



Rutgers Environmental Health and Safety (REHS)

Program Name:	Hazardous Waste Management Program		
Responsible Executive:	Executive Director of REHS		
Adopted:	April 5, 2002	Reviewed/Revised:	November 24, 2020

1. Program Statement

REHS manages hazardous waste from all Rutgers campuses and remote off-site facilities. Hazardous waste management and disposal is strictly regulated by federal, state and local regulations. REHS holds a Part B Permit that sets forth specific requirements for managing and disposing of hazardous wastes through our Treatment, Storage and Disposal Facility (TSDF) at the Environmental Services Building (ESB) located on Davidson Road on the Busch Campus in Piscataway, NJ.

REHS retains the services of a hazardous waste vendor to transport and ultimately dispose of Rutgers hazardous wastes at appropriate treatment and disposal facilities. Rutgers generates approximately 300,000 pounds of hazardous waste per year. Approximately 110,000 pounds of waste organic solvents is offered for beneficial reuse and the balance of hazardous waste is incinerated.

The primary generators of hazardous waste are research laboratories, maintenance facilities and utility systems. Rutgers is obligated to manage hazardous wastes from the point of generation to ultimate disposal, commonly referred to as "from cradle to grave".

2. Reason for Program

This program describes the procedures for properly managing different hazardous waste streams in order to protect the Rutgers community and the environment. It is also designed to ensure compliance with the following regulatory standards:

- *Resource Conservation and Recovery Act (RCRA)* – 40 CFR Parts 260-273 (EPA)

This program does not apply to radioactive waste, regulated medical waste (RMW) or mixed wastes (i.e. hazardous waste mixed with either radioactive waste or RMW).

3. Who Should Read this Program

This program applies to all Rutgers personnel who generate hazardous waste materials in their respective departments.

4. The Program

I. Roles and Responsibilities

A. Waste Generators and Personnel Who Manage Hazardous Waste Materials

- 1) Minimize the generation of hazardous waste streams whenever possible.
- 2) Identify hazardous waste streams that require special management in order to comply with regulatory standards.
- 3) Manage hazardous waste streams in accordance with regulatory requirements and Rutgers policies and programs.

B. Rutgers Environmental Health and Safety (REHS)

- 1) Conduct periodic audits of department hazardous waste storage areas and follow up with department personnel to correct deficiencies if any.
- 2) Conduct weekly inspections at the ESB and all 90-day storage areas. Maintain records of inspections for 3 years.
- 3) Pick up hazardous waste materials upon request and within the required time limits.
- 4) Inspect all hazardous waste materials for proper packaging, labeling and storage requirements whenever waste is picked up by REHS for final disposal.
- 5) Record all hazardous waste materials in the Operating Record upon arrival at the Environmental Services Building (ESB).
- 6) Consolidate hazardous waste through bulking as needed and segregate into proper storage rooms/cells at the ESB.
- 7) Segregate “lab pack” waste items according to their classification until a sufficient amount is available for packing.
- 8) Ensure proper DOT containers are used. Affix proper RCRA and DOT labels.
- 9) Arrange for disposal within required time limits through the contracted hazardous waste vendor.
- 10) Ensure the hazardous waste manifest form is used for each hazardous waste shipment and returned copies are retained in the files at REHS.

II. Definitions

*Acutely Hazardous Waste
(P-Listed Waste)*

Wastes that have the potential to cause death, disabling personal injury or serious illness. EPA designates them as “P-Listed” which refers to chemicals that are either 100% pure, technical grade or the sole active ingredient in a chemical formulation. Refer to [Acutely Hazardous Chemicals List](#).

Bulking

The consolidation of compatible wastes into a single container for storage/shipment.

