upright, fold flaps down, and line inside of box with red biohazard bag. Full sharps containers should be securely closed and placed inside the liner. If there are any incidental liquids, place adequate absorbent material around this waste.

**IMPORTANT :** *Generators DO NOT PLACE into a medical waste any of the following items: free liquids, chemical waste, thermometers, chemotherapy wastes, pharmaceuticals, batteries, aerosol cans, canisters, or inhalers.*

4. When red bag is about  $\frac{3}{4}$  full , secure red bag by tying a overhand knot. Do not overfill the bag. When closed the box must be perfectly square. No top or side bulges.

**Note:** Max. weight for the medium [4.3 cu.ft] box is 50 lbs (29.5 kg)  
Max. weight for gray tote or red barrel is 50 lbs. (29. 5 kg)

5. For medical waste box, fold over flaps. Tape top of box closed with at least two-inch wide clear packaging tape. Again, best to use at least three strips of tape to adequately secure center

seam. Be sure to also tape the top side seams. NO DUCT TAPE, COLORED TAPE, OR MANILLA TAPE.

6. On one side of the box, there is a place for Generator Information. Attach a vendor bar code label in the "Customer label" box . You must provide the following information (write this in the area on the box where it is marked "Generator Information Here" or for tote or barrel write info on a piece of paper or tape and attach to top of container):
  - Building name
  - Room Number
  - Contact Name & Phone Number

DEHS is aware that several generators may be associated with one medical waste collection container. The phone number provided should be the number to a person most familiar with the bio-hazardous contents of the box. This number is required for emergency response in the event that the box leaks or becomes damaged in the respective bio-hazardous waste storage area prior to off-site transport.

7. When the box is taped secured, marked, and ready for pick-up by Custodial Services, leave the box inside the lab or room.

Step-by-step instructions for preparing a medical waste box is attached to the end of this guide.

### **5.6 Request Pick Up of Full Medical Waste Containers and Request additional Medical Waste Containers and Red Bags**

To request pick up of full medical waste containers and/or replacement medical waste supplies, lab and clinic personnel will...

- Call PP Work Control (Belknap 852-6241; HSC 852-5695) OR
- Submit online Physical Plant Non-Chargeable Service Request form <http://louisville.edu/physicalplant/forms>
- Personnel need to provide the number of medical waste containers to be picked up
- For replacement supplies, personnel need to include type and quantity of medical waste containers and number of red bags

### **5.7 Where to obtain Stericycle Bar Code Labels and Clear Tape (for Stericycle box)**

- HSC Campus locations can pick up bar code labels and roll of tape from DEHS Radiation Safety Office located in Library Commons Room 102. Call ahead to 852-5231 to ensure someone is available to receive you.
- Belknap Campus (Biology Labs) can visit Biology Dept. office in Life Sciences OR
- Email [dehsubm@louisville.edu](mailto:dehsubm@louisville.edu), Subject: "Medical Waste Labels" your Name, Dept, Lab Location, and Campus Mail Address

## **6 Miscellaneous/Special Wastes**

Other wastes not covered in this guideline may require special handling or disposal as

follows:

### **6.1 Glassware, Intact and Broken**

Pipettes, broken glassware, microscope slides, and cover slips not considered infectious under this guide should be regarded as injurious materials because they present a physical hazard to custodians if placed in the regular trash. Additionally, plastic vials, pipettes etc are also defined as injurious and should be handled as such in the same manner indicated. These items should be boxed, sealed, and labeled "Broken glassware disposal". Please insure the box selected for shipping broken glass is suitable, sturdy and is taped completely closed for shipping. Boxes needed to insure proper shipping of broken glass and plastic can be ordered through VWR Scientific (1-800-923-5000).

Any uncontaminated intact and broken lab glassware and hard plastic lab ware that could penetrate a trash bag (i.e. pipettes, pipette tips) shall be placed into a non-red (i.e. use clear, black or white) plastic bag lined cardboard box.

- Glass trash box shall be marked or pre-labeled to convey the hazard i.e. "Caution: Glass Trash", Broken Lab Glassware", etc.
- Full glass trash boxes cannot exceed 20 lbs/ 9 kg.
- Full glass trash boxes must be securely taped closed.
- Full glass trash boxes should be placed near a regular trash can within the lab for pick up by Custodial Services

It is the responsibility of every department, unit, or laboratory generating infectious waste to provide the appropriate packaging materials (i.e., sharps container and orange or red infectious waste bags). Biohazard waste bags must be orange or red and can be obtained from either Superior Paper (583-1647), Fisher Scientific (1-800-766-7000) or other laboratory supply companies.

