



# **HAZARDOUS WASTE DISPOSAL GUIDELINES**

**Purdue University Chemical Management Committee  
Radiological and Environmental Management**

**Adopted April 1990  
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# Chapter 1: Introduction

## 1.1 Purpose

Purdue University is committed to providing a healthy and safe work environment for the campus community. The Purdue University Hazardous Waste Disposal Guidelines (HWDG) establishes a formal written program for the safe and compliant collection, storage, and disposal of hazardous waste. The term “hazardous waste” refers to any material designated as a hazardous waste by the Environmental Protection Agency (EPA). Hazardous waste may include, but is not limited to, undesired or outdated chemicals, spent chemical solutions, chemically contaminated debris or media, electronics devices, fluorescent lamps, and batteries. Determining if a chemical waste meets the regulatory definition of a hazardous waste can be difficult and requires specific training. Therefore, it is Purdue’s policy that all staff assumes that all chemical wastes are hazardous and must be managed by the Radiological and Environmental Management Department. Because of the technical nature of hazardous waste determination, the terms “chemical waste” and “hazardous waste” are used synonymously throughout this document.

Hazardous waste regulations are strictly enforced by both the EPA and the Indiana Department of Environmental Management (IDEM). Purdue University is a large quantity generator of hazardous waste and operates a permitted treatment, storage, and disposal facility. As such, Purdue University is subject to the most stringent hazardous waste management regulations. The disposal of hazardous waste requires a system of policies and procedures to protect human health and the environment, and to ensure compliance with governmental regulations. It is essential that each individual that generates hazardous waste at Purdue University comply with the rules, policies, and procedures detailed in this document.

## 1.2 Scope

The HWDG applies to all laboratories, shops, maintenance areas, or other Purdue facilities that use, store, or handle chemical waste. The HWDG describes the proper use and handling procedures to be followed by all faculty, staff, and other personnel working with chemical waste in all settings at Purdue University.

The HWDG was prepared in accordance with the requirements of the EPA’s Resource Conservation and Recovery Act (Title 40 of the Code of Federal Regulations) and the Indiana Administrative Code administered by the IDEM (329 Indiana Administrative Code 3.1).

### **1.3 Employee Rights and Responsibilities**

Employees and other personnel who work at Purdue University have the right to be informed about the potential health hazards of the chemicals in their work areas and to be properly trained to work safely with these substances, including hazardous wastes. Purdue's commitment to comply with all applicable environmental health and safety regulations as well as the protection of human health and the environment can only happen when everyone takes responsibility for their own hazardous waste. All employees that handle hazardous waste must be trained on the procedures detailed in this document. The area supervisor (e.g., principal investigator, shop supervisor) is ultimately responsible for managing the hazardous waste program in their lab, shop, or maintenance area in a safe and compliant manner. It is also the area supervisor's responsibility to ensure that all area employees receive proper instruction and training on hazardous waste handling procedures and that all training is documented.

### **1.4 Radiological & Environmental Management**

Radiological and Environmental Management (REM) serves as the environmental health and safety department for Purdue University. REM's primary role is to assist in monitoring regulatory compliance with various federal, state, and organizational regulations involving environmental health and safety issues. One of the primary services that REM provides is hazardous waste collection for the West Lafayette Campus. The primary responsibility of REM's Hazardous Materials Management Section (REM HMM) is to pick up, transport, process, and dispose of all hazardous waste in a safe and environmentally responsible manner. Careful consideration is given to the disposal of every single container that is picked up and processed by the REM HMM, with the highest priority given to environmental stewardship. More detailed information regarding the services provided by the REM HMM can be found at: <http://www.purdue.edu/rem/hmm/hmm.htm>, or by calling (765) 49-40121.

### **1.5 Chemical and Laboratory Safety Committee**

Purdue University has established the Chemical and Laboratory Safety Committee (CLSC) with the responsibility to promote safe and proper chemical management at all Purdue campuses and related facilities. Chemical management includes, but is not limited to, the procurement and safe handling, use, storage, and disposal of chemicals. The CLSC reviews campus safety programs and makes recommendations to the Provost as appropriate. The CLSC consists of members appointed from the faculty and staff of the major research, teaching, and service areas where chemicals are handled or used. Although REM facilitates the content of the HWDG, it is ultimately the responsibility of the CLSC to approve changes and updates to the HWDG.

## Chapter 2: Hazardous Waste Defined

### 2.1 Regulatory Authority

The EPA's Resource Conservation and Recovery Act (RCRA) passed by the United States Congress in 1976, mandates the proper identification, labeling, handling, storage, and disposal of hazardous waste for protection of human health and the environment. In addition to federal regulations, the state of Indiana also regulates hazardous waste. IDEM administers the hazardous waste compliance program in Indiana. This combination of federal and state regulations governs the management of hazardous waste from the point of generation to the point of final disposition, also known as "cradle to grave management".



The Purdue University West Lafayette Campus is inspected on an annual basis by the EPA for compliance with hazardous waste regulations. Not only does the EPA inspect the REM managed treatment, storage, and disposal facility where all waste from campus locations is stored and processed, the EPA also inspects hazardous waste collection areas (e.g., laboratories, shops, maintenance areas) on campus. The EPA can, and often does fine colleges and universities for being out of compliance with hazardous waste regulations so it is critical that all hazardous waste be managed in accordance with the procedures detailed in this document.

### 2.2 Hazardous Waste Determination

In order for a material to be classified as a hazardous waste, it must first be a "solid waste". The EPA defines a solid waste as garbage, refuse, sludge, industrial waste, or other discarded materials. Solid waste is a regulatory term that is very broad and includes both non-hazardous and hazardous waste, but is not limited to wastes that are physically solid. Many solid wastes are liquid, semisolid, or gas; solid waste is only a regulatory term. There are two criteria to determine if solid waste is hazardous waste. First, determine if solid waste exhibits one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Second, determine if the solid waste is listed by the EPA as a hazardous waste.

### 2.2.1 Characteristic Hazardous Waste

Characteristic hazardous waste is solid waste that is ignitable, corrosive, reactive, and/or toxic. The specific criteria for the characteristics of ignitability, corrosivity, and reactivity are listed in Table 2.1. A waste is considered to exhibit the characteristic of toxicity if it is in concentrations greater than the regulatory thresholds listed in Table 2.2.

Table 2.1 – Criteria and Characteristics of Ignitability, Corrosivity, and Reactivity

EPA Waste Code	Criteria
Ignitability (D001)	<p><b>A solid waste that meets <i>any</i> of the following criteria:</b></p> <ol style="list-style-type: none"> <li>1. 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;</li> <li>2. A solid, under standard temperature and pressure, that can cause fire through friction, absorption of moisture, or spontaneous chemical changes <i>and</i> burn vigorously and persistently that it creates a hazard;</li> <li>3. An ignitable compressed gas as defined by the Department of Transportation in 49 CFR 173.300; or,</li> <li>4. An oxidizer as defined by the Department of Transportation in 49 CFR 173.151.</li> </ol>
Corrosivity (D002)	<p><b>A solid waste that meets <i>any</i> of the following criteria:</b></p> <ol style="list-style-type: none"> <li>1. An aqueous liquid that has a pH of 2 or less or 12.5 or more; or,</li> <li>2. A liquid that corrodes steel at a rate of 6.35 mm or more per year as determined by the National Association of Corrosion Engineers</li> </ol>
Reactivity (D003)	<p><b>A solid waste that meets <i>any</i> of the following criteria:</b></p> <ol style="list-style-type: none"> <li>1. Instability and readiness to undergo violent change;</li> <li>2. Violent reactions when mixed with water;</li> <li>3. Formation of potentially explosive mixtures when mixed with water;</li> <li>4. Generation of toxic fumes in quantities sufficient to present a danger to human health or the environment when mixed with water;</li> <li>5. Cyanide or sulfide waste which generate toxic fumes when exposed to acidic conditions;</li> <li>6. Ease of detonation or explosive reaction when exposed to pressure or heat; or</li> <li>7. Ease of detonation or explosive decomposition or reaction at standard temperature and pressure.</li> </ol>

Table 2.2 – Criteria and Characteristics of Toxicity

EPA Waste Code	Chemical Name	Regulatory Threshold (mg/L)	EPA Waste Code	Chemical Name	Regulatory Threshold (mg/L)
D004	Arsenic	5.0	D024	m-Cresol	200.0
D005	Barium	100.0	D025	p-Cresol	200.0
D006	Cadmium	1.0	D026	Cresol	200.0
D007	Chromium	5.0	D027	1,4-Dichlorobenzene	7.5
D008	Lead	5.0	D028	1,2-Dichloroethane	0.5
D009	Mercury	0.2	D029	1,1-Dichloroethylene	0.7
D010	Selenium	1.0	D030	2,4-Dinitrotoluene	0.13
D011	Silver	5.0	D031	Heptachlor (and its epoxide)	0.008
D012	Endrin	0.02	D032	Hexachlorobenzene	0.13
D013	Lindane	0.4	D033	Hexachlorobutadiene	0.5
D014	Methoxychlor	10.0	D034	Hexachloroethane	3.0
D015	Toxaphene	0.5	D035	Methyl ethyl ketone	200.0
D016	2,4-D	10.0	D036	Nitrobenzene	2.0
D017	2,4,5-TP (Silvex)	1.0	D037	Pentachlorophenol	100.0
D018	Benzene	0.5	D038	Pyridine	5.0
D019	Carbon tetrachloride	0.5	D039	Tetrachloroethylene	0.7
D020	Chlordane	0.03	D040	Trichloroethylene	0.5
D021	Chlorobenzene	100.0	D041	2,4,5-Trichlorophenol	400.0
D022	Chloroform	6.0	D042	2,4,6-Trichlorophenol	2.0
D023	o-Cresol	200.0	D043	Vinyl Chloride	0.2

### 2.2.2 Listed Hazardous Waste

Wastes may be hazardous if the EPA specifically lists them. There are four EPA lists for hazardous waste:

1. **F** list
2. **K** list
3. **P** list
4. **U** list

The **F** list includes wastes from nonspecific sources. At Purdue, the most common F listed waste is waste generated from the use of organic solvents. This includes waste mixtures of organic solvents and debris and/or media contaminated with organic solvents. Table 2.3 lists the most common **F** listed wastes found at Purdue University.



Table 2.3 – Listed Hazardous Wastes from Non-Specific Sources (F001 – F005)

EPA Waste Code	Waste Listing
<b>F001</b> (Spent solvents used in degreasing)	1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons, methylene chloride, trichloroethylene
<b>F002</b> (Spent solvents)	1,1,1-trichloroethane, 1,1,2-trichloro-1,1,2-trifluoroethane, 1,1,2-trichloroethane, chlorobenzene, methylene chloride, o-dichlorobenzene, tetrachloroethylene, trichlorofluoromethane
<b>F003</b> (Spent solvents)	Acetone, cyclohexanone, ethyl acetate, ethyl ether, methanol, methyl isobutyl ketone, n-butyl alcohol, xylene
<b>F004</b> (Spent solvents)	Cresols, cresylic acid, nitrobenzene
<b>F005</b> (Spent solvents)	2-ethoxyethanol, 2-nitropropene, benzene, carbon disulfide, isobutyl alcohol, methyl ethyl ketone, pyridine, toluene

The **K** list includes wastes generated from specific industrial process and is not typically applicable at a university setting.