<i>Hazardous Waste</i>	A waste with certain properties that make it dangerous or capable of having a harmful effect on human health or the environment. EPA defines a hazardous waste as one that exhibits the characteristics of ignitability, corrosivity, reactivity and/or toxicity. EPA further defines hazardous wastes as "listed" wastes which are wastes from common manufacturing and industrial processes, specific industries and can be generated from discarded commercial products. Refer to EPA regulations at https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes .
<i>Lab Pack</i>	The consolidation of containers of small quantities of waste into a single container for storage/shipment.
<i>Satellite Accumulation Area (SAA)</i>	A designated area where hazardous wastes are temporarily stored. The SAA must be located at or near the point of hazardous waste generation and be under the control of the operator generating the waste.

III. Procedures

A. Waste Minimization

The best way to reduce the amount of hazardous waste generated at Rutgers is to prevent it from becoming a waste in the first place by following these simple principles:

- Only purchase the amount of materials needed to complete a project or experiment. Disposal of excess materials often costs more than the original purchase price.
- Purchase non-toxic, non-hazardous alternative products whenever possible
- Reuse or recycle materials whenever possible

Waste minimization is practiced at Rutgers by implementing a chemical reuse program, substituting non-hazardous chemicals for hazardous chemicals, employing the concept of microscaling in chemistry experiments and providing good inventory control.

Chemical Reuse Program

REHS established a Chemical Reuse Program that allows departments to donate unopened chemicals, paints, oils and other similar products for reuse by other departments. REHS stores these chemicals at the ESB and makes them available upon request by contacting 848-445-2550 or hazwaste@rutgers.edu. Consult the following link for more information: <https://ipo.rutgers.edu/rehs/labenv-chemical>

Substituting Non-Hazardous Chemicals

In many situations, it may be possible to substitute non-hazardous chemicals for commonly used hazardous chemicals. Consider the simple replacements shown in Table 1 for reducing hazardous waste and minimizing exposure to toxic materials:

Table 1
Chemical Substitutions

<i>Use</i>	<i>Instead Of</i>
Propylene Glycol	Ethylene Glycol
Ethyl Alcohol	Methyl Alcohol
Alcohol Thermometers	Mercury Thermometers
Alconox®, Pierce RBS™ 35 Concentrate and Nochromix®	Chromic Acid Cleaning Solutions
Detergent and Hot Water	Organic Solvent Cleaning Solutions
Latex Paint	Oil Based Paint
GelRed® or GelGreen®	Ethidium Bromide
Citrus Based Degreasers	Solvent Based Degreasers
Non-Chlorinated Solvents	Chlorinated Solvents
Strontium Carbonate	Barium Carbonate
Prussian Blue or Mars Yellow	Chromate Pigment Powders
Iron Oxide	Uranium
Lead-Free Solder	Lead-Based Solder
Hot Glue	Solvent Based Adhesives

Microscaling

Microscale chemistry involves significantly scaling down the amount of chemicals used in standard experiments through the use of chemistry kits and small-scale equipment such as injection bottles, syringes, wellplates and plastic pipettes that replace traditional large-scale laboratory apparatus. Microscaling offers several advantages including:

- Chemical waste is reduced at the source resulting in cost savings for waste disposal
- Laboratory safety is improved by decreasing the potential exposure to chemicals and reducing fire and explosion hazards
- Air quality is improved due to reduced volumes of volatile chemicals used
- Costs for chemical purchases are reduced
- Time required for completing experiments is reduced
- Less storage space for chemicals is required

- Increased awareness regarding waste minimization and environmental sustainability

Laboratory Inventory Control

Each laboratory is encouraged to maintain an inventory of chemicals in their laboratory as a method to reduce unnecessary purchase and disposal. The following methods can reduce the amount of chemicals in a laboratory and minimize waste generated from expired, unwanted or excess chemicals:

- Check your inventory and the REHS Chemicals for Reuse Program before ordering chemicals
- Purchase only the amount you need to avoid having to dispose of excess chemicals once the shelf life expires
- Avoid accepting “free” samples from chemical manufacturers unless you are certain you will use them
- Rotate chemical stock in the laboratory to make sure older chemicals are used first

B. Drain Disposal

In general, drain disposal of chemicals is prohibited. However, certain buffers, salts, non-hazardous chemicals and dilute aqueous solutions can be safely drain disposed if the building is connected to a public sanitary sewer system. If however, the building is connected to a septic system (e.g. farms, marine research centers, remote off-campus locations), drain disposal is prohibited. Refer to Table 2 for a list of substances that may be drain disposed.