### **6.2 Asbestos-Containing Material (ACM)**

Asbestos containing materials (ACM) are commonly found in older University buildings. Examples can include floor tiles, pipe insulation, plaster and caulk. The presence of asbestos in a building does not mean that occupant health is at risk. As long as ACM remain in good condition, exposure is unlikely.

Do not remove or disturb asbestos containing materials. If asbestos or asbestos containing materials are found, immediately report the nature and location of the material to DEHS for evaluation. Whenever possible, isolate the asbestos containing material by restricting access to the area in which it is found.

### **6.3 PCB Material**

PCBs (Polychlorinated Biphenyls) are compounds that were widely used in the past in oils and dielectric fluids due to their excellent heat exchange and insulating properties. However, because of their persistence in the environment and ecological damage from water pollution, their manufacture was discontinued in 1976. The handling, storage, transportation, and disposal of PCBs are now strictly regulated by the EPA. Some

examples of manufactured items before 1979 which may contain PCBs are: electrical transformers, electrical capacitors, fluorescent light ballasts, equipment fluids, and hydraulic fluids.

Anyone generating these materials at the University must handle them as a chemical waste as outlined in Chapter 3. Items such as gloves, clothing, or utensils/tools that become contaminated with PCBs shall also be handled as a chemical waste in accordance with Chapter 3.

Physical Plant employees who repair or replace lighting fixtures throughout the University must follow the following procedures while handling the ballasts associated with these fixtures. Manufacturers are now required to label ballasts "Non- PCB". Prior to handling any ballast, check to see if it is labeled "Non-PCB". If the article is not labeled "Non-PCB", assume it contains PCBs and precautions should be taken when handling these items. If the article is intact and not leaking, wear a pair of rubber or plastic gloves. Inexpensive surgical gloves will suffice if not worn for extended periods of time. If the article is leaking, also wear a pair of goggles. Contact DEHS to coordinate any clean-up from the floor or other areas.

Do not put leaking ballast in containers already holding non-leaking ballast. Leaking ballast must be segregated in a small container and managed as a chemical waste as outlined in Chapter 3.

55-gallon drums for lighting ballast can be obtained from DEHS. Physical Plant must notify DEHS of the location of ballast drums to ensure that they are labeled appropriately. Only lighting ballast should be placed in these drums. They should not be used for

general trash or other special wastes. Once the drums are full, follow the procedures in Chapter 4 to have DEHS pick them up.

#### **6.4 Compressed Gas Cylinders**

Gas cylinders are widely used at the University in teaching and research laboratories and in maintenance and construction operations. University personnel using cylinders must make every attempt to return them to the supplier when finished. Suppliers will usually accept empty or partially full cylinders at no cost. The best approach is to check with the supplier before purchasing any cylinders to see if used cylinders will be picked up when new ones are delivered. If the supplier will not, try to locate one that will. It is extremely difficult and expensive to have cylinders disposed.

If cylinders cannot be returned to a supplier, they can be handled through the DEHS chemical and hazardous waste program. An empty cylinder still contains pressure and cannot be disposed into the trash or scrap metal dumpster; submit for DEHS chemical waste pick up. Follow the procedures in Chapter 3 to have them picked up by DEHS.

## 6.5 Empty Containers

The improper handling or management of empty containers not only creates an undesirable aesthetic situation at the University but, due to their contents, may also pose an environmental and human health hazard. The University is governed by state and federal environmental agencies which regulate the management of these containers and their contents. Improper handling can result in fines or other penalties imposed against the University.

Empty containers, ranging from small glass bottles to 55-gallon drums, are defined as those having all contents removed by commonly employed practices (e.g., pouring, pumping, scraping, etc.), with no solids or free-flowing liquids remaining in the container.

All chemical containers handled under these procedures must be empty. That means that no material can be poured or practicably removed from that container. If any material can be poured from the container then it must be either used or managed under the Chemical Waste Management Program outlined in Chapter 3. If a container held an acutely hazardous waste it must be managed as a hazardous waste through the procedures detailed in Chapter 3. Contact DEHS for a list of the acutely hazardous wastes.