The **P** list (Appendix A) and the **U** list (Appendix B) include pure or commercial grade formulations of specific unused chemicals. Chemicals on the **P** list are considered acutely toxic and chemicals on the **U** list are considered toxic. Chemicals on both the **P** and **U** lists can also display other characteristics, such as ignitability, corrosivity, and/or reactivity.

## 2.3 Trade Products

Many common trade products such as fuels and cleaners have EPA regulated materials included in their chemical makeup and it is not always evident that the product is hazardous by only looking at the product label. For this reason, it is essential that the SDS be reviewed before using and/or disposing of any trade product waste. All trade products must be submitted to REM for proper disposal (procedures are detailed in Chapter 5). Table 2.4 lists a few common trade products that contain EPA-regulated materials and must be managed as hazardous waste.

**Table 2.4 – Common Trade Products Containing Hazardous Chemicals**

Aromatic Hydrocarbons	Jet Fuels	Petroleum Ether
Creosote	Kerosene	Petroleum Naphtha
Degreaser Fluids	Lacquer Thinner	Photographic Chemicals
Diesel Fuel	Mineral Spirits	Spent Fixer & Developer
Duplicating Fluid	Naphtha	Stains
Dry Cleaning Fluids	Paints	Stoddard Solvent
Fuel Oil	Paint Thinner	Varsol
Gasoline	Petroleum Distillates	White Spirits

## Chapter 3: Hazardous Waste Storage Requirements

### 3.1 Satellite Accumulation Areas

Hazardous waste containers generated at Purdue University are stored in satellite accumulation areas (SAA). SAAs are used to manage hazardous waste in laboratories, shops, and maintenance areas because doing so provides safe and effective means to accumulate hazardous waste before removal by REM. Additionally, SAAs provide the least restrictive regulatory option for the accumulation and storage of hazardous waste containers. The following SAA rules must be followed at all times when managing hazardous waste on campus:



- All waste must be stored in containers. Generators must supply their own waste containers. Usually the original container of the main component of the waste can be used (e.g., 4-liter glass jar). Purdue University Stores also offers waste containers such as 20-liter carboys for sale.
- Containers must be compatible with the waste they contain. Do not use metal containers for corrosive waste or glass containers for waste containing hydrofluoric acid. For liquid waste, only use a container designed for liquids; the container must seal and not leak (no liquids in bags). Food grade containers such as milk jugs should never be used for chemical storage.
- Containers must be kept closed at all times except when adding or removing waste. Open waste containers is the most common EPA hazardous waste violation cited at colleges and universities. Not only is this a violation of EPA regulations, open containers also allow evaporation, invite spills, and can potentially cause employee exposure to a hazardous substance. Safety funnels that close and seal can be used as a more convenient way to fill waste containers as shown in Figure 3.1.



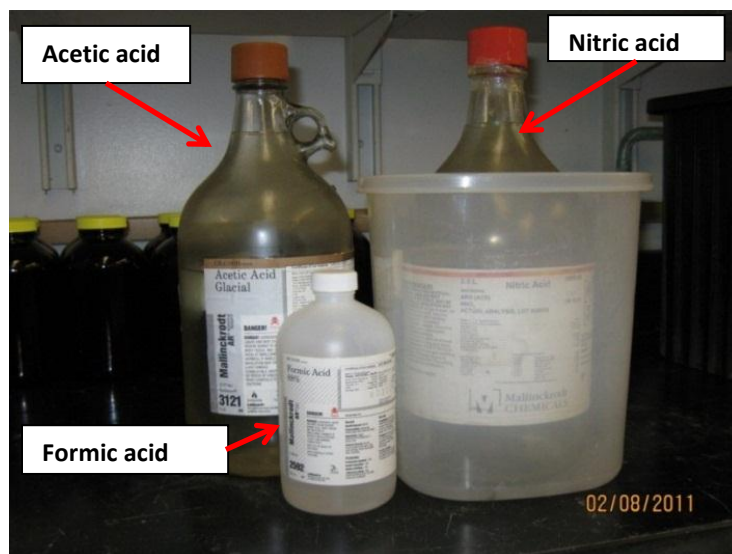
Figure 3.1 – Safety Funnel

- Containers must be labeled or clearly marked with words that describe the contents of the waste and the words "Hazardous Waste". More detail regarding hazardous waste container labeling can be found in Chapter 4.
- All containers must be in reasonably good condition and not leaking. Containers must be clean and without gross chemical contamination on the outside. If a container holding hazardous waste is not in good condition, or if it begins to leak, area personnel must transfer the hazardous waste to a container that is in good condition. Alternatively, over pack the container that is leaking or in poor condition into a larger, compatible container with a tight fitting lid. If leaks or spills occur, all evidence of leakage and spilled material must be cleaned up immediately. Collect all spilled materials and debris used in the cleanup process as hazardous waste. Contact REM at (765) 49-40121 if assistance with spill cleanup is needed. If the hazardous waste spill creates an emergency situation, contact the Purdue University Fire Department by calling **911**. More detail regarding emergency procedures can be found in Chapter 9.
- Containers must be stored at or near the point of generation and under the control of the generator of the waste. Waste must remain in the same room that is generated in. Establish an area to accumulate hazardous waste. This area can be a bench top, fume hood that is being used for storage (should not be a process fume hood), or a cabinet. Store containers upright and securely. Do not place containers in areas such as hallways, doorways, sinks, or next to moving equipment where the chance of spills is likely. Never store waste containers in public areas such as classrooms or reception areas. Figure 3.2 shows a typical compliant SAA collection ready for REM pickup.



**Figure 3.2 – SAA Collection**

- The waste storage volume should never exceed 55 gallons per SAA.
- Containers must be segregated by chemical compatibility during storage. For example, acids (e.g., hydrochloric acid) must be stored away from bases (e.g., sodium hydroxide) and organic acids (e.g., acetic acid) must be stored away from oxidizing acids (e.g., nitric acid). Segregation can be achieved either by physical distance or by secondary containment as shown in Figure 3.3.



**Figure 3.3 – Hazardous Waste Segregation Using Secondary Containment**

- Avoid mixing waste streams such as acids and bases, or halogenated and non-halogenated wastes in the same waste container. Collect all highly toxic, reactive, mercury, and any exotic wastes (e.g., dioxin compounds, PCBs, controlled substances, organo-mercuric compounds) separately even if they are chemically compatible with other waste streams. Doing so can result in costly disposal fees (e.g., mixing mercury with organic solvent waste means that the entire waste stream must be treated as mercury waste).
- Identification of SAAs by signage is not required, but it is recommended as a good practice. Appendix C lists the SAA rules and can be posted in waste collection areas.

## 3.2 Liquid Chromatography Waste

Liquid chromatography (LC) is an analytical technique used to separate, identify, quantify, and purify individual components of a mixture. This technique is very common in biological and chemical research. The most common type of LC at Purdue is High Performance Liquid Chromatography (HPLC). Purdue has numerous LC instruments located in laboratories all over campus. Because organic solvents (e.g., Methanol, Acetonitrile) are commonly used in the process, most LC waste is regulated by the EPA as hazardous waste. Consequently, all

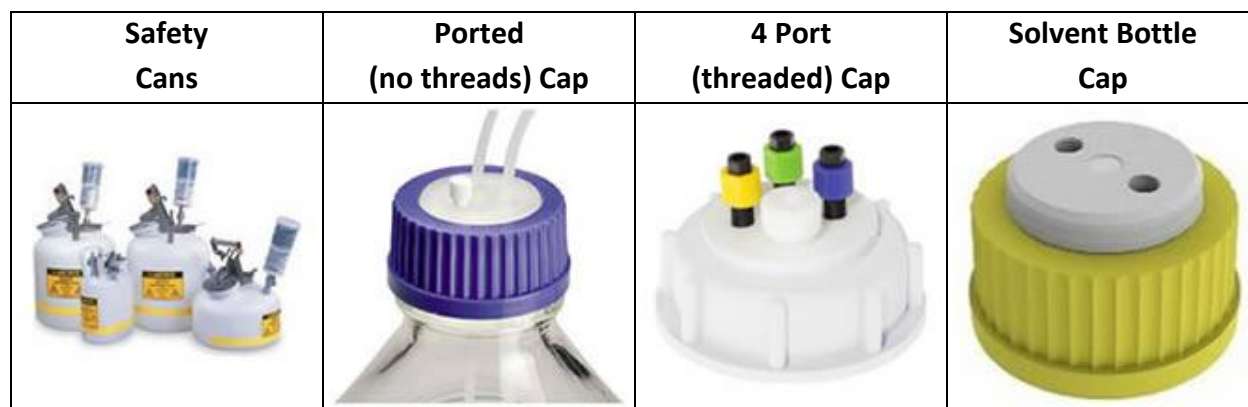
containers collecting LC waste must remain closed while the LC unit is in operation. It is neither acceptable to place a waste line running from the LC unit into an open waste container nor is it acceptable to use foil or Parafilm® as a means of closure. Figure 3.4 illustrates these unacceptable LC collection practices. Purdue has received citations in the past from EPA during hazardous waste inspections so it is of the utmost importance that LC waste be collected in a compliant manner.



**Figure 3.4 – Improper LC Waste Collection Practices**

One of the following practices must be employed in order to comply with hazardous waste regulations for LC waste collection systems:

- Purchase an engineered container and/or cap designed for LC waste collection. Figure 3.5 shows several examples of acceptable solutions for proper LC waste collection that can be purchased.



**Figure 3.5 – Proper LC Waste Collection Options for Purchase**

- An existing cap can be modified by the research lab for LC waste collection. To modify an existing cap, a hole can be drilled into a cap. The diameter of the hole should be similar to

the diameter of the waste line; there should be a tight fit between the container opening and waste line. In addition, a hole should be drilled to accommodate any exhaust filter or air valve tube that may be required. It is recommended that either a 4-liter container or 5-gallon carboy be used for waste collection. The modified cap should be replaced with a regular, unmodified cap once the container is full and ready for REM pickup. See Figure 3.6 for examples of acceptable modified caps.



Figure 3.6 – Proper LC Waste Collection with Modified Caps



## Chapter 4: Hazardous Waste Labeling

All chemical constituents in hazardous waste containers must be identified by knowledgeable personnel. Not only is this required by the EPA, it also ensures that waste can be properly characterized and disposed of by REM. If there is uncertainty about the composition of a waste stream resulting from an experimental process, employees must consult with the area supervisor for assistance. In most cases, careful documentation and review of all chemical products used in the experimental protocol will result in accurate waste characterization. Additionally, review safety data sheets (SDS), specifically Section 2, “Hazard Identification” and Section 13, “Disposal Considerations”, to obtain information about hazardous constituents and characteristics.

