UCONNA Regulated Waste Disposal Manual

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Regulated Waste Disposal Manual			
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Applies To:	Faculty, staff, and others involved in the management of hazardous and other regulated wastes at Storrs and regional campuses, except for UConn Health.		
Contact:	EHS Chemical Health and Safety Manager		



Policies and Procedures

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Regulated Waste Disposal Manual

I. PURPOSE

Environmental Health and Safety (EHS) designed the Regulated Waste Disposal Manual (RWDM) to ensure employees, students, and visitors properly manage and dispose of hazardous and other regulated wastes generated at University of Connecticut. The manual incorporates the regulations of the Connecticut Department of Energy and Environmental Protection (DEEP), Environmental Protection Agency (EPA), Nuclear Regulatory Commission, and Occupational Safety and Health Administration (OSHA).

II. SCOPE

The Regulated Waste Disposal Manual applies to employees, students, and visitors who generate hazardous or other regulated wastes at the University of Connecticut's main and regional campuses, except for UConn Health.

III. POLICY STATEMENT

The University of Connecticut is committed to providing a healthful and safe environment for all activities under its jurisdiction and complying with all applicable federal, state, and local safety regulations and standards. The RWDM is designed to meet compliance with the requirements of the **UConn Health and Safety Policy**, **Biological Safety Manual**, **Chemical Hygiene Plan**, and the **Radiation Safety Manual** and requires the cooperation of multiple departments and individuals to ensure that hazardous and other regulated wastes are properly managed.

IV. ENFORCEMENT

Employees, students, and visitors who fail to comply with this manual may result in disciplinary measures in accordance with University Laws and By-Laws, General Rules of

Conduct for All University Employees, applicable collective bargaining agreements, and the **University of Connecticut Student Code**.

V. **RESPONSIBILITIES**

The Regulated Waste Disposal Manual (RWDM) requires cooperation from multiple departments and individuals to ensure the proper management of hazardous and other regulated wastes at the University. The responsibilities of each group involved with the program are outlined below.

A. President of the University

- Provides institutional leadership and assumes ultimate responsibility to ensure compliance with the RWDM.
- Supplies Environmental Health and Safety with the support necessary to implement and maintain the requirements of the RWDM.
- Ensures EHS policies, programs, and relevant issues regarding regulated wastes are delegated to the Provost, Deans, Department Heads, Principal Investigators and Supervisors.

B. Biosafety Officer (BSO)

- Reviews and updates applicable sections of the Regulated Waste Disposal Manual.
- Develops policies and procedures to ensure the proper management and disposal by individuals generating biomedical waste.
- Manages and updates the training and inspection programs to ensure the proper management by individuals generating biomedical waste.
- Provides technical assistance to personnel regarding adherence to the biomedical waste procedures in the RWDM.

C. Chemical Hygiene Officer (CHO)

- Reviews and updates applicable sections of the Regulated Waste Disposal Manual.
- Develops policies and procedures to ensure the proper management and disposal by individuals generating chemical waste.
- Manages and updates the training and inspection programs to ensure the proper management by individuals generating chemical waste.

 Provides technical assistance to personnel regarding adherence to the chemical waste procedures in the RWDM.

D. Radiation Safety Officer (RSO)

- Ensures compliance with the UConn Nuclear Regulatory (NRC) license, federal and state regulations, and UConn policies and procedures pertaining to radioactive materials.
- Reviews and updates applicable sections of the Regulated Waste Disposal Manual.
- Develops policies and procedures to ensure the proper management and disposal by individuals generating radiological waste.
- Manages and updates the training and inspection programs to ensure the proper management of radiological wastes by individuals generating waste.
- Provides technical assistance to personnel regarding adherence to the radioactive waste procedures in the RWDM.

E. Department Head

- Directs personnel within their department(s) to comply with the guidelines of the RWDM.
- Instructs employees, students, and visitors within their department(s) to receive appropriate EHS training and retraining courses through EHS to ensure the proper management of regulated wastes.
- Works to maintain an up-to-date list of employees, students, and visitors within their department(s).
- Works with employees, within their department(s), found to be in violation of the RWDM or the Health and Safety Policy to ensure timely corrective action.

F. Supervisory Personnel

(e.g., principal investigators, laboratory managers, shop supervisors, etc.)

- Follows the guidelines of the RWDM and ensures compliance with all EHS policies and programs applicable to their labs or work areas.
- Ensures that applicable EHS trainings are completed by all employees, students, and visitors to ensure wastes are properly managed in labs.
- Ensures personnel use appropriate engineering and administrative controls to minimize exposure to regulated wastes.

- Provides appropriate personal protective equipment to personnel in their work areas for the waste being generated in their labs.
- Ensures that employees, students, and visitors properly collect, label, and manage regulated wastes.
- Ensures work areas remain clean, orderly, and in a sanitary condition.
- Provides oversight of operations and procedures to ensure compliance with the RWDM.

G. Workers

- Reviews and follows policies, procedures, and work practices outlined in the RWDM.
- Completes appropriate EHS trainings.
- Uses engineering, administrative, and work practice controls to minimize exposure to wastes in the work areas.
- Wears appropriate personal protective equipment as specified in the Workplace Hazard Assessment Form, Safety Data Sheets (SDSs), or other applicable documentation while handling regulated wastes.
- Notifies and consults with the supervisory personnel prior to making changes to existing and reviewed procedures.
- Properly collects, handles, labels, stores, and manages regulated wastes.
- Ensures that work areas(s) remain clean, orderly, and in a sanitary condition.
- Adheres to all University, departmental, and laboratory-specific safety policies, procedures, and directives.