### TO HANDLE EMPTY CONTAINERS:

- Empty EPA P-listed chemical (acutely toxic) containers must be tagged with a DEHS uniquely numbered chemical/hazardous waste label and submitted for DEHS pick up via online Chemical and Hazardous Waste Pick up form

*For your convenience, a copy of the EPA P-Listed Chemicals is included in Attachment 1 of this manual.*

Empty Reactive chemical (air-reactive, water-reactive, pyrophoric, compressed gas cylinders, aerosol cans, lecture bottles) containers must be tagged with a DEHS uniquely numbered chemical/hazardous waste label and submitted for DEHS pick up via online Chemical and Hazardous Waste Pick up form.

All other empty non-P Listed and non-Reactive chemical containers, regardless of size, must be verified empty (no pumpable, pourable residue), thoroughly rinsed, labeled defaced, lids removed and dry prior to discard.

Empty non-P Listed and non-reactive plastic, metal, and fiberboard containers that are  1 gal/4L can be placed in recycling bin.

- Custodial Services will dispose empty non-acutely toxic 5 gallon container into a regular trash dumpster
- Any non-P-listed and non-reactive chemical empty glass container must be placed into a non-red (i.e. use clear, black or white) colored plastic bag lined cardboard box. The box should be marked or pre-labeled to convey the hazard i.e. "Caution: Glass Trash", "Broken Lab Glassware", etc.

- Full glass trash boxes cannot exceed 20 lbs/ 9 kg.
- Full glass trash boxes must be securely taped closed.
- Full glass trash boxes should be placed near a regular trash can within the lab for pick up by Custodial Services
- Custodial Services will dispose full glass trash boxes into a regular trash dumpster.
- Empty non-P-listed and non-Reactive plastic or metal containers 5 gallon shall have lid removed, thoroughly rinsed to displace any residual vapors, labels defaced, ensure container dry, and placed next to the normal trash can for pick up by Custodial Services

## 6.6 Expired Pharmaceuticals, Non-DEA Controlled

Expired and unwanted non-DEA controlled pharmaceuticals must not be discarded into medical waste container. Expired and unwanted non-DEA controlled pharmaceuticals used to treat human and animals can be toxic (e.g., chemotherapy agents), while others cause more limited physiological changes. Unused pharmaceuticals may not readily break down after release into the environment and can be absorbed by plants, animals, and/or humans. In accordance with IACUC policy, expired euthanasia, anesthesia and analgesia agents must not be used in animal care and research. These items must be marked "Expired-Do Not Use" and separated from non-expired inventory. Expired non-DEA controlled pharmaceuticals and pharmaceutical compounds are picked up by DEHS as chemical waste.

Lab personnel shall submit expired and unwanted pharmaceutical pickup request via the online university-wide hazardous waste management program, Chematix, at <https://louisville.chematix.com/Chematix/Login>. If you have never used Chematix, contact DEHS at 852-6670 or [chematix@louisville.edu](mailto:chematix@louisville.edu) for further assistance and training.

Health Clinics managed by U of L employees can request from DEHS a "Black container" (8-gallon in size) for the collection of expired and unwanted pharmaceuticals only. Please contact the DEHS Hazardous Waste at 502-852-6670.

### Black Container Use Requirements

Every item placed into the black container must be clearly marked or labeled to describe its contents.

Any damaged package should be placed in plastic bag prior to placement into this container.

The black container should be kept in a secure, non-patient access area.

Absolutely:

- No Free Liquids
- No Dea Controlled Substances
- No Loose Sharps
- No Vaccines Containing Live Viruses (these items can be placed in "Red Bag")



- waste)
- No Chemicals i.e. isopropyl alcohol, hydrogen peroxide, acids, bases, phenol, etc. Chemicals must be submitted separately on-line as chemical hazardous waste

When container is near-full, clinic personnel shall submit DEHS pickup request via the online university-wide hazardous waste management program, Chematix , at <https://louisville.chematix.com/Chematix/Login>. If you have never used Chematix, contact DEHS at 852-6670 or [chematix@louisville.edu](mailto:chematix@louisville.edu) for further assistance and training.

## 6.7 DEA Controlled Substances

To minimize waste, DEA registrants should only purchase quantities they intend to use. Damaged, expired, unwanted, unusable, or non-returnable controlled substances must be accounted for, retained, and disposed of in accordance with the following procedure.

There are two disposal options for expired or unwanted controlled substances recommended by the University's Department of Environmental Health and Safety (DEHS). DEHS should be contacted to help determine the correct disposal method.

### Supplier Disposal

Some suppliers (reverse distribution) will take back pharmaceuticals for credit. Utilizing this option transfers the ownership of the Controlled Substances to a DEA registered and authorized processor for destruction or resale. Multiple forms must be completed and the DEA Registration Number is required to utilize this option. The fee associated with this service will be the responsibility of the registrant. Contact your vendor to see if this is a viable option.