All waste must be properly labeled as soon the first drop of waste enters a waste container. Containers must be labeled and clearly marked with words that describe the contents of the waste and the words "Hazardous Waste". Chemical constituents should be listed completely in a percentage format. Listing accurate percentages is not as important as listing all the chemicals that makeup the waste. For example,  $\pm 5\%$  concentration is acceptable and constituents less than 1% can be listed as “trace”. The label that REM provides for proper identification of hazardous waste is shown in Figure 4.1. Contact REM at (765) 49-40121 to receive Hazardous Waste Disposal Tags free of charge. For pure chemicals, the manufacturer’s label is sufficient as long as it is legible and accurate.

If a chemical is found and the composition is unknown, it should be assumed to be hazardous and labeled as “Unknown hazardous chemical, awaiting proper characterization by REM”. More detail regarding unknown waste can be found below in Section 5.4.

PURDUE UNIVERSITY HAZARDOUS WASTE DISPOSAL TAG	
Chemical Ingredients	
Principle Investigator: _____	
Contents (Print)	
1. _____	% _____
2. _____	% _____
3. _____	% _____
4. _____	% _____
5. _____	% _____
6. _____	% _____
7. _____	% _____
8. _____	% _____
9. _____	% _____
10. _____	% _____
Comments: _____	
_____	

Figure 4.1 – Hazardous Waste Disposal Tag



## Chapter 5: Hazardous Waste Disposal Procedures

### 5.1 REM Hazardous Waste Pickup Services

REM provides pickup services for all chemical waste generated on the West Lafayette campus. A Hazardous Materials Pickup Request Form (Appendix D) must be completed and submitted by the generator of the waste to initiate pickup services. Once the pickup request has been processed, REM HMM staff will come to the area to pick up the waste. The average turnaround time for pickups from the day the Hazardous Materials Pickup Request Form was submitted to the day that REM arrives to pick up the waste is typically 3-5 days.

The following procedures must be followed in order to have hazardous waste removed from campus locations:

1. Prior to pick up, all waste must be placed in the SAA within the same room where the waste was generated.
2. All waste must be placed in an appropriate container(s).
3. All containers must be capped and properly labeled.
4. Complete and submit a Hazardous Materials Pickup Request Form. Visit the REM webpage to find the online Hazardous Material Pickup Request submission form (<http://www.purdue.edu/rem/hmm/hmm.htm>).

Hazardous waste containers may be rejected by REM for the following reasons:

- Room is locked and REM personnel do not have a key or a way to gain access
- Improper container or container is leaking or has been overfilled
- Improper caps/lids
- Mislabeled containers:
  - No label
  - Use of chemical formula or abbreviations
  - Label description does not match the contents of containers
  - Containers are heavily contaminated and not in good condition

### 5.2 Hazardous Materials Pickup Request Form Hints

#### 5.2.1 Chemical Description:

- Spell out all chemical names. Do not use acronyms, abbreviations or formulas.
- The chemicals must be in percent format adding up to 100%. Chemical constituents should be listed completely in a percentage format. Listing accurate percentages is not as

important as listing all the chemicals that makeup the waste. For example,  $\pm 5\%$  concentration is acceptable and constituents less than 1% can be listed as “trace”. The following is an example of a good chemical description: "Acetone 50%, Tetrahydrofuran 10%, Chloroform 20%, Acetic Acid 10%, Water 10%, Trace Silver Nitrate".

- The description on the container label must match the description written on the pickup request exactly.
- When submitting trade products, read the description of the chemical components on the label or request a SDS from the manufacturer. This information will provide you with a proper chemical description for the product. A SDS is not required to be submitted to REM with the Hazardous Materials Pickup Request Form. However, each area is responsible for providing REM with a SDS if requested to do so.

### **5.2.2 Amount of Waste in Container:**

- Estimate chemical concentrations as accurately as possible;  $\pm 5\%$  is acceptable, less than 1% can be listed as “trace”.
- Use mass units for solids and volume units for liquids.

### **5.2.3 Spent or Useable:**

- The material is only useable if it is certain that the chemical is uncontaminated and can still be used for its intended use. Otherwise, it should be considered spent.
- If the material is useable, consider asking a neighboring lab or shop if they have use for the material.
- Some useable chemicals may be redistributed by REM to other campus areas for reuse.

### **5.2.4 Physical State of the Material:**

- Solid, liquid and gas are the only designations that should be used.
- In general, keep solid and liquid wastes separate.
- If you have a mixture containing both solids and liquids, the rule of thumb is that if any portion of the waste flows as a liquid, call it liquid.

### **5.2.5 Special Comments or Instructions:**

- Use this section located at the bottom of the Hazardous Materials Pickup Request Form to convey important information such as where the waste is located within the room or how to gain access to a room if it is always locked.
- This section can also be used to communicate any special precautions REM staff should take when handling the waste.

### 5.3 Hazardous Waste Containers

REM does not provide containers. It is the responsibility of the generator of the waste to provide containers. Usually the original container of the main component of the waste can be used (e.g., 4-liter glass jar, 5-gallon green metal solvent can). Purdue Stores also offers waste containers such as 20-liter carboys as shown in Figure 5.1 for sale.



Figure 5.1 – 20 Liter Carboy Container

If requested, reusable hazardous waste storage containers of 5 gallons or larger may be returned to the generator's area. Mark the container clearly with "Return to", the building, and room number as illustrated in Figure 5.2. Containers unsuitable for reuse will be properly disposed of and not returned.

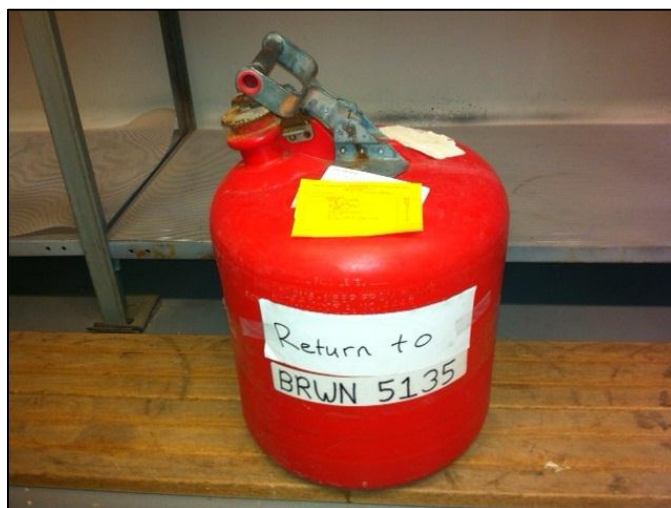


Figure 5.2 – Reusable Hazardous Waste Container

Purdue's policy for the disposal of empty containers is implemented to protect Purdue facilities and the Physical Facilities Buildings and Grounds staff when removing trash. Please remember that some chemical residues have the potential to mix with other incompatible residues in the dumpster or compactor causing a reaction or fire. In addition, sealed containers may become pressurized during compaction, which may result in residues spraying onto workers. Please keep the following procedures and information in mind when disposing of empty containers:

- Triple rinse empty containers with a solvent capable of removing the original material.
- Collect the rinsate for disposal through REM.
- Identify triple-rinsed, dry, odorless, and empty containers by placing a "Safe for Disposal" label on the container (Figure 5.3). Contact REM at (765) 49-40121 to request a supply of these labels.
- Remove any cap that may cause the container to become pressurized when compacting.
- Arrange removal of these containers with the Building Services staff in your area or take these containers to the designated area beside the dumpster outside your building.
- If unable to remove residual hazardous materials from containers, submit these to REM for pickup using the Hazardous Materials Pickup Request Form.



Figure 5.3 – Safe for Disposal Label

## 5.4 Unknown Chemical Waste

Unknown chemicals are a serious problem in laboratories. Mysterious chemicals are often stored in labs for years before lab personnel notice the unidentified items. However, steps can be taken to assist with proper management of unknowns. Unknown chemicals must be properly identified according to hazard class before proper disposal. The hazards that should be noted include: corrosive, flammable, oxidizer, reactive, toxic, and radioactive. The following subsections describe in detail how to properly manage unknown chemicals.



### 5.4.1 Labeling Unknown Chemicals

Until the unknown chemical can be properly identified by either lab staff or REM, the container should be labeled with a Hazardous Waste Disposal Tag. The following information should be written on the label: “Unknown hazardous chemical, awaiting proper characterization by REM” as illustrated in Figure 5.4.

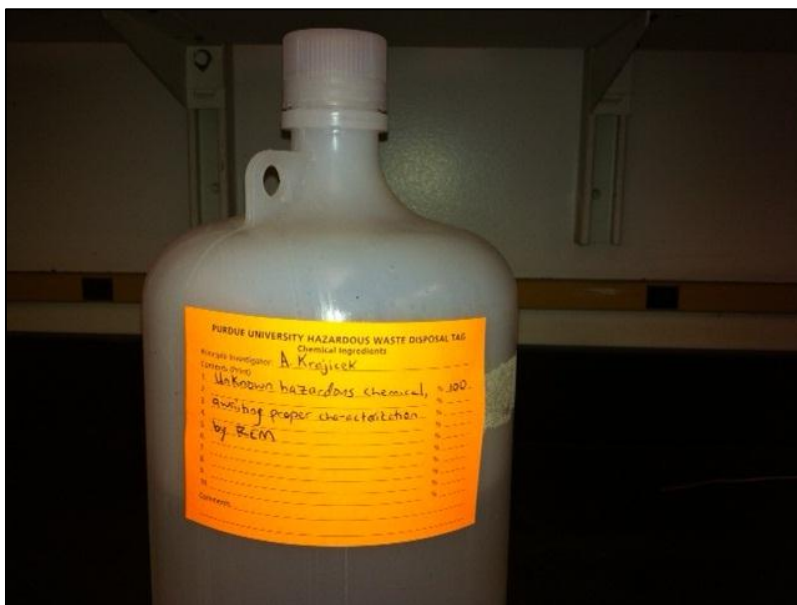


Figure 5.4 – Unknown Waste Properly Labeled

### 5.4.2 Identifying Unknown Chemicals

Every effort should be made by laboratory personnel to identify unknown chemicals. Here are a few steps that can be taken to help this effort:

1. Ask other laboratory personnel if they are responsible for, or can help identify the unknown chemical.
2. The type of research conducted in the laboratory can be useful information for making this determination. Eliminating certain chemicals as a possibility helps narrow the problem as well. This is especially important for Mercury, PCB, or dioxin compounds because they must be managed separately from other hazardous waste.
3. For trade products, contact the manufacturer or search online to obtain an SDS. REM staff can assist you in finding an SDS.

### 5.4.3 Removing Unknown Chemicals from the Work Area

If it is not possible to identify the material, a "Hazardous Waste" label should be placed on the container as described above in Section 5.4.1 and a Hazardous Materials Pickup Request Form should be submitted which describes all of the available information (e.g., 4-liter container of clear liquid). Call REM at (765) 49-40121 if you have a question about an unknown.

### 5.4.4 Preventing Unknown Chemicals

Here are a few tips that will help prevent the generation of unknown chemicals:

- Label all chemical containers, including beakers, flasks, vials, and test tubes.
- Immediately replace labels that have fallen off or that are deteriorated.
- Label containers using chemical names. Do not use abbreviations, structure, or formulae.
- Archived research samples are often stored in boxes containing hundreds of small vials. Label the outside of the box with the chemical constituents paying special attention to regulated materials such as radioactives, organic solvents, heavy metals and other toxics. If the samples are nonhazardous, label them as such.
- Submit frequent Hazardous Materials Pickup Request Forms to reduce the amount of chemicals in your laboratory.
- Employees should dispose of all of their waste before leaving/graduating from Purdue. The lab and/or department should come up with a system to ensure that all faculty, staff, and students properly dispose of hazardous waste, including unwanted research samples, before employees leave.