Other considerations for drain disposal include:

- Aqueous solutions must be within the range of 6-9 pH to be drain disposed
- Plumbing systems must not be compromised in any way by the action of drain disposal
- Foul odors to downstream connections may occur during drain disposal of odorous chemicals

Drain Disposal of Dilute Acids and Alkalis

Acids and alkalis that have been rendered neutral by the experimental process may be drain disposed. Neutralization must be conducted in volumes no larger than 1 liter and must be done as part of the experiment generating the waste. It is inappropriate to collect waste from multiple experiments and conduct batch neutralization.

Proper care must be taken to adjust solutions to a pH range of 6-9. Generally, 1N hydrochloric acid can be used to neutralize alkaline materials and 1N sodium hydroxide can be used to neutralize acid materials. Remember to SLOWLY add the acid or alkali to water when creating these solutions.

Drain disposal is properly achieved in the following manner:

- 1) Wear appropriate PPE (personal protective equipment) such as lab coat, rubber gloves, safety goggles and lab apron.
- 2) Before pouring the solution down the drain, turn on the tap water to get a good flow of water to wash it down. Make sure the sink and drain lines are free of any substances that will generate noxious gases when mixed with the solutions to be drained (e.g. cyanides, sulfides, bisulfides, sulfites, bisulfites, nitrates and nitrites).
- 3) Pour the solution down the drain slowly with the tap water running. Allow the tap water to run for 1-2 minutes after draining.

**Table 2
Drain Disposal Substances**

Solutions Adjusted to a pH of 6-9		Polyhydroxy Alcohols
Hydrobromic acid	Sodium hydroxide	1,2 Propylene glycol
Hydrochloric acid	Potassium hydroxide	Glycerol (glycerine)
Hydroiodic acid	Ammonium hydroxide	Mannitol
Nitric acid	Potassium carbonate (potash)	Sorbitol
Phosphoric acid	Sodium carbonate (soda ash)	
Sulfuric acid	Sodium pyrophosphate	
Acetic acid	Trisodium phosphate	
All Vitamins	All Naturally-Occurring Amino Acids	All Sugars
I-Ascorbic acid (Vitamin C)	Alanine	Arabinose
Choline	Cysteine	Fructose
Inositol	Glycine	Galactose
Nicotinic acid (Niacin)	Histidine	Glucose
Pantothenic acid	Leucine	Lactose
Pyridoxine (Vitamin B6)	Lysine	Maltose
Riboflavin (Vitamin B2)	Serine	Sucrose
Thiamine (Vitamin B1)	Tryptophan	
	Tyrosine	
Chemicals* Commonly Used on the Farm and in the Household (No pesticides of any kind)		
Acetylsalicylic acid (aspirin)	Casein	Sodium bicarbonate
Alum (Sodium aluminum sulfate)	Citric acid (Sour salt)	Sodium bisulfate
Ammonium alum (Ammonium aluminum sulfate)	Corn syrup	Sodium bitartrate
Borax (Sodium tetraborate decahydrate)	Dextrin	Sodium carboxymethylcellulose
Boric acid	Gelatin	Sodium chloride
Calcium chloride	Magnesium sulfate (Epsom salt)	Sodium citrate
Calcium phosphate, monobasic	Potassium aluminum sulfate (Potassium alum)	Sodium dihydrogen phosphate
Calcium superphosphate	Potassium bitartrate (cream of tartar)	Sodium hypochlorite
Calcium triple superphosphate	Sodium potassium tartrate (Rochelle salt)	Sodium mono-hydrogen phosphate

Sodium silicate	Sodium nitrate	Sodium sulfate (Glauber's salt)
Urea		

*For any chemical containing sodium, the corresponding potassium or ammonium (salt) compound may be substituted.