### Witnessed Destruction Disposal

Small quantities (less than 1 pound) of DEA controlled substance(s) can be rendered unrecoverable using the following procedure:

To schedule a DEA-controlled substance(s) destruction, DEA registrant or DEA-registrant authorized agent can call DEHS at 852-6670 or email [dehsih@louisville.edu](mailto:dehsih@louisville.edu), subject line "DEA Controlled Substance Destruction Request".

- 1) DEA registrant will keep expired drugs secured until time of destruction.
- 2) DEA registrant will prepare DEA Form 41.
- 3) DEHS staff will schedule with DEA Registrant on-site destruction at DEA Registrant preferred lab location that has a properly operating chemical fume hood.
- 4) DEHS will ensure a UofL police officer is present to "witness" the destruction.
- 5) The controlled substance(s) will be poured into a solvent container to render the material irrecoverable.
- 6) Once the destruction is complete, the police officer, DEA Registrant (or DEA registrant authorized agent), and DEHS will sign page 2 as Witnesses to the destruction of drug (s).

DEA Registrant will retain original completed/signed DEA Form 41 with their DEA

Controlled Substance records for at least two years from date of destruction. A copy of the DEA Form 41 will be retained in the DEHS office for three years (3) and available for review by a DEA authorized agent request or inspection.

#### Controlled Substance Spills

Breakage, spills, or other witnessed controlled substance losses do not need to be reported as lost. This type of loss must be documented by the registrant and witness on the inventory record. Controlled substances that can be recovered after a spill, but cannot be used because of contamination (tablets), must be placed in Witness Destruction disposal waste stream (completion of DEA Form 41 required). If the spilled controlled substance is not recoverable (liquids); the registrant must document the circumstances in their inventory records and the witnesses must sign (must include PI as witness in record).

#### Theft of or Missing Controlled Substances Reporting

The DEA license holder must have complete accountability of all controlled substances stored or used in their area. This makes keeping good records essential so that any shortages or missing controlled substances will not go unnoticed. Theft or misuse of a controlled substance is a criminal act that must be reported to the following agencies:

Louisville DEA office: 1006 Federal Building, 600 Martin Luther King, Jr. Place, Louisville, KY 40202 Diversion Number: (502) 582-5905

Diversion Fax: (502) 582-6360

University Department of Public Safety: (502) 852- 6111

University DEHS: (502) 852-6670

### **6.8 Used Oils**

Used oils from maintenance shops, pumps, equipment, machinery, etc. should be collected by DEHS using the Chemical Waste Management Procedures outlined in Chapter 3. Do not mix any other material with used oils and do not allow water to enter used oil containers. Used oils can usually be transferred to a recycler at little or not cost to the university. However, used oil which has been mixed with water, solvents, heavy metals, toxics, PCB's, or other chemical substances may result in substantial costs to the university. Containers used for accumulating used oils must be clearly marked "USED OIL" to help prevent this problem.

### 6.9 Universal Waste – Used Lamps

The EPA Universal Waste Rule provides flexibility in the management of used lamps. It streamlines requirements for waste handlers and promotes recycling. Used lamps cannot be stored on-site longer than 1 year. University personnel should promptly submit pick up request to DEHS via online form when bucket is full OR at least once a semester, whichever is sooner!

Fluorescent light tubes and compact lamps contain a small amount of mercury. Recycling

is the most environmentally acceptable method of handling lighting waste. Fluorescent lamps can be recycled for their mercury (Hg) content. Comprehensive recyclers also can recover other metals, soda glass and phosphor powder from fluorescent lighting waste as well. DEHS manages the University's lighting waste recycling program. DEHS accepts all lamp types. Acceptable lighting waste includes, but is not limited to, the following:

- Fluorescent light tubes
- High-intensity discharge (HID) lamps, such as high pressure sodium and mercury vapor
- Compact fluorescent bulbs, including U-tube and circular
- Ultra-violet (UV) lamps
- LED lamps

Used lamps should be placed in original box or like-packaging; secure box closed. The box must be marked with the words "Used Lamp(s)" and the earliest date the lamp was taken out of service.

Used lamp collection container must be kept closed, unless adding lamps. To have used lamps picked up, please submit the DEHS online Battery & Lamp Pick Up Request form <https://louisville.edu/dehs/waste-disposal>

## **6.10 Universal Waste -Used Batteries**

The Universal Waste Rule provides flexibility in the management of used lamps and used batteries. It streamlines requirements for waste handlers and promotes recycling. Used batteries and lamps cannot be stored on-site longer than 1 year. University personnel should promptly submit pick up request to DEHS via online form when bucket is full OR at least once a semester, whichever is sooner!