## 5.5 Sharps Waste

Sharps are items capable of puncturing, cutting, or abrading the skin such as glass or plastic pipettes, broken glass, test tubes, petri dishes, razor blades, needles, and syringes with needles. Sharps waste contaminated with hazardous chemicals must be placed into puncture resistant containers (e.g., sharps container, glass or plastic container with lid) and properly labeled as detailed in Chapter 4 of the HWDG. All chemically contaminated waste should be inventoried on a Hazardous Materials Pickup Request Form (detailed above) and sent to REM for proper disposal.



Clean uncontaminated broken glassware and plastic sharps should be placed in a corrugated cardboard box or other strong disposable container. Do not exceed 20 pounds. When ready for disposal, the box should be taped shut and prominently labeled as "Sharp Objects/Glass –

Discard” or similar wording. The “Safe for Disposal” label (Figure 5.3) should also be affixed to the outside of the container. Contact your Building Services department for specific non-hazardous waste disposal instructions. More detail regarding sharps, including biologically contaminated sharps, can be found at the found in the REM Sharps and Infectious Waste Handling and Disposal Guidelines. (<http://www.purdue.edu/rem/home/booklets/sharps.pdf>)

## 5.6 Sink and Trash Disposal

No chemical waste should be poured down the drain or discarded in the trash unless it is certain that doing so does not violate hazardous waste regulations or the West Lafayette wastewater treatment plant’s discharge requirements. In order to ensure improper disposal does not occur, only small quantities of the materials listed in Appendix E are permitted to be disposed of down the drain (if water soluble) or discarded in the trash (if not water soluble). Information regarding solubility of ions is included in Appendix F. The materials in Appendices 5 and 6 do not include every non-hazardous substance or every material that can be disposed of via the sanitary sewer or trash. Please contact REM at (765) 49-40121 for further information regarding non-hazardous chemical waste disposal.

## 5.7 Chemical Treatments

If lab personnel are interested in performing hazardous waste treatments or neutralizations, standard operating procedures for the materials listed in Table 5.1 are available from REM. Contact REM at (765) 49-40121 for further details. However, chemical treatment and/or neutralization are not required to be performed by lab staff. The waste can be submitted on a Hazardous Materials Pickup Request Form as is and REM staff will perform the treatments.

**Table 5.1 – Chemical Treatments Listing**

Acid anhydrides	Boron tribromide	Hydrogen peroxide
Acid halides	Boron trichloride	Inorganic/organic acids
Aluminum bromide	Boron trifluoride	Inorganic/organic bases
Aluminum chloride	Bromine	Iodine
Benzoyl peroxide	Chlorosilanes	Magnesium choride
Boron tribromide	Formaldehyde solutions	Metal alkoxides

# Chapter 6: Universal Waste and Electronic Waste Disposal Procedures

## 6.1 Universal Waste

Universal wastes are waste streams that meet the definition of a hazardous waste but are very common and can be easily recycled. Universal waste includes:

- Batteries
- Pesticides
- Mercury-containing equipment
- Light bulbs (lamps)

Because universal waste streams are so common and widely generated, the EPA has eased the regulatory burden to encourage the development of municipal and commercial recycling programs. The following subsections describe the waste collection procedures for these waste streams.



### 6.1.1 Batteries

Batteries that are regulated by the EPA as a universal waste include:

- Lead-Acid
- Nickel-Cadmium
- Lithium and Lithium Ion
- Mercury (mercuric oxide or mercury cell)
- Nickel-Metal Hydride
- Any other rechargeable battery

Universal waste batteries should be inventoried on a Hazardous Materials Pickup Request Form (detailed in Chapter 5 of this document) and sent to REM for proper recycle. Alkaline batteries are not considered universal waste because they contain no EPA regulated hazardous constituents, and can legally be discarded in the trash.



### **6.1.2 Pesticides**

Purdue does not manage pesticide waste as universal waste. All pesticide waste should be inventoried on a Hazardous Materials Pickup Request Form (detailed in Chapter 5 of this document) and sent to REM for proper disposal.

### **6.1.3 Mercury-Containing Equipment**

Purdue does not manage mercury-containing equipment waste as universal waste. All mercury-containing equipment waste should be inventoried on a Hazardous Materials Pickup Request Form (detailed in Chapter 5 of this document) and sent to REM for proper disposal.

### **6.1.4 Light Bulbs (lamps)**

Light bulbs regulated as universal waste include:

- Fluorescent
- Compact fluorescent light bulbs
- High-Intensity Discharge
- Ultraviolet
- Flood lamps

Incandescent light bulbs are not considered universal waste because they contain no EPA regulated hazardous constituents, and can legally be discarded in the trash.

### **6.1.5 Electrical Ballasts (both non-PCB and PCB)**

Electrical ballasts are not regulated by the EPA as hazardous waste. However, REM manages them in a similar fashion. All ballasts can be brought directly to the REM Laboratory Materials Storage Building (LMSB) (address listed below) for proper recycle; submitting a Hazardous Materials Pickup Request Form is not necessary. When bringing waste to HMMT, all personnel must sign in at the front desk and will receive further instructions.

LMSB

201 Ahlers Drive

West Lafayette, IN 47906-5991

### 6.1.6 Capacitors (both non-PCB and PCB)

Capacitors are not regulated by the EPA as a hazardous waste. However, REM manages them in a similar fashion. All capacitors can be brought directly to the REM Hazardous Materials Management Trailer (HMMT) (address listed below) for proper recycle; submitting a Hazardous Materials Pickup Request Form is not necessary. When bringing waste to HMMT, all personnel must sign in at the front desk and will receive further instructions.

LMSB

201 Ahlers Drive

West Lafayette, IN 47906-5991

## 6.2 Electronic Waste

All electronic waste (e-waste) is regulated by IDEM and must be disposed of properly. IDEM's definition of e-waste is extremely broad and includes (329 IAC 16-2-1):

- A circuit board in a computer or electronic device that holds integrated circuits and other electronic components
- An electronic component such as a diode, resistor, capacitor, or coil
- Display device such as a cathode ray tube, liquid crystal display screen, or other such display device
- A computer
- An electronic device, which is a device that has its primary functions provided by electronic circuitry and components

No e-waste should be thrown away in the trash. All e-waste must be sent to the Purdue Warehouse and Surplus where it will be processed for proper recycle. Contact the Purdue Warehouse and Surplus Store personnel at (765) 742-4414 for more detailed waste disposal instructions.

## Chapter 7: Laboratory Decommissioning

### 7.1 Introduction

Abandoned chemicals in laboratories create unsafe and non-compliant conditions. Additionally, these orphan materials are expensive and time consuming to manage. Therefore, it is imperative that principal investigators and laboratory staff take responsibility for properly decommissioning their laboratories. Before leaving your laboratory or assigned space, all unwanted chemicals, research samples, and chemical waste must be disposed following the normal hazardous material pickup request process detailed in Chapter 5 of this document. Please note that you are responsible for all materials in your area, including materials you purchased, created, or may have inherited from former laboratory occupants. The role of REM is to provide consultation and assistance with the decommissioning process. REM will ease the process as much as practicable, and then remove the materials once we receive the Hazardous Materials Pickup Request Form. If materials are abandoned by laboratory occupants, it is the department's responsibility to identify unwanted materials, prepare and submit a request for those materials.

### 7.2 Laboratory Decommissioning Procedures

The decommissioning process can be time consuming for the researcher, but is necessary to maintain a safe and healthy work environment. REM has limits in capabilities of removing large volumes of materials in a short period of time. The following are recommendations to ease the process as much as possible:

- Develop a departmental, college or school policy regarding proper laboratory decommissioning procedures.
- Plan ahead. The decommissioning process can take days to weeks. If there are time-driven deadlines, contact REM as soon as possible, so we may assist you in meeting your deadlines.
- Assign an individual, the area safety committee chair for instance, to implement the laboratory decommissioning policy.



- Unwanted materials must be submitted for pickup on a Hazardous Materials Pickup Request Form.
- Submit pickup requests often.
- All materials must be properly labeled and in appropriate containers with tight fitting lids.
- Segregate and handle unknown materials as detailed in Section 5.4 of this document and submit them on a separate pickup request.
- Keep radioactive and biological materials separated from all other chemicals.
- Redistribute useable materials to other researchers in the department.
- Maintain current chemical inventories for each laboratory.
- Buy only what you need.
- Practice good laboratory hygiene.
- Contact REM at (765) 49-40121 for assistance.

## Chapter 8: Waste Minimization

### 8.1 Introduction

Waste minimization is any action that reduces the amount and/or toxicity of hazardous wastes before they are shipped off-site for disposal. The U.S. Congress mandates through RCRA, that large quantity generators of hazardous waste such as Purdue University have an active waste minimization program. There is clear intent in RCRA, the Clean Air Act, and the Pollution Prevention Act is to practice source reduction and recycling as preferred environmental management approaches over the treatment, disposal, or release of harmful chemicals to the environment. The EPA's hierarchy of waste minimization is source reduction, reuse, recycle, and dispose.

### 8.2 Source Reduction and Reuse

The most desirable method of waste minimization is source reduction, which reduces the impact of chemical wastes on the environment to the greatest extent. This activity reduces or eliminates the generation of chemical waste at the source. The following tips can help reduce the use of chemicals in an area:

- Substitute hazardous materials with less toxic or non-hazardous compounds, such as using non-mercury alternatives for thermometers, gas bubblers, and other devices.
- Micro-scale analytical techniques and experimentation should be used where practicable.
- Purchase only in quantities necessary for immediate use. Large portions of the hazardous waste generated at Purdue are unused chemicals in their original containers.
- Designate a single person to be responsible for purchasing chemicals.
- Maintain current chemical inventories and review inventories before purchasing additional chemicals.
- Establish a departmental redistribution system for usable chemicals.
- Purchase compressed gas cylinders or lecture bottles only from manufacturers that will accept the empty cylinders back.

### 8.3 Recycling

Waste materials are recycled when they are used for another purpose, treated and reused in the same process, or reclaimed for another process. Used oil, batteries, mercury, fluorescent light bulbs, rechargeable batteries, electronic ballasts and capacitors, precious metals, and electronic wastes are all managed for off-site recycling by REM and/or the Purdue Warehouse

and Surplus Store. Chapter 6 of this document discusses the recycling procedures for these waste streams in detail.

When feasible, install solvent distillation systems to recycle organic solvents for reuse. This can be done when ultra-pure solvents are not required such as for classroom experiments or when solvents are being used as cleaning agents. Contact REM at (765) 49-40121 for further information regarding solvents distillation systems.

## **8.4 Treatment**

The primary responsibility of REM HMM is to pick up, transport, process, and dispose of all hazardous waste in a safe and environmentally responsible manner. Careful consideration is given to the disposal of every single container that is picked up and processed by REM HMM staff, with the highest priority given to environmental stewardship.