H. Environmental Health and Safety

- Reviews, edits, and evaluates the RWDM, as needed.
- Establishes procedures regarding disposal of hazardous and other regulated wastes.
- Trains employees, students, and visitors of the requirements for managing regulated wastes.
- Prepares, submits, and maintains waste records, reports, permits, and manifests as required by regulations.
- Provides technical guidance and consultation to the University community regarding work practices, procedures, controls, and personal protective equipment to ensure the proper management and disposal of regulated wastes.
- Inspects laboratories and work areas to ensure the proper management of regulated waste.

 Provides services and consultation related to regulated waste management and disposal.

VI. BIOMEDICAL WASTE

Biomedical waste is defined by the Connecticut Department of Energy and Environmental Protection (DEEP) as infectious waste, pathological waste, chemotherapy waste and the receptacles and supplies generated during its handling and/or storage. It is further defined as waste that, because of its quantity, character or composition, has been determined to require special handling.

A. Biomedical Waste Categories

1. Cultures and stocks

This category includes agents infectious to humans and associated biologicals, waste from biological production, live and attenuated vaccines and anything used to contain, mix or transfer agents. This includes but is not limited to petri dishes, pipettes, pipette tips, microtiter plates, disposable loops, Eppendorfs and toothpicks.

2. Human blood, blood products and infectious body fluids

This category includes blood that is not contained by a disposable item or is visibly dripping, serum, plasma, and other blood products or non-glass containers filled with such discarded fluids. It further includes any substance which contains visible blood, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, peritoneal fluid and pericardial fluid. Glass containers filled with such discarded fluids shall be considered sharps. Intravenous bags which did not contain blood or blood products should not be considered a blood product. Dialysates are not considered blood or body fluids.

3. Sharps

Sharps, including needles, scalpel blades, hypodermic needles, syringes (with or without attached needles) and needles with attached tubing regardless of contact with infectious agents, are considered by the EPA and DEEP to be Regulated Medical Waste. Other sharps such as Pasteur pipettes, disposable pipettes, razor blades, blood vials, test tubes, pipette tips, broken plastic culture dishes, glass culture dishes and other types of broken and unbroken glass waste (including microscope slides

and cover slips) that may have been in contact with infectious material as well as other items that can puncture or tear autoclave bags are included in this category.

4. Research Animal Waste

Research animal wastes, including contaminated carcasses, body parts, and bedding of animals that were intentionally exposed to infectious agents during research or testing, must be managed as biomedical wastes. Animal carcasses and body parts not intentionally exposed to infectious agents during research or teaching are disposed of through a separate waste stream and vendor.

5. Isolation waste

Isolation waste includes biological wastes and discarded materials contaminated with body fluids from humans or animals which are isolated because they are known to be infected with a highly communicable disease (Biosafety Level 4 Agent).

6. Untreated Material

Any untreated material collected during or resulting from the cleanup of a spill of infectious or chemotherapy waste must be managed as biomedical waste.

7. Waste Mixed with Infectious Waste

Any waste that has been mixed with an infectious waste that cannot be considered a chemical hazardous waste or radioactive waste.

B. Other Potentially Infectious Materials

Other Potentially Infectious Materials means:

- Human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids;
- 2. Any unfixed tissue or organ (other than intact skin) from a human (living or dead) including cell or tissue cultures; and
- HIV-containing cell or tissue cultures, organ cultures and HIV- or HBV-containing culture medium or other solutions; blood, organs, or other tissues from experimental animals infected with HIV or HBV.

C. Infectious Look-Alike Waste

Infectious look-alike wastes include laboratory materials that can be used to contain, transfer or mix infectious agents but have been used with non-infectious agents. For example, disposable micropipette tips may have transferred sterile water or broth, but an identical tip in the same laboratory may have transferred an infectious agent. The tips would be indistinguishable in the trash. Look- alike materials must be handled as infectious waste if the facility routinely generates infectious or potentially infectious biological waste or is engaged in a temporary project that generates infectious or potentially infectious biological waste.

D. Biomedical Waste Management

- 1. Construct the biomedical waste box bag unit.
- 2. Donn the appropriate personal protective equipment:
 - a. ANSI Z87.1-certified eyewear
 - b. Nitrile gloves
 - c. Lab coat
 - d. Clothing that covers the legs
 - e. Closed-toed footwear
- 3. Manage all biomedical waste as indicated below:
 - a. Never place liquids, hazardous chemical wastes, or radioactive wastes in biomedical waste bags or sharps containers.
 - b. Place all solid biomedical waste in separate plastic or autoclave bags, label each bag with a white "Regulated Biological Waste" sticker, and place in the red biomedical waste liner bag inside the box.
 - c. Sharps containers must be sealed, labeled with a white "Regulated Biological Waste" sticker, and placed directly in the red biomedical waste liner bag inside the box (i.e., sharps do not need to be sealed in a separate bag).
 - d. Place larger and heavier bags or sharps containers in the red liner bag on the bottom of the box.
 - e. Place smaller and lighter bags or sharps containers in the red liner bag at the top of the box.

- f. Never overfill or improperly package the biomedical waste box. Boxes that are greater than 40lbs, unable to close, or leaky will not be removed. Generators must repackage non-compliant boxes.
- 4. Seal and label the **biomedical waste box**.
- 5. Submit a Biological Waste Pick-Up Form on the EHS Website.