Rechargeable batteries are used in a wide variety of products, including cellular and cordless phones, digital cameras, laptop computers, portable electronic devices, and cordless power tools. While using rechargeable batteries reduces waste and can be more economical than regular household batteries, they may contain mercury, cadmium, lead, and other heavy metals.

DEHS manages the University's battery recycling program. DEHS accepts all battery types, including, but not limited to the following:

- Lead-acid, wet-celled (vehicle and golf cart type)
- Lead batteries, sealed (Pb)
- Nickel-cadmium, sealed (Ni-Cad), Nickel-Hydride (NI-MH)
- Rechargeable lithium type -, Lithium hydride, sealed (Li), Li-Ion, Lithium, LiSo
- Primary lithium
- Alkaline (A, AA, AAA, C, D, 9-volt, 12-volt, etc)
- Carbon Zinc
- Silver Oxide
- Button type

Used batteries must be collected in a sturdy container to minimize breakage and release of contents. The collection container must be marked with the words "Used Batteries" and the earliest out of service date. To have used batteries picked up, please submit the DEHS online Battery & Lamp Pick Up Request form <https://louisville.edu/dehs/waste-disposal>

## Attachment A

**EPA Acutely Hazardous Wastes (P-List)**

- Generators cannot store or accumulate more than 1 quart (1 L) or 2.2 lbs (1 kg) of P-Listed hazardous waste.
- Also, empty P-listed chemical containers must be reused to collect hazardous waste OR the empty container submitted for DEHS chemical waste pick up.

List is sorted alphabetically by substance name.

Hazardous waste No.	CAS Number	Substance
P023	107-20-0	Acetaldehyde, chloro-
P002	591-08-2	Acetamide, N-(aminothioxomethyl)-
P057	640-19-7	Acetamide, 2-fluoro-
P058	62-74-8	Acetic acid, fluoro-, sodium salt
P002	591-08-2	1-Acetyl-2-thiourea
P003	107-02-8	Acrolein
P070	116-06-3	Aldicarb
P203	1646-88-4	Aldicarb sulfone.
P004	309-00-2	Aldrin
P005	107-18-6	Allyl alcohol
P006	20859-73-8	Aluminum phosphide (R,T)
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol
P008	504-24-5	4-Aminopyridine
P009	131-74-8	Ammonium picrate (R)
P119	7803-55-6	Ammonium vanadate
P099	506-61-6	Argentate(1-), bis(cyano-C)-, potassium
P010	7778-39-4	Arsenic acid H <sub>3</sub> AsO <sub>4</sub>
P012	1327-53-3	Arsenic oxide As <sub>2</sub> O <sub>3</sub>
P011	1303-28-2	Arsenic oxide As <sub>2</sub> O <sub>5</sub>
P011	1303-28-2	Arsenic pentoxide
P012	1327-53-3	Arsenic trioxide
P038	692-42-2	Arsine, diethyl-
P036	696-28-6	Arsonous dichloride, phenyl-
P054	151-56-4	Aziridine
P067	75-55-8	Aziridine, 2-methyl-
P013	542-62-1	Barium cyanide
P024	106-47-8	Benzenamine, 4-chloro-
P077	100-01-6	Benzenamine, 4-nitro-
P028	100-44-7	Benzene, (chloromethyl)-
P042	51-43-4	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-
P046	122-09-8	Benzeneethanamine, alpha,alpha-dimethyl-
P014	108-98-5	Benzenethiol