C. Types of Waste and Disposal

1) Hazardous Waste

There are many different types of hazardous and universal wastes generated at Rutgers. Some of the most common include:

- Organic solvents
- Acids, bases and other corrosive chemicals
- Pure heavy metals or solutions/solids containing heavy metals
- Reactive chemicals
- Laboratory reagents
- Products or solutions containing >10% alcohol
- Aerosol cans – full or partially filled*
- Lecture bottles of compressed gases
- Pesticides

*NOTE: Empty aerosol cans can be discarded in the regular trash.

The EPA definition of hazardous waste includes “characteristic” wastes and “listed” wastes which are defined in more detail below:

Characteristic Hazardous Waste (D Codes)

- **Ignitibility** – liquids with a flash point $\leq 140^{\circ}\text{F}$, oxidizers, spontaneously combustible materials
- **Corrosivity** – $\text{pH} \leq 2$ or ≥ 12.5
- **Reactivity** – materials that readily explode or undergo violent reactions
- **Toxicity** – wastes likely to leach dangerous concentrations of toxic chemicals into groundwater

Listed Hazardous Waste (F, K, P and U Codes)

- Listed hazardous wastes from non-specific sources (F Codes)
- Listed hazardous wastes from specific sources (K Codes)
- Listed “acutely hazardous” waste from discarded commercial chemical products (P Codes)
- Listed “toxic” waste from discarded commercial chemical products (U Codes)

Procedures for Managing Hazardous Waste

- a. Collect hazardous wastes in satellite accumulation areas (SAAs) specifically designated for the temporary storage of hazardous waste.
- b. Store liquid wastes in secondary containment unless they are in the 5-gallon carboys provided by REHS.
- c. Segregate wastes by chemical compatibility (e.g. don't store acids with flammable liquids in the same secondary container). See example in Figure 1.

- d. Make sure the container holding the waste is chemically compatible with the waste (e.g. store corrosive chemicals in plastic or glass containers). Glass containers may be safely used for most chemicals **except** hydrofluoric acid, acid fluoride salts and very strong alkalis.
- e. Store waste chemicals in clean containers. Empty containers that previously held chemicals may be used provided they are clean and no residual chemical remains in the container.
- f. Collect broken and/or intact hypodermic needles or syringes that are contaminated with chemicals in 1-gallon plastic screw top jars or sharps containers. If sharps containers are used, make sure the biohazard symbol is completely covered with a Rutgers Hazardous Waste Label shown in Figure 2. This is **not** considered Regulated Medical Waste.
- g. Label hazardous waste containers with the Rutgers Hazardous Waste Label. Make sure the label is completely filled out.
 - i. Check off one or more pictograms on the bottom of the label to further identify the waste characteristics.
 - ii. Use chemical names (not formulas or acronyms) to identify the constituents.
 - iii. Use percent by weight, percent by volume or molar concentration to identify the constituents.

Containers must be labeled at the time chemical waste is first added to the container.

- h. Keep lids securely closed on all hazardous waste containers in storage.
- i. Submit an online Request for Hazardous Waste Disposal at the following link to alert REHS to pick up the waste. Request additional replacement waste containers at the online link.
<https://halfife.rutgers.edu/forms/hazwaste.php>
- j. Contact REHS at hazwaste@rutgers.edu or 848-445-2550 if you have any questions regarding the collection, storage and disposal of hazardous waste.

2) Unidentified Waste

State and federal transportation regulations for waste haulers prohibit REHS from collecting substances that are unidentified or unknown. The department that generated the unknown material is responsible for establishing its identity. REHS can assist by furnishing the names of state-certified analytical laboratories capable of testing unknown materials to help establish their identity.