E. Animal Research Waste Disposal

Animal research waste includes animal carcasses, body parts, and bedding of animals that were intentionally exposed to infectious agents during research or teaching. All animal research waste must be managed as solid biomedical waste using approved boxbag units provided by EHS. Each biomedical waste box has a maximum limit of 40 pounds. Boxes that exceed 40 pounds must be repackaged by the generators. Supplies and pickup requests can be provided by completing a **Biological Waste Pickup Form**.

Animal carcasses and body parts not intentionally exposed to infectious agents during research or teaching are disposed of by a contracted vendor and are not picked up by EHS. Contact **EHS** for contracted vendor information.

Any animals or animal tissues that have been chemically preserved in alcohol, formaldehyde, or another chemical preservative must be containerized and managed as chemical waste. Pickup requests and supplies can be ordered using the **Chemical Waste Pickup Form**.

VII. HAZARDOUS WASTE

A. Types of Hazardous Waste

Hazardous wastes include discarded solids, liquids, or gases with properties that are dangerous or potentially harmful to human health or the environment. Hazardous wastes include those chemicals that are listed as a hazardous waste or exhibit characteristics (i.e., ignitability, corrosivity, reactivity, or toxicity) of a hazardous waste as defined by the **Environmental Protection Agency** (EPA). All listed and characteristic hazardous wastes are identified by waste codes. The waste list and descriptions of each type are listed in the table below:

Listed Hazardous Wastes			
Hazardous Waste List	Description		
F-list (Non-specific source wastes)	 The F-list consists of 28 different wastes, including certain spent solvents, metal finishing wastes, dioxin-containing wastes, chemical manufacturing wastes, wood preserving wastes, petroleum refinery wastewater treatment sludges, and hazardous waste landfill leachate The K-list consists of over 100 wastes from specific industrial processes (e.g., wood preserving, petroleum refining, primary and secondary metals manufacturing; and the manufacturing of industrial chemicals, inks, pigments, pesticides, explosives, and veterinary pharmaceuticals). 		
K-list (Source-specific wastes)			
P-list (Discarded commercial chemical products-acute)	This P-list consists of about 200 different commercial chemical products that are defined as acutely hazardous and toxic. Wastes that fall under this listing include only those products that contain the listed constituent as the sole active ingredient. These wastes include virgin materials that are being discarded, as well as container residues and spill residues.		
U-list (Discarded commercial chemical products- non- acute) The U-list consists of several hundred different commercial chemical products. Wastes that fall ur this listing include only those products that contai listed constituent as the sole active ingredient. The wastes include old or off-specification virgin mate that are being discarded, as well as container resic and spill residues of these materials.			

*Table derived from 40 CFR Part 261 Subpart D.

Hazardous wastes that are not identified on the F, K, P or U-lists must still be managed in labs as hazardous waste if they exhibit any of the four characteristics listed below:

Characteristic Hazardous Wastes		
Characteristic	Description	
Ignitability	A solid waste that meets any of the following criteria:	

(D001)	 A liquid that has a flash point of less than 140° F as determined by a Pensky-Martens closed cup tester using ASTM method D- 93-70 or D-93-80; A solid, under standard temperature and pressure, that can cause fire through friction, absorption of moisture, or spontaneous chemical changes and burn vigorously and persistently that it creates a hazard; An ignitable compressed gas as defined by the Department of Transportation in 49 CFR 173.300; or, An oxidizer as defined by the Department of Transportation in 49 CFR 173.151.
	A solid waste that meets any of the following criteria:
Corrosivity (D002)	 An aqueous liquid that has a pH of less than or equal to 2 or greater than or equal to 12.5; or, A liquid that corrodes steel at a rate of 6.35 mm or more per year as determined by the EPA Publication SW-846.
	A solid waste that meets any of the following criteria:
	 It is normally unstable and readily undergoes violent change without detonating. It reacts violently with water
	3. It forms potentially explosive mixtures with water.
	 When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
Reactivity (D003)	 It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
	6. It is capable of detonation or explosive reaction if it is subjected
	to a strong initiating source or if heated under confinement.
	 It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
	8. Defined as a forbidden explosive by the Department of
	Transportation.

	A waste is toxic if it contains any of 40 different hazardous		
	constituents at a concentration equal to or greater than the		
Toxicity	Maximum Concentration of Contaminants for the Toxicity		
(D004-D043)	Characteristic table. These 40 constituents include 8 metals, 6		
	pesticides, 2 herbicides, 10 volatile organic compounds (VOCs), and		
	14 semi-volatile organic compounds (SVOCs).		

*Table derived from 40 CFR Part 261 Subpart C.

No listed (i.e., F, K, P, or U-listed wastes) or characteristic hazardous wastes are allowed to be disposed of down drains, treated to render them non-hazardous, or volatilized into the air. In addition, abandoned chemicals, **unknown chemicals**, or chemicals in deteriorating containers must also be managed as hazardous waste. Supervisory personnel are responsible for assuring that the waste management and disposal procedures are followed by their workers.