Hazardous waste No.	CAS Number	Substance
P127	1563-66-2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.
P188	57-64-7	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1).
P001	181-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%
P028	100-44-7	Benzyl chloride
P015	7440-41-7	Beryllium powder
P017	598-31-2	Bromoacetone
P018	357-57-3	Brucine
P045	39196-18-4	2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime
P021	592-01-8	Calcium cyanide
P021	592-01-8	Calcium cyanide Ca(CN) <sub>2</sub>
P189	55285-14-8	Carbamic acid, [(dibutylamino)- thio]methyl-, 2,3-dihydro-2,2-dimethyl- 7-benzofuranyl ester.
P191	644-64-4	Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]- 5-methyl-1H- pyrazol-3-yl ester.
P192	119-38-0	Carbamic acid, dimethyl-, 3-methyl-1- (1-methylethyl)-1H- pyrazol-5-yl ester.
P190	1129-41-5	Carbamic acid, methyl-, 3-methylphenyl ester.
P127	1563-66-2	Carbofuran.
P022	75-15-0	Carbon disulfide
P095	75-44-5	Carbonic dichloride
P189	55285-14-8	Carbosulfan.
P023	107-20-0	Chloroacetaldehyde
P024	106-47-8	p-Chloroaniline
P026	5344-82-1	1-(o-Chlorophenyl)thiourea
P027	542-76-7	3-Chloropropionitrile
P029	544-92-3	Copper cyanide
P029	544-92-3	Copper cyanide Cu(CN)
P202	64-00-6	m-Cumenyl methylcarbamate.
P030		Cyanides (soluble cyanide salts), not otherwise specified
P031	460-19-5	Cyanogen
P033	506-77-4	Cyanogen chloride
P033	506-77-4	Cyanogen chloride (CN)Cl
P034	131-89-5	2-Cyclohexyl-4,6-dinitrophenol
P016	542-88-1	Dichloromethyl ether

Hazardous waste No.	CAS Number	Substance
P036	696-28-6	Dichlorophenylarsine
P037	60-57-1	Dieldrin
P038	692-42-2	Diethylarsine
P041	311-45-5	Diethyl-p-nitrophenyl phosphate
P040	297-97-2	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	55-91-4	Diisopropylfluorophosphate (DFP)
P004	309-00-2	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a,-hexahydro-, (1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-
P060	465-73-6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a,-hexahydro-, (1alpha,4alpha,4abeta,5beta,8beta,8abeta)-
P037	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta, 7aalpha)-
P051	172-20-8	2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2abeta,3alpha,6alpha,6abeta,7beta, 7aalpha)-, & metabolites
P044	60-51-5	Dimethoate
P046	122-09-8	alpha,alpha-Dimethylphenethylamine
P191	644-64-4	Dimetilan.
P047	1534-52-1	4,6-Dinitro-o-cresol, & salts
P048	51-28-5	2,4-Dinitrophenol
P020	88-85-7	Dinoseb
P085	152-16-9	Diphosphoramidate, octamethyl-
P111	107-49-3	Diphosphoric acid, tetraethyl ester
P039	298-04-4	Disulfoton
P049	541-53-7	Dithiobiuret
P185	26419-73-8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O- [(methylamino)-carbonyl]oxime.
P050	115-29-7	Endosulfan
P088	145-73-3	Endothall
P051	72-20-8	Endrin
P051	72-20-8	Endrin, & metabolites
P042	51-43-4	Epinephrine
P031	460-19-5	Ethanedinitrile
P194	23135-22-0	Ethanimidothioic acid, 2-(dimethylamino)-N-[[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester.
P066	16752-77-5	Ethanimidothioic acid, N-[[[(methylamino)carbonyl]oxy]-, methyl ester

Hazardous waste No.	CAS Number	Substance
P101	107-12-0	Ethyl cyanide
P054	151-56-4	Ethyleneimine
P097	52-85-7	Famphur
P056	7782-41-4	Fluorine
P057	640-19-7	Fluoroacetamide
P058	62-74-8	Fluoroacetic acid, sodium salt
P198	23422-53-9	Formetanate hydrochloride.
P197	17702-57-7	Formparanate.
P065	628-86-4	Fulminic acid, mercury(2 + ) salt (R,T)
P059	76-44-8	Heptachlor
P062	757-58-4	Hexaethyl tetraphosphate
P116	79-19-6	Hydrazinecarbothioamide
P068	60-34-4	Hydrazine, methyl-
P063	74-90-8	Hydrocyanic acid
P063	74-90-8	Hydrogen cyanide
P096	7803-51-2	Hydrogen phosphide
P060	465-73-6	Isodrin
P192	119-38-0	Isolan.
P202	64-00-6	3-Isopropylphenyl N-methylcarbamate.
P007	2763-96-4	3(2H)-Isoxazolone, 5-(aminomethyl)-
P196	15339-36-3	Manganese, bis(dimethylcarbamodithioato-S,S')-,
P196	15339-36-3	Manganese dimethyldithiocarbamate.
P092	62-38-4	Mercury, (acetato-O)phenyl-
P065	628-86-4	Mercury fulminate (R,T)
P082	62-75-9	Methanamine, N-methyl-N-nitroso-
P064	624-83-9	Methane, isocyanato-
P016	542-88-1	Methane, oxybis[chloro-
P112	509-14-8	Methane, tetranitro- (R)
P118	75-70-7	Methanethiol, trichloro-
P198	23422-53-9	Methanimidamide, N,N-dimethyl-N'-[3-[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride.
P197	17702-57-7	Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[[(methylamino)carbonyl]oxy]phenyl]-
P050	115-29-7	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide



Hazardous waste No.	CAS Number	Substance
P059	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-
P199	2032-65-7	Methiocarb.
P066	16752-77-5	Methomyl
P068	60-34-4	Methyl hydrazine
P064	624-83-9	Methyl isocyanate
P069	75-86-5	2-Methylactonitrile
P071	298-00-0	Methyl parathion
P190	1129-41-5	Metolcarb.
P128	315-8-4	Mexacarbate.
P072	86-88-4	alpha-Naphthylthiourea
P073	13463-39-3	Nickel carbonyl
P073	13463-39-3	Nickel carbonyl Ni(CO) <sub>4</sub> , (T-4)-
P074	557-19-7	Nickel cyanide
P074	557-19-7	Nickel cyanide Ni(CN) <sub>2</sub>
P075	154-11-5	Nicotine, & salts
P076	10102-43-9	Nitric oxide
P077	100-01-6	p-Nitroaniline
P078	10102-44-0	Nitrogen dioxide
P076	10102-43-9	Nitrogen oxide NO
P078	10102-44-0	Nitrogen oxide NO <sub>2</sub>
P081	55-63-0	Nitroglycerine (R)
P082	62-75-9	N-Nitrosodimethylamine
P084	4549-40-0	N-Nitrosomethylvinylamine
P085	152-16-9	Octamethylpyrophosphoramidate
P087	20816-12-0	Osmium oxide OsO <sub>4</sub> , (T-4)-
P087	20816-12-0	Osmium tetroxide
P088	145-73-3	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P194	23135-22-0	Oxamyl.
P089	56-38-2	Parathion
P034	131-89-5	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	51-28-5	Phenol, 2,4-dinitro-
P047	1534-52-1	Phenol, 2-methyl-4,6-dinitro-, & salts
P020	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-

Hazardous waste No.	CAS Number	Substance
P009	131-74-8	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P128	315-18-4	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester).
P199	2032-65-7	Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate
P202	64-00-6	Phenol, 3-(1-methylethyl)-, methyl carbamate.
P201	2631-37-0	Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.
P092	62-38-4	Phenylmercury acetate
P093	103-85-5	Phenylthiourea
P094	298-02-2	Phorate
P095	75-44-5	Phosgene
P096	7803-51-2	Phosphine
P041	311-45-5	Phosphoric acid, diethyl 4-nitrophenyl ester
P039	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester
P094	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester
P044	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
P043	55-91-4	Phosphorofluoridic acid, bis(1-methylethyl) ester
P089	56-38-2	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester
P040	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
P097	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-dimethyl ester
P071	298-00-0	Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester
P204	57-47-6	Physostigmine.
P188	57-64-7	Physostigmine salicylate.
P110	78-00-2	Plumbane, tetraethyl-
P098	151-50-8	Potassium cyanide
P098	151-50-8	Potassium cyanide K(CN)
P099	506-61-6	Potassium silver cyanide
P201	2631-37-0	Promecarb
P070	116-06-3	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
P203	1646-88-4	Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime.
P101	107-12-0	Propanenitrile
P027	542-76-7	Propanenitrile, 3-chloro-
P069	75-86-5	Propanenitrile, 2-hydroxy-2-methyl-
P081	55-63-0	1,2,3-Propanetriol, trinitrate (R)

Hazardous waste No.	CAS Number	Substance
P017	598-31-2	2-Propanone, 1-bromo-
P102	107-19-7	Propargyl alcohol
P003	107-02-8	2-Propenal
P005	107-18-6	2-Propen-1-ol
P067	75-55-8	1,2-Propylenimine
P102	107-19-7	2-Propyn-1-ol
P008	504-24-5	4-Pyridinamine
P075	154-11-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts
P204	57-47-6	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.
P114	12039-52-0	Selenious acid, dithallium(1 + ) salt
P103	630-10-4	Selenourea
P104	506-64-9	Silver cyanide
P104	506-64-9	Silver cyanide Ag(CN)
P105	26628-22-8	Sodium azide
P106	143-33-9	Sodium cyanide
P106	143-33-9	Sodium cyanide Na(CN)
P108	157-24-9	Strychnidin-10-one, & salts
P018	357-57-3	Strychnidin-10-one, 2,3-dimethoxy-
P108	157-24-9	Strychnine, & salts
P115	7446-18-6	Sulfuric acid, dithallium(1 + ) salt
P109	3689-24-5	Tetraethyldithiopyrophosphate
P110	78-00-2	Tetraethyl lead
P111	107-49-3	Tetraethyl pyrophosphate
P112	509-14-8	Tetranitromethane (R)
P062	757-58-4	Tetraphosphoric acid, hexaethyl ester
P113	1314-32-5	Thallic oxide
P113	1314-32-5	Thallium oxide TI2 O3
P114	12039-52-0	Thallium(I) selenite
P115	7446-18-6	Thallium(I) sulfate
P109	3689-24-5	Thiodiphosphoric acid, tetraethyl ester
P045	39196-18-4	Thiofanox
P049	541-53-7	Thioimidodicarbonic diamide [(H2 N)C(S)]2 NH
P014	108-98-5	Thiophenol