D. Waste Containers

- 1) REHS can provide the following containers for collecting and storing wastes:

Liquid Wastes

- 5-gallon plastic carboys
- 30-gallon plastic drums
- 55-gallon plastic or metal drums

Solid Wastes

- 1-gallon plastic screw top jars
- 5-gallon plastic screw top pails
- 55-gallon metal open top drums

REHS will also provide plastic liners for pails and drums used for solid wastes.

- 2) Do not use your own drums or pails unless approved by REHS. They may not meet US Department of Transportation (DOT) requirements or may have residual material left behind from former uses.
- 3) Select the smallest container size available that will properly hold the anticipated quantity of waste and still allow sufficient headspace above the liquid for expansion under different storage temperatures.
- 4) Containers must be leak-proof and securely sealed with lids while in storage.

E. Labeling

The Rutgers Hazardous Waste Label shown in Figure 2 must be affixed to all hazardous waste containers at the time chemical waste is first added to the container. Each section of the label must be completely filled out, ensuring they are legible. Chemical names (not formulas, abbreviations or acronyms) must be used along with the percent of each constituent. One or more pictograms must be checked off on the bottom of the label to describe the container contents (i.e. ignitable, toxic, corrosive, reactive, compressed gas).

F. Satellite Accumulation Areas (SAAs)

- 1) Hazardous waste must be stored in Satellite Accumulation Areas (SAAs) which are designated areas at or near the point of generation and under the control of the operator generating the waste. Typically there is a SAA in each room where such wastes are generated. REHS can assist in determining appropriate locations for SAAs.
- 2) Chemical wastes in SAAs must be segregated by waste type and arranged so that incompatible wastes cannot mix. Incompatibles are substances that either react violently or emit flammable or poisonous gases or vapors when in contact with each other. See example in Figure 1 for proper segregation of chemical wastes.
- 3) Hazardous wastes must be stored in secondary containment bins in SAAs.
- 4) Containers in SAAs must be arranged so that the labels are easily visible during inspection.
- 5) Conduct a daily visual inspection of each SAA to check for leakage, corrosion or other signs of deterioration. Ensure that lids are secure and labels complete and legible. Immediately correct any deficiencies noted.
- 6) No more than 55 gallons of hazardous waste or 1 quart of [acutely hazardous waste](#) are allowed to be stored in a SAA.
- 7) Follow the basic guidelines below for safely storing hazardous wastes:

- Store like materials in the same secondary containment bin (e.g. store flammables in one bin, acids in another, toxics in another – See Figure 1)
- Separate acids and bases
- Keep acids separate from oils, flammables, cyanides and sulfides
- Store corrosive chemicals in plastic or glass containers
- Keep water-reactive chemicals away from water sources or aqueous solutions
- Immediately clean up spilled materials in secondary containment bins
- Consult REHS if you encounter shock-sensitive, explosive or air-reactive chemicals

G. Request for Waste Removal

- 1) Submit an online Request for Hazardous Waste Disposal whenever hazardous waste containers are full. The link for the online request can be found at: <https://half-life.rutgers.edu/forms/hazwaste.php>
- 2) REHS will pick up the waste within 5-10 working days at the New Brunswick/Piscataway campuses and every 30-60 days at the Newark and Camden campuses. Remote farm research centers and other off-campus locations are generally scheduled within one month of receipt of the online form.
- 3) Replacement containers and labels can be ordered when the online Request for Hazardous Waste Disposal is submitted.

Figure 1. Example of Properly Stored Hazardous Waste in SAA



Figure 2. Rutgers Hazardous Waste Label

HAZARDOUS WASTE
(For Satellite Accumulation Areas)
Rutgers, The State University of New Jersey

Chemical Contents: (% vol. or % weight) circle one

_____ %
_____ %
_____ %
_____ %
_____ %
_____ %

P.I. _____ Telephone: _____

Campus: _____ Bldg.: _____ Rm#: _____

Waste Characteristics (Check all that apply)

<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Ignitable		Toxic		Corrosive		Compressed Gas		Reactive	

For assistance, contact REHS @ 848-445-2550 or hazwaste@rutgers.edu