## Chapter 9: Chemical Spills

### 9.1 Introduction

Chemical spills in the work area can pose a significant risk to human health and the environment. All personnel that work with chemicals must be trained on how to properly respond to chemical spills in order to minimize risk. In general, chemical spills can be placed into one of two categories: non-emergency chemical spills, or emergency chemical spills.

### 9.2 Non-Emergency Chemical Spill Procedures

Non-emergency chemical spills are generally defined as less than 1 liter, do not involve a highly toxic or reactive material, do not present a significant fire or environmental hazard, and are not in a public area such as a hallway. These spills can be cleaned up by properly trained lab personnel using conventional PPE (e.g., safety glasses/goggles, lab coat, gloves) and the area spill kit. In general, when a non-emergency spill occurs, the area around the spill should be isolated, everyone in immediate area should be made aware of the spill, and the spilled material should be absorbed and collected using either pads or some other absorbent material such as oil dry or kitty litter. Decontamination of the spill area should be conducted using an appropriate solvent (soap and water is often the most effective). Proper PPE should be worn at all times and only personnel that have been trained on the Non-Emergency Spill Cleanup SOP should conduct the cleanup. Additionally, review the SDS(s) (specifically Section 6, “Accidental Release Measures”) to obtain chemical-specific cleanup information.

### 9.3 Emergency Chemical Spill Procedures

Emergency chemical spills are generally defined as greater than 1 liter, involve a highly toxic or reactive compound, present an immediate fire or environmental hazard, or require additional PPE (e.g., respirator) and specialized training to properly cleanup. The following procedures should be followed in the event of an emergency chemical spill:

- Cease all activities and immediately evacuate the affected area (make sure that all personnel in the area are aware of the spill and also evacuate).
- If chemical exposure has occurred to the skin or eyes, the affected personnel should be taken to the nearest safety shower and eyewash station.



- **Dial 911**, which will initiate both the Purdue Police and Purdue Fire Department response, if the situation is, or could become an emergency (e.g., chemical exposure has occurred, a fire or explosion has occurred).
- The fire alarm should be pulled, which will initiate building evacuation, if any of the following occurs:
  - A fire and/or explosion has occurred (or there is a threat of fire and/or explosion);
  - The large spill (which is either highly toxic or presents an immediate fire or environmental hazard) is in a public area such as a hallway;
  - Toxic vapors are leaving the area where the spill has occurred, such as seeping from the laboratory into the hallway or neighboring rooms;
  - You are unsure of the hazards and feel that the spill could be harmful to building occupants.
- Ensure that no one else is allowed to enter the area until the spill has been properly cleaned up by the Purdue Fire Department.

## 9.4 Chemical Spill Kits

Each area where hazardous chemicals are stored should have a spill response kit available for use. Spill kits can either be purchased from a vendor or created by area personnel, but each spill kit should be equipped to handle small spills of the most common hazards in the particular area. The kit should be equipped with response and cleanup materials such as:

- Absorbent materials such as pads, booms, oil dry or kitty litter, booms, or pillows
- Neutralizing agents (e.g., Neutrasorb) for acids and/or bases if high volume of acids and/or bases are stored in the laboratory
- Containers such as drums, buckets, and/or bags to containerize spilled material and contaminate debris generated during the cleanup process
- PPE such as chemical-resistant gloves, safety glasses and/or goggles, lab coat or apron, chemical-resistant booties
- Caution tape or some other means to warn people of the spill





## **Appendices**

Appendix A: Listed Hazardous Waste - P List

Appendix B: Listed Hazardous Waste - U List

Appendix C: Satellite Accumulation Area Rules Posting

Appendix D: Hazardous Materials Pickup Request Form

Appendix E: Non-Hazardous Materials

Appendix F: Non-Hazardous Materials Solubility

## Appendix A: Listed Hazardous Waste - P List

Listed Hazardous Waste - Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof (**P** list):

EPA Waste Code	CAS#	Chemical Name
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
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol
P008	504-24-5	4-Aminopyridine
P009	131-74-8	Ammonium picrate
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]-
P046	122-09-8	Benzenethanamine, alpha,alpha-dimethyl-
P014	108-98-5	Benzenethiol

EPA Waste Code	CAS#	Chemical Name
P127	1563-66-2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate
P188	57-64-7	Benzoic acid, 2-hydroxy-(3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamateester
P001	<sup>1</sup> 81-81-2	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-[(dimethylamino)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
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-pyrazinylphosphorothioate

EPA Waste Code	CAS#	Chemical Name
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-(1 $\alpha$ ,4 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,8 $\alpha$ ,8 $\beta$ )-
P060	465-73-6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a-hexahydro-(1 $\alpha$ ,4 $\alpha$ ,4 $\beta$ ,5 $\beta$ ,8 $\beta$ ,8 $\beta$ )-
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-, (1 $\alpha$ ,2 $\beta$ ,2 $\alpha$ ,3 $\beta$ ,6 $\beta$ ,6 $\alpha$ ,7 $\beta$ , 7 $\alpha$ )-
P051	<sup>1</sup> 72-20-8	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-, (1 $\alpha$ ,2 $\beta$ ,2 $\beta$ ,3 $\alpha$ ,6 $\alpha$ ,6 $\alpha$ $\beta$ ,7 $\beta$ , 7 $\alpha$ )-, & metabolites
P044	60-51-5	Dimethoate
P046	122-09-8	alpha,alpha-Dimethylphenethylamine
P191	644-64-4	Dimetilan.
P047	<sup>1</sup> 534-52-1	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	Ethanimidothioc acid, 2-(dimethylamino)-N-[[[(methylamino)carbonyl]oxy]-2-oxo-, methyl ester
P066	16752-77-5	Ethanimidothioic acid,N-[[[(methylamino)carbonyl]oxy]-,methyl ester
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
P059	76-44-8	Heptachlor

EPA Waste Code	CAS#	Chemical Name
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(dimethylcarbomodithioato-S,S')-,
P196	15339-36-3	Manganese dimethyldithiocarbamate
P092	62-38-4	Mercury, (acetato-O)phenyl-
P065	628-86-4	Mercury fulminate
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-
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
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 cynaide Ni(CN) <sub>2</sub>

EPA Waste Code	CAS#	Chemical Name
P075	<sup>1</sup> 54-11-5	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
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	<sup>1</sup> 534-52-1	Phenol, 2-methyl-4,6-dinitro-, & salts
P020	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-
P009	131-74-8	Phenol, 2,4,6-trinitro-, ammonium salt
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)-, methylcarbamate.
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-nitrophenylester
P039	298-04-4	Phosphorodithioic acid, ,O-diethylS-[2-(ethylthio)ethyl] ester
P094	298-02-2	Phosphorodithioic acid, ,O-diethylS-[(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

EPA Waste Code	CAS#	Chemical Name
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
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	<sup>1</sup> 54-11-5	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	<sup>1</sup> 57-24-9	Strychnidin-10-one, & salts
P018	357-57-3	Strychnidin-10-one, 2,3-dimethoxy-
P108	<sup>1</sup> 57-24-9	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

EPA Waste Code	CAS#	Chemical Name
P062	757-58-4	Tetraphosphoric acid, hexaethyl ester
P113	1314-32-5	Thallic oxide
P113	1314-32-5	Thallium oxide $Tl_2 O_3$
P114	12039-52-0	Thallium(I) selenite
P115	7446-18-6	Thallium(I) sulfate
P109	3689-24-5	Thiodiphosphoric acid, tetraethylester
P045	39196-18-4	Thiofanox
P049	541-53-7	Thioimidodicarbonic diamide $[(H_2N)C(S)]_2NH$
P014	108-98-5	Thiophenol
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 $V_2O_5$
P120	1314-62-1	Vanadium pentoxide
P084	4549-40-0	Vinylamine, N-methyl-N-nitroso-
P001	<sup>1</sup> 81-81-2	Warfarin, & salts, at concentrations greater than 0.3%
P205	137-30-4	Zinc, bis(dimethylcarbamo-dithioato-S,S')-
P121	557-21-1	Zinc cyanide
P121	557-21-1	Zinc cyanide $Zn(CN)_2$
P122	1314-84-7	Zinc phosphide $Zn_3P_2$ , when present at concentrations greater than 10%
P205	137-30-4	Ziram



## Appendix B: Listed Hazardous Waste - U List

Listed Hazardous Waste - Discarded commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products (U list):