B. Hazardous Waste Management in the Laboratory

All hazardous wastes must be properly managed prior to disposal. The following work practice must be followed by all employees and students generating or storing hazardous wastes:

- Package all hazardous wastes in sturdy containers that are compatible with the waste (e.g., do not store acid wastes in metal containers). Never use empty household or food grade containers to store hazardous waste.
- Mark containers with hazardous waste stickers or tags and full chemical names from the moment waste is added (i.e., DO NOT USE CHEMICAL FORMULAS OR ABBREVIATIONS).
- Ensure hazardous wastes with more than one chemical list the approximate percentage of each chemical product, including the percentage of water if applicable, and add up to 100%. Examples of compliant hazardous waste labels are pictured below:



- Keep containers closed with a tight-fitting cap or lid (e.g., no corks, rubber stoppers or open funnels), unless waste is being directly added to the container.
- Place containers that continually generate hazardous wastes (e.g., high-performance liquid chromatography wastes) in secondary containment, and ensure all tubes and hoses are closed as much as possible to minimize potential release.
- Never mix incompatible wastes in the same container.
- Never add waste to an unlabeled waste container.
- Never store incompatible wastes in the same secondary containment bin.
- Store all hazardous wastes at or near a "Satellite Accumulation Area" sign in the lab or work area. Hazardous wastes cannot be stored in another work area or across a hallway.
- Never exceed 55 gallons of non-acute waste per waste stream or 1 quart of acutely hazardous waste in a satellite accumulation area.

C. Hazardous Waste Disposal Procedures

 Ensure hazardous waste stickers or tags, full chemical names, and approximate percentages (if applicable) are legible and prominently displayed on each container. Check all the applicable hazard classes and complete the contact information on the hazardous waste sticker or tag.

HAZARDOUS List Full Chemical	WASTE Name(s):
Ethanol – 50%	
Methanol – 50%	
Check All Applicab	ole Hazards: ing □ Reactive □ Toxic
Contact: Jonathon Husky	Phone: 860-486-9999
Building Chemistry	Room:

- Submit a Chemical Waste Pickup Form when waste containers are almost full.
- Verify submission of the pick-up through a confirmation email to the email address listed on the form.
- EHS normally picks up hazardous wastes on Mondays, Wednesdays, and Fridays.

Note: EHS will not remove hazardous wastes that have chemical abbreviations, illegible names, no percentages (if applicable), inadequate contact information, or fail to use hazardous waste stickers or tags.

VIII. CONNECTICUT REGULATED WASTES

Connecticut Regulated Wastes are wastes that are not classified as hazardous wastes under Connecticut's Hazardous Waste Management Regulations, but still subject to specific management requirements under Connecticut General Statutes (CGS) Section 22a-454. If a hazardous waste determination indicates that a waste is not hazardous, but the waste meets the description of one of the waste types listed below, it must be managed in compliance with the requirements of CGS. These requirements include:

Connecticut Regulated Wastes			
Waste Number	ber Waste Name Description		
CR01 Waste PCBs		Any waste material containing or contaminated by PCBs (Polychlorinated Biphenyls) in concentrations at or above 50 ppm (parts per million). These include, but are not limited to, PCB oils, items and equipment.	
CR02	Waste Oil	Oil or petroleum that is no longer suitable for the services for which it was manufactured due to the presence of impurities or a loss of original properties, and is not <i>miscible</i> in water (e.g., crude oil, fuel oil, lubricating oil, kerosene, diesel fuel, motor oil, non- halogenated oil, and oils that are recovered from oil separators, oil spills or tank bottoms).	
CR03	Waste Water Soluble Oil	Oil or petroleum that is no longer suitable for the services for which it was manufactured, due to the presence of impurities or a loss of original properties and is <i>miscible</i> in water (e.g., cutting oil emulsions or coolants).	
CR04 CR04 Chemical Liquid Any wastes that are contain free drainin to handle and/or m and/or surface wat latex and solvent p waste sludges, anti		Any wastes that are liquid, free flowing and/or contain free draining liquids and are toxic, hazardous to handle and/or may cause contamination of ground and/or surface water if improperly managed (e.g., latex and solvent paint wastes, grinding wastes, waste sludges, antifreeze wastes and glycol solutions.	
CR05 Waste Chemical Solid		Any chemical solid or semi-solid from a commercial, industrial, agricultural or community activity (e.g., grinding dusts, tumbling sludges, scrap plastic and rubber flash, and other ground or chipped waste solid).	

All Connecticut Regulated Wastes must be managed and disposed of as chemical waste through **EHS**.

IX. UNIVERSAL WASTES

Universal wastes refer to common items such as thermometers, batteries, and fluorescent lamps that contain mercury and/or other toxic metals. These wastes are generated in a wide variety of settings, including laboratories. At UConn, the following materials must be managed as universal wastes:

Universal Wastes Management			
Category	Management	Disposal	
Lamps (e.g., linear fluorescent, HID/HPS, U and Circlines, Biax and Compact/PL's, etc.)	 Place the lamp(s) in a closed container immediately after it is removed from service. Label the container with a "Universal Waste" sticker. Mark the checkbox on the label for "Universal Waste- Lamp(s)." Write the "Accumulation Start Date." 	Submit a work order through Facilities Operations for removal once containers are full or near the one year accumulation time limit.	
Batteries, Automotive (lead-acid vehicle batteries)	 Tape the terminals. Label the battery with a "Universal Waste" sticker. Mark the checkbox on the label for "Universal Waste Battery(ies)." Write the "Accumulation Start Date." 	Contact UConn Motor Pool for disposal.	
Batteries, Non- Automotive (e.g., lead- acid, nickel-cadmium, silver oxide, lithium, mercury, magnesium, etc.)	 Place used batteries in individual plastic bags or tape the terminals. Label the bag or battery with a "Universal Waste" sticker. 	Submit a chemical waste pick-up request through EHS .	