Hazardous waste No.	CAS Number	Substance
P116	79-19-6	Thiosemicarbazide
P026	5344-82-1	Thiourea, (2-chlorophenyl)-
P072	86-88-4	Thiourea, 1-naphthalenyl-
P093	103-85-5	Thiourea, phenyl-
P185	26419-73-8	Tirpate.
P123	8001-35-2	Toxaphene
P118	75-70-7	Trichloromethanethiol
P119	7803-55-6	Vanadic acid, ammonium salt
P120	1314-62-1	Vanadium oxide V2 O5
P120	1314-62-1	Vanadium pentoxide
P084	4549-40-0	Vinylamine, N-methyl-N-nitroso-
P001	181-81-2	Warfarin, & salts, when present at concentrations greater than 0.3%
P205	137-30-4	Zinc, bis(dimethylcarbamodithioato-S,S')-,
P121	557-21-1	Zinc cyanide
P121	557-21-1	Zinc cyanide Zn(CN)2
P122	1314-84-7	Zinc phosphide Zn3 P2, when present at concentrations greater than 10% (R,T)
P205	137-30-4	Ziram.

<sup>1</sup>CAS Number given for parent compound only.

(f) The commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products referred to in paragraphs (a) through (d) of this section, are identified as toxic wastes (T), unless otherwise designated and are subject to the small quantity generator exclusion defined in §261.5 (a) and (g).

[*Comment:* For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), R (Reactivity), I (Ignitability) and C (Corrosivity). Absence of a letter indicates that the compound is only listed for toxicity.]

End of List

List can be found at the Electronic Code of Federal Regulations' website as part of 40 CFR §261.33: [https://www.ecfr.gov/cgi-bin/text-idx?node=se40.26.261\\_133](https://www.ecfr.gov/cgi-bin/text-idx?node=se40.26.261_133)

### Step-By-Step Instructions For Stericycle Medical Waste Box Use And Closure

- University personnel must use Stericycle provided box, gray totes or red barrels, and red bag liners for collecting medical (aka biological, bio-hazardous, infectious) waste.
- 2" wide clear tape is required for boxes.
- The Stericycle containers and red bag liners are provided free of charge.
- Personnel can call and obtain boxes and red bags from Custodial Services - HSC Campus 852-7174; Belknap Campus- 852-8200, Off Campus locations contact DEHS Hazardous Waste at 852-2956 or 852-6670.
- HSC personnel can obtain 2" wide clear tape and Stericycle bar code labels from the DEHS Radiation Safety Office located at Library Commons Room 102 (phone 852-5231)- OR
- Belknap personnel and Off-Campus locations can obtain from DEHS Hazardous waste at 1800 Arthur St (852-6670); free of charge.



STEP 1: Obtain Stericycle box



STEP 2: Fold bottom flaps down, DoT spec mark visible (US 43). Use 2" wide clear tape to securely tape the middle seam (at least 2 strips) .



STEP 3: Invert box upright, use red bag to line box. Use two bags if waste is damp or wet.



STEP 4: Discard medical waste. Sharps Containers must be securely closed.



STEP 5 and 6: When box is full (max weight is 50 lbs/ 23 kg), gather top of bag, twist, tie an overhand knot to securely close bag.





STEP 7: Fold top flaps down, using 2" wide clear tape, tape the middle seam with at least two strips of tape



STEP 8: In "Customer Label" Section of box, attach a white or yellow bar code label. In the "Generator Information" area, personnel must print lab location (bldg. and room number), contact name and phone.



Contact DEHS Hazardous Waste at 852-2956 if personnel have any questions, concerns, or need further clarification.