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U001	75-07-0	Acetaldehyde (I)	U034	75-87-6	Acetaldehyde, trichloro-
U187	62-44-2	Acetamide, N-(4-ethoxyphenyl)	U005	53-96-3	Acetamide, N-9H-fluoren-2-yl-
U112	141-78-6	Acetic acid, ethyl ester (I)	U144	301-04-2	Acetic acid, lead salt
U214	563-68-8	Acetic acid, thallium (1 +) salt	U232	93-76-5	Acetic acid, (2,4,5,-trichlorophenoxy)-
U002	67-64-1	Acetone (I)	U003	75-05-8	Acetonitrile (I,T)
U004	98-86-2	Acetophenone	U005	53-96-3	2-Acetylaminofluorene
U006	75-36-5	Acetyl chloride (C,R,T)	U007	79-06-1	Acrylamide
U008	79-10-7	Acrylic acid(I)	U009	107-13-1	Acrylonitrile
U011	61-82-5	Amitrole	U012	62-53-3	Aniline (I,T)
U014	492-80-8	Auramine	U015	115-02-6	Azaserine
U010	50-07-7	Azirino(2,3:3,4)pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-	U157	50-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-
U016	225-51-4	3,4-Benzacridine	U017	98-87-3	Benzal chloride
U192	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-diethyl-2-propynyl)-	U018	56-55-3	Benz[a]anthracene
U094	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	U012	62-53-3	Benzenamine (I,T)
U014	492-80-8	Benzenamine, 4,4-carbonimidoylbis[N,N-dimethyl-	U049	3165-93-3	Benzenamine, 4-chloro-2-methyl
U093	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	U328	95-53-4	Benzenamine, 2-methyl-
U353	106-49-0	Benzenamine, 4-methyl-	U158	101-14-4	Benzenamine, 4,4-methylenebis[2-chloro-
U222	636-21-5	Benzenamine, 2-methyl-, hydrochloride	U181	99-55-8	Benzenamine, 2-methyl-5-nitro-
U019	71-43-2	Benzene	U038	510-15-6	Benzeneacetic acid, 4-chloro-alpha-(4 chlorophenyl)-alpha-hydroxy, ethyl ester
U030	101-55-3	Benzene, 1-bromo-4-phenoxy-	U035	305-03-3	Benzenebutanoic acid, 4[bis(2chloroethyl)amino]-
U037	108-90-7	Benzene, chloro-	U221	25376-45-8	Benzenediamine, ar-methyl
U028	117-81-7	1,2-Benzenedicarboxylic acid, [bis(2-ethyl-hexyl)] ester	U069	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U088	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	U102	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	117-84-0	1,2-Benzenedicarboxylic acid, di-n-octyl ester	U070	95-50-1	Benzene, 1,2-dichloro-
U071	541-73-1	Benzene, 1,3-dichloro-	U072	106-46-7	Benzene, 1,4-dichloro-
U060	72-54-8	Benzene, 1,1 -(2,2-dichloroethylidene) bis[4-chloro-	U017	98-87-3	Benzene, (dichloromethyl)-
U223	26471-62-5	Benzene, 1,3 diisocyanatomethyl-(R,T)	U239	1330-20-7	Benzene, dimethyl- (I,T)
U201	108-46-3	1,3-Benzenediol	U127	118-74-1	Benzene, hexachloro-
U056	110-82-7	Benzene, hexahydro- (I)	U220	108-88-3	Benzene, methyl-
U105	121-14-2	Benzene, 1-methyl-2,4-dinitro-	U106	606-20-2	Benzene, 2-methyl-1,3-dinitro-
U055	98-82-8	Benzene, (1-methylethyl)- (I)	U169	98-95-3	Benzene, nitro- (I,T)
U183	608-93-5	Benzene, pentachloro-	U185	82-68-8	Benzene, pentachloronitro-
U020	98-09-9	Benzenesulfonic acid chloride (C,R)	U020	98-09-9	Benzenesulfonyl chloride (C,R)
U207	95-94-3	Benzene, 1,2,4,5-tetrachloro-	U061	50-29-3	Benzene, 1,1 -(2,2,2-trichloroethylidene)bis[4-chloro-
U247	72-43-5	Benzene, 1,1 -(2,2,2-trichloroethylidene)[4 -methoxy-	U023	98-07-7	Benzene, (trichloromethyl)- (C,R,T)
U234	99-35-4	Benzene, 1,3,5-trinitro- (R,T)	U021	92-87-5	Benzidine
U202	<sup>1</sup> 81-07-2	1,2-Benzisothiazol-3-(2H)-one,1,1 dioxide and salts	U203	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-
U141	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	U090	94-58-6	1,3-Benzodioxole, 5-propyl-
U064	189-55-9	Benzo[rs]t] pentaphene	U022	50-32-8	Benzo[a]pyrene
U197	106-51-4	p-Benzoquinone	U023	98-07-7	Benzotrichloride (C,R,T)
U085	1464-53-5	2,2'-Bioxirane (I,T)	U021	92-87-5	[1,1' -Biphenyl]-4,4' -diamine
U073	91-94-1	[1,1' -Biphenyl]-4,4' -diamine, 3,3' -dichloro-	U091	119-90-4	[1,1' -Biphenyl]-4,4' -diamine, 3,3' -dimethoxy-
U095	119-93-7	[1,1' -Biphenyl]-4,4' -diamine, 3,3' -dimethyl-	U027	39638-32-9	Bis(2-chloroisopropyl) ether
U024	111-91-1	Bis(2-chloromethoxy) ethane	U028	117-81-7	Bis(2-ethylhexyl) phthalate
U225	75-25-2	Bromoform	U030	101-55-3	4-Bromophenyl phenyl ether
U128	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	U172	924-16-3	1-Butanamine, N-butyl-N-nitroso
U031	71-36-3	1-Butanol (I)	U159	78-93-3	2-Butanone (I,T)
U160	1338-23-4	2-Butanone peroxide (R,T)	U053	4170-30-3	2-Butenal
U074	764-41-0	2-Butene, 1,4-dichloro- (I,T)	U143	303-34-4	2-Butenoic acid, 2-methyl-, 7-[(2,3-dihydroxy- 2-(1-methoxyethyl)- 3-methyl-1- oxobutoxy)methyl]- 2,3,5,7a-tetrahydro-1- pyrrolizin-1- yl ester, [1S-

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
					[1alpha(Z),7(2S,3R),7aalpha)]-
U031	71-36-3	n-Butyl alcohol (l)	U136	75-60-5	Cacodylic acid
U032	13765-19-0	Calcium chromate	U238	51-79-6	Carbamic acid, ethyl ester
U178	615-53-2	Carbamic acid, methylnitroso, ethyl ester	U097	79-44-7	Carbamic chloride, dimethyl-
U114	<sup>1</sup> 111-54-6	Carbamodithioic acid, 1,2-ethanediybis-, salts and esters	U062	2303-16-4	Carbamothioic acid, bis(1-methylethyl)- S-(2,3-dichloro-2-propenyl) ester
U215	6533-73-9	Carbonic acid, dithallium (1+) salt	U033	353-50-4	Carbonic difluoride
U156	79-22-1	Carbonochloridic acid, methyl ester (l,T)	U033	353-50-4	Carbon oxyfluoride (R,T)
U211	56-23-5	Carbon tetrachloride	U034	75-87-6	Chloral
U035	30503-3	Chlorambucil	U036	12789-03-6	Chlordane
U026	494-03-1	Chlornaphazine	U037	108-90-7	Chlorobenzene
U039	59-50-7	p-Chloro-m-cresol	U041	106-89-8	1-Chloro-2,3 epoxypropane
U042	110-75-8	2-Chloroethyl vinyl ether	U044	67-66-3	Chloroform
U046	107-30-2	Chloromethyl methyl ether	U047	91-58-7	beta-Chloronaphthalene
U048	95-57-8	o-Chlorophenol	U049	3165-93-3	4-Chloro-o-toluidine, hydrochloride
U032	13765-19-0	Chromic acid, calcium salt	U050	218-01-9	Chrysene
U051	8021-39-4	Creosote	U052	1319-77-3	Cresols (Cresylic acid)
U053	4170-30-3	Crotonaldehyde	U055	98-82-8	Cumene (l)
U246	506-68-3	Cyanogen bromide	U197	106-51-4	2,5-Cyclohexadiene-1,4-dione
U056	110-82-7	Cyclohexane (l)	U057	108-94-1	Cyclohexanone (l)
U130	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexa-chloro-	U058	50-18-0	Cyclophosphamide
U240	<sup>1</sup> 94-75-7	2,4-D, salts and esters	U059 2	0830-81-3	Daunomycin
U060	72-54-8	DDD	U061	50-29-3	DDT
U062	2303-16-4	Diallate	U063	53-70-3	Dibenz[a,h]anthracene
U064	189-55-9	Dibenzo[s,i]pyrene	U066	96-12-8	1,2-Dibromo-3-chloropropane
U069	84-74-2	Dibutyl phthalate	U070	95-50-1	o-Dichlorobenzene
U071	541-73-1	m-Dichlorobenzene	U072	106-46-7	p-Dichlorobenzene
U073	91-94-1	3,3'-Dichlorobenzidine	U074	764-41-0	1,4-Dichloro-2-butene (l,T)
U075	75-71-8	Dichlorodifluoromethane	U078	75-35-4	1,1-Dichloroethylene
U079	156-60-5	1,2-Dichloroethylene	U025	111-44-1	Dichloroethyl ether
U081	120-83-2	2,4-Dichlorophenol	U082	87-65-0	2,6-Dichlorophenol
U240	<sup>1</sup> 94-75-7	2,4-Dichlorophenoxyacetic acid, salts and esters	U083	78-87-5	1,2-Dichloropropane
U084	542-75-6	1,3-Dichloropropene	U085	1464-53-5	1,2:3,4-Diepoxybutane (l,T)
U108	123-91-1	1,4-Diethyleneoxide	U086	1615-80-1	N,N-Diethylhydrazine

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U087	3288-58-2	O,O-Diethyl-S-methyl-dithiophosphate	U088	84-66-2	Diethyl phthalate
U089	56-53-1	Diethylstilbestrol	U090	94-58-6	Dihydrosafrole
U091	119-90-4	3,3'-Dimethoxybenzidine	U092	124-40-3	Dimethylamine (l)
U093	60-11-7	Dimethylaminoazobenzene	U094	57-97-6	7,12-Dimethylbenz [a]anthracene
U095	119-93-7	3,3'-Dimethylbenzidine	U096	80-15-9	alpha,alpha-Dimethylbenzylhydroperoxide (R)
U097	79-44-7	Dimethylcarbamoyl chloride	U098	57-14-7	1,1-Dimethylhydrazine
U099	540-73-8	1,2-Dimethylhydrazine	U101	105-67-9	2,4-Dimethylphenol
U102	131-11-3	Dimethyl phthalate	U103	77-78-1	Dimethyl sulfate
U105	121-14-2	2,4-Dinitrotoluene	U106	606-20-2	2,6-Dinitrotoluene
U107	117-84-0	Di-n octyl phthalate	U108	123-91-1	1,4-Dioxane
U109	122-66-7	1,2-Diphenylhydrazine	U110	142-84-7	Dipropylamine (l)
U111	621-64-7	Di-n-propylnitrosamine	U001	75-07-0	Ethanal (l)
U174	55-18-5	Ethanamine, N-ethyl-N-nitroso-	U155	91-80-5	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'- (2-thienylmethyl)-
U067	106-93-4	Ethane, 1,2-dibromo-	U076	75-34-3	Ethane, 1,1-diichloro-
U077	107-06-2	Ethane, 1,2-dichloro-	U131	67-72-1	Ethane, hexachloro-
U024	111-91-1	Ethane, 1,1' - [methylenebis(oxy)]bis[2-chloro-	U117	60-29-7	Ethane, 1,1-oxybis- (1)
U025	111-44-4	Ethane, 1,1-oxybis[2-chloro-	U184	76-01-7	Ethane, pentachloro-
U208	630-20-6	Ethane, 1,1,1,2-tetrachloro-	U209	79-34-5	Ethane, 1,1,2,2-tetrachloro-
U218	62-55-5	Ethanethioamide	U227	110-80-5	Ethanol, 2-ethoxy
U359	79-00-5	Ethane, 1,1,2-trichloro-	U173	1116-54-7	Ethanol, 2,2'-(nitrosoimino)bis-
U004	98-86-2	Ethanone, 1-phenyl-	U043	75-01-4	Ethene, chloro-
U042	110-75-8	Ethene, (2-chloroethoxy)-	U078	75-35-4	Ethene, 1,1-dichloro-
U079	156-60-5	Ethene, 1,2-dichloro-	U210	127-18-4	Ethene, tetrachloro-
U228	79-01-6	Ethene, trichloro	U112	141-78-6	Ethyl acetate (l)
U113	140-88-5	Ethyl acrylate (l)	U238	51-79-6	Ethyl carbamate
U038	510-15-6	Ethyl 4,4'-dichlorobenzilate	U114	<sup>1</sup> 111-54-6	Ethylenebis(dithiocarbamic acid), salts and esters
U067	106-93-4	Ethylene dibromide	U077	107-06-2	Ethylene dichloride
U359	110-80-5	Ethylene glycol monoethyl ether	U115	75-21-8	Ethylene oxide (l,T)
U116	96-45-7	Ethylene thiourea	U117	60-29-7	Ethyl ether (l)
U076	75-34-3	Ethylidene dichloride	U118	97-63-2	Ethyl methacrylate
U119	62-50-0	Ethylmethanesulfonate	U120	206-44-0	Fluoranthene
U122	50-00-0	Formaldehyde	U123	64-18-6	Formic acid (C,T)
U124	110-00-9	Furan (l)	U125	98-01-1	2-Furancarboxaldehyde (l)
U147	108-31-6	2,5-Furandione	U213	109-99-9	Furan, tetrahydro- (l)