	 Mark the checkbox on the label for "Universal Waste Battery(ies)." Write the "Accumulation Start Date." 	
Mercury-Containing Thermostats or Other Mercury-Containing Equipment	 Place the mercury containing device(s) in a container with a tight-fitting cap or lid. Label the container with a "Universal Waste" sticker. Mark the checkbox on the label for "Waste-Mercury Thermostat(s)." Write the "Accumulation Start Date." 	Submit a chemical waste pick-up request through EHS .
Used Electronic Equipment (e.g., computers, monitors, radios, copiers, etc.)	 Contact Surplus Operations. Surplus Operations will remove the used electronic and determine when it becomes a solid waste. Once the waste determination is made, Surplus will: Label the device with a "Universal Waste" sticker. Mark the checkbox for "Universal Waste- Used Electronics." Write the "Accumulation Start Date." 	Surplus Operations will contact an e- waste recycler to remove the used electronics within one year.

Pesticides	 Label waste pesticides with a "Hazardous Waste" sticker or tag and full chemical names. Keep the cap or lid of the waste container closed, unless actively adding waste. Store pesticide wastes with compatible chemicals in a secure location at or near a "Satellite Accumulation Area" sign. 	Submit a chemical waste pick-up request through EHS . EHS will determine whether the pesticide waste meets the criteria to be managed as a universal waste.
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X. SPECIFIC WASTE MANAGEMENT

In addition to hazardous, Connecticut regulated and universal wastes, other wastes generated in labs and work areas must also be properly managed.

A. Empty Chemical Container Management

Lab personnel must update their lab-specific inventory or their inventory associated with the **Laboratory Chemical Inventory Program** when original chemical containers become empty. Empty chemical containers must be managed based on the chemical originally present in the container.

a. Empty Acutely Hazardous Chemical Containers

Empty containers of **P-listed chemicals** must be properly labeled as hazardous waste and be discarded through EHS. Wastes that fall on the P-List include only those products that contain the listed constituent as the sole active ingredient. P-listed chemicals commonly found in labs may include:

Common P-Listed Chemicals in Laboratories		
Acrolein	Allyl alcohol	Arsenic compounds
Carbon disulfide	Cyanogen	2,4-dinitrophenol

Epinephrine	Inorganic cyanide	Nitrous and nitric
	salts	oxides
Osmium tetroxide	Sodium azide	Vanadium pentoxide

Prior to disposal of any empty container, principal investigators, laboratory managers, and lab personnel must determine if the empty container is listed on the EPA's **P-List**.

b. Empty Non-Acutely Hazardous Chemical Containers

All empty containers, not identified on the P-List, must meet the following four criteria prior to disposal in the regular trash:

- 1. All waste has been removed using the practices commonly employed to remove materials from that type of container (e.g., pouring, pumping, aspirating, etc.);
- 2. No more than 2.5 centimeters (one inch) of residue remains on the bottom of the container or inner liner;
- 3. No more than 3% by weight of the total capacity remains in the container or inner liner (for containers greater than 110 gallons); and
- 4. The empty container does not have a residual, noxious odor.

If all four criteria are met, lab personnel must remove and dispose of the caps, cross out/deface the chemical name(s) on the label, and then dispose of the empty container in the regular trash, lab glass, or other suitable waste receptacle. If one or more of the four criteria cannot be met, the container must be managed as **hazardous waste** and be disposed of through EHS.

B. Aerosol Cans

Waste aerosol cans commonly contain hazardous chemicals (e.g., solvents, pesticides) and/or hazardous propellants (e.g., propane or isobutane). Aerosol cans cannot be disposed of in the regular trash. Lab personnel must manage full, partially full, and empty aerosol cans as hazardous waste and dispose of them through EHS. The steps to manage aerosol cans are outlined below:

Waste Aerosol Cans Management		
Steps	Procedure	
1.	Label a box or bag with a hazardous waste sticker or tag with the words "Used Aerosol Cans."	
2.	Place full, partially full, and empty aerosol cans in the labeled box or bag.	
3.	Submit a Chemical Waste Pickup Form when waste aerosol cans require disposal.	

EHS will manage and dispose of the waste aerosol cans, residual solvents, and propellants in compliance with state and federal regulations.

C. Ethidium Bromide Waste

Ethidium bromide is a toxin capable of causing harm and genetic defects upon exposure. Although ethidium bromide is not regulated by the EPA as a hazardous waste, specific work practices must be followed to ensure proper disposal through EHS. The management and disposal practices for ethidium bromide waste are listed below:

Ethidium Bromide Waste Management		
Solid Waste		
1.	Place ethidium bromide gels or contaminated debris in an open head 5-gallon pail for solids available through EHS.	
2.	Place a green "Connecticut Regulated Waste" sticker on the pail and label the sticker with the words "Ethidium Bromide."	
3.	Close the container when not directly adding waste to the container.	
4.	Submit a Chemical Waste Pickup Form when the container is almost full.	
Liquid Waste		
1.	Place ethidium bromide liquids in a sturdy, non-leaking container.	
2.	Place a green "Connecticut Regulated Waste" sticker on the container and label the sticker "Ethidium Bromide."	

3.	Close the container when not directly adding waste to the
	container.
	Submit a Chemical Waste Pickup Form when the container is

Do not use biohazard or autoclave bags to store ethidium bromide wastes. All ethidium bromide wastes must be managed, collected, and disposed of through EHS as chemical waste.