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U125	98-01-1	Furfural (I)	U124	110-00-9	Furfuran (I)
U206	18883-66-4	D-Glucopyranose, 2-deoxy-2(3-methyl-3-nitrosoureido)	U126	765-34-4	Glycidylaldehyde
U163	70-25-7	Guanidine, N-methyl-N'-nitro-N-nitroso-	U127	18-74-1	Hexachlorobenzene
U128	87-68-3	Hexachlorobutadiene	U129	58-88-9	Hexachlorocyclohexane (gamma isomer)
U130	77-47-4	Hexachlorocyclopentadiene	U131	67-72-1	Hexachloroethane
U132	70-30-4	Hexachlorophene	U243	1888-71-7	Hexachloropropene
U133	302-01-2	Hydrazine (R,T)	U086	1615-80-1	Hydrazine, 1,2-dimethyl- -
U098	57-14-7	Hydrazine, 1,1-dimethyl-	U099	540-73-8	Hydrazine, 1,2-diethyl
U109	122-66-7	Hydrazine, 1,2-diphenyl-	U134	7664-39-3	Hydrofluoric acid (C,T)
U134	7664-39-3	Hydrogen fluoride (C,T)	U135	7783-06-4	Hydrogen sulfide
U096	80-15-9	Hydroperoxide, 1-methyl-1-phenylethyl- (R)	U136	75-60-5	Hydroxydimethylarsine oxide
U116	96-45-7	2-Imidazolidinethione	U137	193-39-5	Indeno[1,2,3-cd]pyrene
U139	9004-66-4	Iron dextran	U190	85-44-9	1,3-isobenzofurandione
U140	78-83-1	Isobutyl alcohol (I,T)	U141	120-58-1	Isosafrole
U142	143-50-0	Kepone	U143	303-34-4	Lasiocarpine
U144	301-04-2	Lead acetate	U146	1335-32-6	Lead, bis(acetato-O)tetrahydroxytri-
U145	7446-27-7	Lead phosphate	U146	1335-32-6	Lead subacetate
U129	58-89-9	Lindane	U147	108-31-6	Maleic anhydride
U148	123-33-1	Maleic hydrazide	U149	109-77-3	Malononitrile
U150	148-82-3	Melphalan	U151	7439-97-6	Mercury
U152	126-98-7	Methacrylonitrile (I,T)	U092	124-40-3	Methanamine, N-methyl- (I)
U029	74-83-9	Methane, bromo-	U045	74-87-3	Methane, chloro-(I,T)
U046	107-30-2	Methane, chloromethoxy-	U068	74-95-3	Methane, dibromo-
U080	75-09-2	Methane, dichloro-	U075	75-71-8	Methane, dichlorodifluoro-
U138	74-88-4	Methane, iodo-	U119	62-50-0	Methanesulfonic acid, ethyl ester
U211	56-23-5	Methane, tetrachloro-	U153	74-93-1	Methanethiol (I,T)
U225	75-25-2	Methane, tribromo-	U044	67-66-3	Methane, trichloro-
U121	75-69-4	Methane, trichlorofluoro-	U123	64-18-6	Methanoic acid (C,T)
U154	67-56-1	Methanol (I)	U155	91-80-5	Methapyrilene
U142	143-50-0	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5a,5b,6- decachloro-octahydro-	U247	72-43-5	Methoxychlor
U154	67-56-1	Methyl alcohol (I)	U029	74-83-9	Methyl bromide
U186	504-60-9	1-Methylbutadiene (I)	U045	74-87-3	Methyl chloride (I,T)

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U156	79-22-1	Methylchlorocarbonate (I,T)	U226	71-55-6	Methylchloroform
U157	56-49-5	3-Methylcholanthrene	U158	101-14-4	4,4'-Methylenebis(2-chloroaniline)
U068	74-95-3	Methylene bromide	U080	75-09-2	Methylene chloride
U159	78-93-3	Methyl ethyl ketone (MEK)(I,T)	U160	1338-23-4	Methyl ethyl ketone peroxide (R,T)
U138	74-88-4	Methyl iodide	U161	108-10-1	Methyl isobutyl ketone (I)
U162	80-62-6	Methyl methacrylate (I,T)	U163	70-25-7	N-Methyl-N'-nitro-N-nitrosoguanidine
U161	108-10-1	4-Methyl-2-pentanone (I)	U164	56-04-2	Methylthiouracil
U010	50-07-7	Mitomycin C	U059	20830-81-3	5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-
U165	91-20-3	Naphthalene	U047	91-58-7	Naphthalene, 2-chloro-
U166	130-15-4	1,4-Naphthalenedione	U236	72-57-1	2,7-Naphthalenedisulfonic acid, 3,3'-[[3,3'-dimethyl-(1,1'-biphenyl)-4,4'diyl]]-bis(azo) bis(5-amino-4-hydroxy)-, tetrasodium salt
U166	130-15-4	1,4-Naphthoquinone	U167	134-32-7	alpha-Naphthylamine
U168	91-59-8	beta-Naphthylamine	U026	494-03-1	2-Naphthylamine, N,N'-bis(2-chloroethyl)-
U167	134-32-7	1-Naphthylenamine	U168	91-59-8	2-Naphthylenamine
U217	10102-45-1	Nitric acid, thallium(1 + ) salt	U169	98-95-3	Nitrobenzene (I,T)
U170	100-02-7	p-Nitrophenol	U171	79-46-9	2-Nitropropane (I,T)
U172	924-16-3	N-Nitrosodi-n-butylamine	U173	1116-54-7	N-Nitrosodiethanolamine
U174	55-18-5	N-Nitrosodiethylamine	U176	759-73-9	N-Nitroso-N ethylurea
U177	684-93-5	N-Nitroso-N-methylurea	U178	615-53-2	N-Nitroso-N-methylurethane
U179	100-75-4	N-Nitrosopiperidine	U180	930-55-2	N-Nitrosopyrrolidine
U181	99-55-8	5-Nitro-o-toluidine	U193	1120-71-4	1,2 Oxathiolane, 2,2-dioxide
U058	50-18-0	2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl) tetrahydro-, 2-oxide	U115	75-21-8	Oxirane (I,T)
U126	765-34-4	Oxiranecarboxyaldehyde	U041	106-89-8	Oxirane, (chloromethyl)-
U182	123-63-7	Paraldehyde	U183	608-93-5	Pentachlorobenzene
U184	76-01-7	Pentachloroethane	U185	82-68-8	Pentachloronitrobenzene (PCNB)
U242	87-86-5	Pentachlorophenol	U186	504-60-9	1,3-Pentadiene (I)
U187	62-44-2	Phenacetin	U188	108-95-2	Phenol
U048	95-57-8	Phenol, 2-chloro-	U039	59-50-7	Phenol, 4-chloro-3-methyl-
U081	120-83-2	Phenol, 2,4-dichloro-	U082	87-65-0	Phenol, 2,6-dichloro-
U089	56-53-1	Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-,(E)-	U101	105-67-9	Phenol, 2,4-dimethyl-

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U052	1319-77-3	Phenol, methyl-	U132	70-30-4	Phenol, 2,2' -methylenebis[3,4,6-trichloro-
U170	100-02-7	Phenol, 4-nitro-	U242	87-86-5	Phenol, pentachloro-
U212	58-90-2	Phenol, 2,3,4,6-tetrachloro-	U230	95-94-4	Phenol, 2,4,5-trichloro-
U231	88-06-2	Phenol, 2,4,6-trichloro-	U150	148-82-3	L-Phenylalanine, 4[bis(2-chloroethyl) amino]-
U145	7446-27-7	Phosphoric acid, lead salt	U087	3288-58-2	Phosphorodithioic acid, O,O-diethyl-, S-methyl ester
U189	108-95-2	Phosphorus sulfide (R)	U190	85-44-9	Phthalic anhydride
U191	109-06-8	2-Picoline	U179	100-75-4	Piperidine, 1-nitroso-
U192	23950-58-5	Pronamide	U194	107-10-8	1-Propanamine (I,T)
U111	621-64-7	1-Propanamine, N-nitroso-N-propyl-	U110	142-84-7	1-Propanamine, N-propyl- (I)
U066	96-12-8	Propane, 1,2-dibromo-3-chloro-	U149	109-77-3	Propanedinitrile
U171	79-46-9	Propane, 2-nitro-(I,T)	U027	39638-32-9	Propane, 2,2' -oxybis[2-chloro-
U193	1120-71-4	1,3-Propane sultone	U235	126-72-7	1-Propanol, 2,3-dibromo-, phosphate (3:1)
U140	78-83-1	1-Propanol, 2-methyl- (I,T)	U002	67-64-1	2-Propanone (I)
U084	542-75-6	1-Propane, 1,3-dichloro-	U152	126-98-7	2-Propanenitrile, 2-methyl- (I,T)
U007	79-06-1	2-Propenamide	U243	1888-71-7	1-Propene, hexachloro-
U009	107-13-1	2-Propenenitrile	U008	79-10-7	2-Propenoic acid (I)
U113	140-88-5	2-Propenoic acid, ethyl ester (I)	U118	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester
U162	80-66-2	2-Propenoic acid, 2-methyl-, methyl ester(I,T)	U233	93-72-1	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U194	107-10-8	n-Propylamine (I,T)	U083	78-87-5	Propylene dichloride
U148	123-33-1	3,6-Pyridazinedione, 1,2-dihydro	U196	110-86-1	Pyridine
U191	109-06-8	Pyridine, 2-methyl-	U237	66-75-1	2,4(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-
U164	56-04-2	4-(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	U180	930-55-2	Pyrrolidine, 1-nitroso-
U200	50-55-5	Reserpine	U201	108-46-3	Resorcinol
U202	<sup>1</sup> 81-07-2	Saccharin and salts	U203	94-59-7	Safrole
U204	7783-00-8	Selenious acid	U204	7783-00-8	Selenium dioxide
U205	7446-34-6	Selenium sulfide (R,T)	U015	115-02-6	L-Serine, diazoacetate (ester)
U233	93-72-1	Silvex	U206	18883-66-4	Streptozotocin
U103	77-78-1	Sulfuric acid, dimethyl ester	U189	1314-80-3	Sulfur phosphide (R)
U232	93-76-5	2,4,5-T	U207	95-94-3	1,2,4,5-Tetrachlorobenzene
U208	630-20-6	1,1,1,2-Tetrachloroethane	U209	79-34-5	1,1,2,2-Tetrachloroethane
U210	127-18-4	Tetrachloroethylene	U212	58-90-2	2,3,4,6-Tetrachlorophenol
U213	109-99-9	Tetrahydrofuran (I)	U214	15843-14-8	Thallium(I) acetate