D. Glass Waste

Lab personnel must dispose of intact or broken lab glass in puncture-resistant containers or boxes with inner liners to prevent cuts or lacerations to individuals handling the waste. Glass waste must never contain solid or liquid chemicals or be disposed of with regular trash. Empty, non-contaminated glass waste is not a regulated material and is disposed from laboratories by the custodial staff or other **Facilities Operations** personnel.

E. Sharps Waste

The Environmental Protection Agency (EPA) and Connecticut Department of Energy and Environmental Protection (DEEP) require sharps waste (e.g., needles, scalpel blades, hypodermic needles, syringes (with or without attached needles), and needles with attached tubing, regardless of contact with infectious agents, to be managed as "Regulated Medical Waste."

Other sharps that can puncture or tear autoclave bags including Pasteur pipettes, disposable pipettes, razor blades, blood vials, test tubes, pipette tips, broken plastic culture dishes, glass culture dishes, and other types of broken and unbroken glass waste (e.g., microscope slides and cover slips) that may have been in contact with infectious material must also be managed as sharps.

All sharps generated in labs must be disposed of in approved sharps containers provided by EHS. Sharps containers are available through submission of a **Biological Waste Pick-Up Form**.

Note: Sharps derived from injections with **P-Listed chemicals** (e.g., epinephrine) must be disposed of in black sharps containers provided by EHS upon request.

F. Gas Cylinder Returns/Disposal

Lab personnel using compressed gases are responsible for returning empty or unused cylinders to the onsite vendor or supplier. EHS does not manage the return or disposal of compressed gas cylinders. Prior to purchasing compressed gases, lab personnel must check with the supplier to ensure they will accept the return of empty or partially used cylinders. If the supplier will not accept the cylinders, the costs associated with returning or disposing of the cylinders may be charged to the department, principal investigator, or laboratory manager. Lab personnel must contact the **Purchasing Department** to review a current list of approved vendors for compressed gases at UConn.

XI. WASTE MINIMIZATION

The University is required under EPA regulations to reduce the volume of hazardous wastes generated. Minimizing wastes increases worker safety, protects the environment, and decreases disposal costs. Lab personnel must take measures to manage and reduce quantities of hazardous chemicals and wastes when feasible. Strategies to minimize waste are listed below:

Waste Minimization Practices	
	Chemical Management
	Maintain an accurate chemical inventory. Check the lab chemical inventory
1.	for existing chemicals prior to reordering. Update the inventory each time
	chemicals are received or disposed of.
	Order the minimum amount of a chemical required for an experiment or
2.	process. Avoid purchasing chemicals in bulk quantities at reduced costs if the
	additional quantity is unnecessary. Disposal costs may nullify discounts.
3.	Use the oldest chemicals first to prevent older chemicals from expiring or
	becoming off-specification.
4.	Reduce the scale of chemicals used in experiments or processes.
	Label each chemical and sample stored in secondary containers (i.e., beakers,
5.	flasks, vials, etc.) with the chemical name(s) and hazard class(es). Unknown
	chemicals are extremely costly to dispose of.

6.	Purchase equipment that uses non-hazardous chemicals or reduced quantities of hazardous chemicals.
7.	Use spent solvents capable of removing residues for initial rinsing(s) of
	glassware and new solvent for final rinse(s). Dispose of hazardous rinsate
	through EHS.
8.	Dispose of expired or off-specification chemicals, or chemicals and samples
	with no useful purpose in the lab, through EHS. Do not stockpile chemicals.
	Substitution
1.	Substitute ethanol for methanol, if feasible.
2.	Substitute non-mercury thermometers for mercury thermometers.
3.	Substitute citric acid-based solutions in histology for xylene, benzene, or toluene.
4.	Substitute ethanol for formaldehyde for tissue preservation.
5.	Substitute non-hazardous liquid scintillation cocktails for hazardous solvent- based cocktails.
6.	Substitute rechargeable alkaline batteries for nickel cadmium.
	Substitute non-hazardous chemicals for cleaning glassware for hazardous
7.	chemicals (e.g., chromic acid, hydrochloric acid, potassium hydroxide, etc.), if
	feasible.
	Reduction of EPA Regulated Hazardous Chemicals
1	Avoid, minimize, or substitute reagents containing arsenic, barium, copper,
1.	cadmium, chromium, lead, mercury, nickel, osmium, selenium, silver, or zinc.
	Avoid, minimize, or substitute the following halogenated solvents;
2	tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-
2.	trichloroethane, chlorobenzene, 1,1,2- trichloro-1,2,2-trifluoroethane, ortho-
	dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane.
	Avoid, minimize, or substitute the following non-halogenated solvents;
3.	xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl
	ketone, n-butyl alcohol, cyclohexanone, and methanol.
	Avoid, minimize, or substitute the following non-halogenated solvents;
4.	toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene,
	2-etnoxyetnanol, and 2-nitropropane.
	Avoid, minimize, or use chloroform solutions at concentrations less than
-	Construction of the second state of the second
5.	6mg/L. Chloroform volumes greater than or equal to 6mg/L are regulated by

Waste Management	
1.	Label hazardous waste containers with hazardous waste stickers/tags and full
	chemical names from the moment waste is added.
2.	Avoid mixing chemical, biological and/or radiological wastes. Contact EHS
	prior to generating mixed waste.
3.	Avoid mixing hazardous and non-hazardous chemical waste.
4.	Segregate non-halogenated waste from halogenated waste, if feasible.
5.	Segregate inorganic waste from organic waste, if feasible.
6.	Segregate cyanides, arsenic trioxide, osmium tetroxide, and other P-Listed
	wastes from other chemical wastes, if feasible.
7.	Separate waste containing heavy metals from organic solvent waste, if
	feasible.
8.	Do not mix uncontaminated pump oil with other hazardous wastes.
	Uncontaminated pump oil can be recycled.
9.	Avoid purchasing lecture bottles of compressed gases that cannot be
	returned to the manufacturer.

The University recycles batteries, fluorescent lamps, mercury-containing thermostats and other mercury-containing equipment, and used electronics with circuit boards. The appropriate management practices and disposal contacts for each waste type are listed in the **Storrs campus** and **regional campuses** waste stream guidance documents.

XII. RADIOLOGICAL WASTE

Principal Investigators (PIs) are required to gain authorization from the Radiation Safety Committee and obtain an approved radioactive materials usage license from Radiation Safety prior to using radioactive materials. The authorized PI is then referred to as a Licensed Investigator (LI). The LI and lab personnel in authorized radioactive material labs are also required to complete applicable prerequisite radiation safety training. Procedures for the authorized, proper disposal of radioactive waste, including thorium and uranium compounds, generated in UConn labs must be carried out as indicated in the **Radiation Safety Manual**. LIs, laboratory managers, and lab personnel generating radioactive wastes in UConn labs are responsible for compliance with the UConn Nuclear Regulatory Commission (NRC) license requirements, federal and state regulations, and the University requirements indicated in the manual.

A. Waste Security

Each LI is responsible for the safe and secure storage of their radioactive waste in the authorized, designated radioactive materials lab until Radiation Safety picks it up. The waste must be properly secured from unauthorized removal. All radioactive waste containers shall be kept in the controlled areas of the lab, not in the hall or other unsecured areas, as this represents a violation of NRC regulations and subjects an LI to revocation of their usage license. Waste must also be stored with sufficient shielding to minimize the radiation exposure levels as low as is reasonably achievable (ALARA) to any individual in the laboratory. Contact Radiation Safety immediately if unauthorized individuals remove or attempt to remove radioactive materials or radioactive waste from a laboratory.

B. Waste Categories

Each laboratory shall segregate their radioactive waste into a number of different categories. Short half-life ($t_{1/2} < 120$ days) waste must be separated from the long half-life ($t_{1/2} \ge 120$ days) waste. Short half-life waste must be further segregated by radionuclide. Biological waste, hazardous waste, and animal waste that are contaminated with radioactivity must all be inventoried, labeled appropriately, and stored separately. There shall also be separate radioactive waste containers for liquid, liquid scintillation vials (LSVs), dry waste, and sharps.

Mixed waste that contains both hazardous waste and radioactive material are regulated by the Environmental Protection Agency (EPA) and the NRC. No mixed waste (i.e., regulated hazardous waste contaminated with radioactive material), shall be generated unless it is authorized, and prior approval is obtained by the Radiation Safety Committee and documented in the Ll's approved radionuclide usage license. Lls, laboratory managers, and lab personnel are responsible for contacting EHS prior to the generation of mixed waste containing hazardous chemicals and radioactive materials. Fees associated with the proper disposal of mixed waste may be charged to the Pl/department of the laboratory that generated the mixed waste. Material must not be put into radioactive waste collection containers if there is any possibility of a chemical reaction during storage or shipment that might cause the release of radioactive gases, a fire, or an explosion. Radioactive waste containing a volatile iodine radionuclide must be sealed in plastic bags prior to pick up due to the volatile nature of iodine. Lead being disposed of must be managed as hazardous waste. Therefore, empty lead stock vial containers (i.e., lead containers/pigs) are required to be segregated for pick-up by Radiation Safety.

Laboratory personnel are required to use radioactive waste containers provided by Radiation Safety for radioactive waste collection. The containers provided are properly labeled and have a waste log sheet attached to the lid. Arrangements can be made for the delivery of these waste containers via the EHS website. Each waste category shall be disposed of in a separate radioactive waste container. The dry waste containers shall not include liquid, animal tissue of any kind, hazardous material such as chemicals, lead, sharps, or items that require refrigeration. Care must be taken to keep containers dry and not filled to a volume more than approximately three-fourths full.

Liquid scintillation cocktails must be non-hazardous and listed on the University's *List of Approved Liquid Scintillation Cocktails* which can be found on the EHS website or may be obtained by requesting it from Radiation Safety staff. Radiation Safety must be contacted with questions about any cocktails not on the list prior to utilization. Do not pour the contents of the liquid scintillation vials down the drain. Radiation Safety will collect the intact vials for proper disposal.

In any given lab there can be many radioactive waste categories. For example: A lab has the following two protocols: 1. Using C-14 in cell cultures and 2. Using I-125 in mice. The following separate long and short half-life waste categories could result for each isotope:

Long half-life waste associated with the C-14:

- 1. Dry waste (gloves, plastic, and paper)
- 2. Aqueous waste
- 3. Animal waste
- 4. Sharps
- 5. Liquid scintillation vials

6. Empty lead stock vial containers (i.e., pigs) or other hazardous waste approved to be generated in a research protocol

A similar list of short half-life categories would apply to the I-125. The LI must consult with Radiation Safety if there are questions regarding which waste categories are appropriate.

Uranium and thorium compound waste must also be segregated and managed as radioactive waste. Barcodes on empty chemical bottles previously containing thorium and uranium compounds must be sent to EHS prior to disposal for compliance with the Laboratory Chemical Inventory Program. Unwanted thorium and uranium compounds or waste containing thorium and uranium must be disposed of through Radiation Safety.

C. Waste Collection and Pick-Up Procedures

1. Waste Logs

As the waste container is being filled, remove the empty tag from the lid and keep accurate records of the specific radionuclides, quantities, and dates that the waste is being placed in the container. These records shall be kept on the waste disposal log provided with each receptacle. There must be a waste log entry for any waste put into the container, including items such as gloves with trace radioactivity.

2. Radioactive Material Label Removal

Remove and obliterate radioactive material labels from all Short Half-Life waste prior to disposal in a designated waste container. Labels may be obliterated prior to disposal by tearing them up or completely covering the words "radioactive material" and all radiation symbols by 1) covering with a thick, permanent marker; 2) completely covering with duct tape; or 3) other means that permanently removes the radioactive materials warnings.

3. Waste Storage

The presence of the receptacle within the laboratory must not constitute a health hazard. If significant dose rates are associated with the container, special arrangements must be made through Radiation Safety for recommendations concerning proper shielding or different methods for handling waste must be arranged. Acrylic (e.g., Lucite or Plexiglass) rather than lead must be used as the shielding for P-32 waste and lead shielding for gamma emitters. If additional shielding is needed for high energy beta emitters, use Lucite on the inside of the shield and lead on the outside.

4. Waste Removal

Waste container removal can be requested by going to the EHS website and filling out the on-line **radioactive waste pick-up form**. Scheduling a waste pick-up necessitates advance notice; allowance must be made to anticipate full containers (not over-flowing) at the time of pick up. LIs are reminded of their responsibility for safe and secure storage of the waste until removed by Radiation Safety. Prior to pick-up, laboratory personnel must perform the following:

- The exterior of each container shall be wipe-tested to assure that any removable contamination is less than 100dpm/100cm. The wipe tests shall include the handle, top, sides, and the bottom of each container being picked up and documented appropriately.
- 2. Each container shall have a completed waste log sheet indicating the specific radionuclide(s), total amount of activity disposed, associated dates of disposals, LI name, waste class, and the name of the liquid scintillation cocktail, if applicable.
- 3. Enter the waste pick-up date and activity amount on the current quarter inventory spreadsheet when Radiation Safety removes from lab.

D. Waste Processing

Radiation Safety is responsible for the processing of most of the radioactive waste. The short half-life waste is allowed to be decayed on-site for at least ten half-lives at which time it is no longer considered radioactive if the radiation levels cannot be distinguished from natural background. Long half-life wastes are accumulated and sent through a licensed broker to disposal sites that have been duly licensed by the NRC and/or State agency.

Aqueous waste can be disposed of into the sanitary sewer and must be readily soluble in water, biological material readily dispersible in water, or otherwise suitable for disposal into a sanitary sewer and within the limits of concentration and activity. Each LI is allowed to release up to one millicurie per week total of all isotopes combined into a designated sink within the laboratory. The weekly limit applies to the combined total disposals for all designated sinks in the LI laboratory, not per sink. There must be a thorough flushing with several gallons of water each time radioactivity is released to the sanitary sewer. A record of the isotope, volume, activity, and date of each disposal

released must be kept. The sink must be surveyed after each disposal and decontaminated if radioactive contamination is present.

E. Deregulation of C-14 and H-3 Waste

NRC and UConn regulations allow for the deregulation from radiation control of small concentrations (< 0.05 μ Ci/g) of C-14 and H-3 in scintillation cocktails or animal carcasses under an approved radioactive material protocol. Radiation Safety will pick up the deregulated liquid scintillation vials for proper disposal in accordance with waste collection procedures specified in this section. Do not pour the contents of the liquid scintillation Safety will collect the intact vials for disposal. Deregulated animal carcasses must be disposed of in accordance with appropriate Biological Safety procedures.

F. Animal Carcasses and Associated Waste

1. LIs authorized to use animals by the IACUC and the RSC in their radionuclide research shall make provisions for packaging and freezing the carcasses in a secure location until picked up by Radiation Safety.

2. Bags containing animal carcasses and associated waste shall be labeled with the specific radionuclide, date, activity, and weight of the containerized carcasses/tissue.

G. Radioactive Viruses

- All liquid preparations containing infectious viruses and radioactive compounds shall be mixed with an appropriate agent such as bleach to destroy the virus, then neutralize before disposal.
- All solid waste contaminated with infectious viruses and radioactive compounds should be autoclaved before being placed in the radioactive waste receptacles. Care must be taken so that disposable glassware, etc., which might have radioactive contamination on the outside does not touch the walls of the autoclave. Additionally, radionuclides attached to highly volatile compounds must not be used in procedures that require autoclaving.

H. Excess and Unwanted Radioactive Material

Contact Radiation Safety for removal of excess or unwanted radioactive material.

XIII. APPENDICES

- Biological Safety Manual
- Chemical Hygiene Plan
- Radiation Safety Manual
- Environmental Protection Agency F, K, P, and U Lists
- Environmental Protection Agency Characteristic Wastes
- CT Department of Energy and Environmental Protection CT Regulated Wastes
- CT Department of Energy and Environmental Protection Universal Wastes