EPA Waste Code	CAS#	Chemical Name	EPA Waste Code	CAS#	Chemical Name
U215	6533-73-9	Thallium(I) carbonate	U216	7791-12-0	Thallium chloride
U217	10102-45-1	Thallium(I) nitrate	U218	62-55-5	Thioacetamide
U153	74-93-1	Thiomethanol (I,T)	U244	137-26-8	Thioperoxydicarbonic diamide, tetramethyl-
U219	62-56-6	Thiourea	U244	137-26-8	Thiuram
U220	108-88-3	Toluene	U221	25376-45-8	Toluenediamine
U223	26471-62-5	Toluene diisocyanate (R,T)	U328	95-53-4	o-Toluidine
U353	106-49-0	p-Toluidine	U222	636-21-5	o-Toluidine hydrochloride
U011	61-82-5	1H-1,2,4- Triazol-3-amine	U226	71-55-6	1,1,1 -Trichloroethane
U227	79-00-5	1,1,2-Trichloroethane	U228	79-01-6	Trichloroethylene
U121	75-69-4	Trichloromonofluoromethane	U230	95-95-4	2,4,5-Trichlorophenol
U231	88-06-2	2,4,6-Trichlorophenol	U234	99-35-4	sym-Trinitrobenzene (R,T)
U182	123-63-7	1,3,5- Trioxane, 2,4,6- trimethyl-	U235	126-72-7	Tris(2,3-dibromopropyl) phosphate
U236	72-57-1	Trypan blue	U237	66-75-1	Uracil mustard
U176	759-73-9	Urea, N-ethyl-N-nitroso-	U177	684-93-5	Urea, N-methyl-N-nitroso-
U043	75-01-4	Vinyl chloride	U248	<sup>1</sup> 81-81-2	Warfarin, when present at concentrations of 0.3% or less
U239	1330-20-7	Xylene (I)	U200	50-55-5	Yohimban-16 carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl) oxy]-, methyl ester
U249	1314-84-7	Zinc phosphide, when present at concentrations of 10% or less			



## Appendix C: Satellite Accumulation Area Rules Posting

### PURDUE UNIVERSITY

## HAZARDOUS WASTE STORAGE REQUIREMENTS

- All waste must be stored in containers.
- Containers must be kept closed at all times except when adding or removing waste.
- Containers must be labeled or clearly marked with words that describe the contents of the waste and the words "Hazardous Waste".
- Containers must be in good shape and not leaking and must be compatible with the waste they contain.
- Containers must be stored at or near the point of generation and under the control of the generator of the waste.
- The waste storage volume should never exceed 55 gallons per waste collection area.
- Containers must be segregated by chemical compatibility during storage.



**Contact the REM Hazardous Materials Management Section  
with questions: (765) 49-40121**

## Appendix D: Hazardous Materials Pickup Request Form

HMM-001

### Hazardous Material Pickup Request

(Located on our website: <http://www.purdue.edu/rem/home/files/forms.htm#HMM001>)

Send to **REM, LMSB** via campus mail or **Fax 49-61106**

PI: \_\_\_\_\_ PI Telephone #: \_\_\_\_\_

Requested By: \_\_\_\_\_ Date: \_\_\_\_\_

Telephone #: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Building: \_\_\_\_\_ Room/Shop: \_\_\_\_\_  
Waste Location

Department: \_\_\_\_\_ Dept. Code: \_\_\_\_\_

**When filling out this form remember the following:**

1. All mixture materials must be submitted in a percentage format. Each Container's percentage must add up to 100% (See Example Below).
2. Chemical descriptions on this form must match the container label.
  - Always include as much information as possible.
  - Only submit known mixtures or chemicals.
  - Absolutely no chemical formulae, abbreviations, acronyms or structures.
3. When submitting trade products:
  - It is your responsibility to provide the product information.
  - An accurate chemical description of the product must accompany the form (i.e. an MSDS).
4. Make sure all writing is legible.
5. Forms completed improperly can cause severe delays in pickup times.

**Example Pickup Line:**

1	Acetone 50%, Benzene 10%, Dichloromethane 20%, Acetic Acid 10%, Water 10%, Trace Silver	5	5 gal.	5 gal.	S	L
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I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Item #	Chemical Description (List Each Container)	Number of Containers	Container Size	Amount of Waste in Container	Spent/Usable	Solid/Liquid/Gas/Aerosol

Special Comments or Instructions:

## Appendix E: Non-Hazardous Materials

In order to ensure improper disposal does not occur, only small quantities of the materials listed in the table below can be disposed down the drain if water soluble or discarded in the trash. This list does not include every non-hazardous substance or every material that can be disposed of via the sanitary sewer or trash. Please contact REM at (765) 49-40121 for further information regarding non-hazardous waste disposal.

Actin	Acetylsalicylic acid	Adenosine
Alanine	Albumin	Alconox
Alginic acid	Aminoacetic acid	Aluminum sulfate
Amino acid	Ammonium bicarbonate	Ammonium bitrate
Ammonium carbonate	Ammonium chloride	Ammonium sulfate
Ammonium phosphate	Amylopectin	Arabinose
Arginine	Asparagine	Aspartic acid
Ascorbic acid	Beef extract	Bees wax
Bentonite	Benzoic acid	Bitumen
Boric acid	Broth nutrients	Calcium acetate
Calcium carbonate	Calcium chloride	Calcium fluoride
Calcium gluconate	Calcium phosphate	Calcium sulfate
Carnitine	Casein	Chlorophyll
Choline	Choline chloride	Corticotropin
Creatinine	Cysteine	Cytosine
Dextran	Dextrose	Diathymosulfone
Drierite	EDTA	Epsom salts
Ferric chloride	Ferric sulfate	Ferritin
Ferrous ammonium sulfate	Fructose	Fullers earth
Galactose	Gelatin	Glutamic acid
Glutamine	Glutaric acid	Glutathione
Glycerin	Glycylglycine	Guanosine
Gypsum	Hemoglobin	Histidine
Hydroxyproline	Insulin	Iron oxide
Isoleucine	Kaolin	Keratin
Lactic acid	Lactose	Lanolin
Lecithin	Leucine	Lithium carbonate
Lithium chloride	Lithium sulfate	Litmus
Magnesium carbonate	Magnesium phosphate	Magnesium sulfate
Malt Extract	Maltose	Manganese acetate
Manganese chloride	Manganese sulfate	Mannitol
Methionine	Molecular sieves	Naphthoflavone
Oleic acid	Ovalbumin	Pancreatin
Papain	Paraffin	Pepsin
Peptone	Phenylalanine	Phthalic acid
Plastics	Polymers (solid)	Potassium acetate
Potassium acid phosphate	Potassium bicarbonate	Potassium bisulfate
Potassium borate	Potassium bromide	Potassium carbonate
Potassium chloride	Potassium citrate	Potassium hydrogen phthalate

Potassium iodide	Potassium phosphate	Potassium pyrosulfate
Potassium sulfate	Potassium sulfite	Potassium tartrate
Pumice	Riboflavin	Riboflavin-5-phosphate
Serine	Silicon carbide	Silicon dioxide
Sodium acetate	Sodium ammonium phosphate	Sodium benzoate
Sodium bicarbonate	Sodium bisulfate	Sodium bisulfite
Sodium borate	Sodium carbonate	Sodium chloride
Sodium citrate	Sodium dodecyl sulfate	Sodium fluoride
Sodium formate	Sodium iodide	Sodium lactate
Sodium phosphate	Sodium salicylate	Sodium sulfate
Sodium sulfite	Sorbitol	Sorbose
Succinic acid	Sucrose	Sugars
Tartaric acid	Thiamine hydrochloride	Tocopherol
Trypsin	Tryptophan	Tyrosine
Urea	Uricase	Valine
Xanthine	Yeast extract	

## Appendix F: Non-Hazardous Materials Solubility

The following table contains anion and cation combinations, which are safe for disposal via the sanitary sewer (if soluble) or via the trash (if insoluble) subject to the conditions stated.

Materials that create acid or basic aqueous solutions will require neutralization to a pH of 5-9 prior to disposal to sanitary sewer. Reactive items should not be trashed.

	Acid <sup>5,6</sup> (H <sup>+</sup> )	Aluminum (Al <sup>3+</sup> )	Ammonium (NH <sup>4+</sup> )	Calcium (Ca <sup>2+</sup> )	Ferric <sup>7</sup> (Fe <sup>3+</sup> )	Ferrous <sup>8</sup> (Fe <sup>2+</sup> )	Lithium (Li <sup>+</sup> )	Magnesium (Mg <sup>2+</sup> )	Manganous <sup>9</sup> (Mn <sup>2+</sup> )	Potassium (K <sup>+</sup> )	Sodium (Na <sup>+</sup> )
Acetate	C	SS	S	S	S	VS	VS	VS	S	VS	VS
Benzoate	S	SS	S	S	I	S	SS	S	S	S	VS
Borate <sup>1</sup> (B <sub>4</sub> O <sub>7</sub> <sup>2-</sup> )	S	I	S	SS			S	SS	I	S	S
Bromide (Br <sup>-</sup> )	C	R	VS	VS	S	VS	VS	VS	VS	VS	VS
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	S	I	VS	I	I	SS	S	I	I	VS	S
Chloride (Cl <sup>-</sup> )	C	R	S	VS	VS	VS	VS	S	VS	S	S
Citrate	S	S	VS	S	S	SS	VS	SS	SS	VS	VS
Formate	C	S	VS	S	S	S	S	S	S	VS	VS
Gluconate	VS		S	SS		S		S		VS	S
Hydroxide <sup>2</sup> (OH <sup>-</sup> )	VS	I	C	SS	I	I	C	I	I	C	C
Iodide (I <sup>-</sup> )	C	R	VS	VS	S	S	VS	VS	VS	VS	VS
Lactate	S	S	VS	S	S	S	S	S	SS	S	VS
Phosphate <sup>3</sup> (PO <sub>4</sub> <sup>3-</sup> )	C	I	S	I	I	I	I	I	SS	VS	VS
Salicylate	S	I	VS	S			VS	S		VS	VS
Silicate	I	I	S	I	I	I	I	I	I	S	S
Sulfate <sup>4</sup> (SO <sub>4</sub> <sup>2-</sup> )	C	S	VS	I	S	S	S	VS	VS	S	S
Sulfite <sup>4</sup> (SO <sub>3</sub> <sup>2-</sup> )	C		S	I		SS	S	SS		VS	S
Tartrate <sup>4</sup>	S	SS	S	SS	S	SS	S	SS	SS	VS	S

### Key

- C = Caution! These acids and bases can generate a lot of heat or be violent when neutralized or diluted. This is especially true for concentrated solutions.
- I = Insoluble, these may be marked as non-hazardous and placed in trash. [Approximate Solubility < 0.01g per 100g Water]
- R = Caution! These anhydrous aluminum salts react violently with water. Reactive items should not be trashed.
- S = Soluble (also miscible for liquids) [Approximate Solubility 1.0 to 60g per 100g Water]
- SS = Slightly Soluble [Approximate Solubility 0.01 to 1.0g per 100g Water]
- VS = Very Soluble [Approximate Solubility > 60g per 100g Water]
- 1 = Also known as tetraborate. Boric acid, H<sub>3</sub>BO<sub>3</sub>, Magnesium Borate, Mg(BO<sub>2</sub>)<sub>2</sub>.
- 2 = All bases must be neutralized before sink disposal.
- 3 = Includes monobasic, dibasic, and tribasic phosphates. Solubility generally decreases with increasing basicity.
- 4 = Also known as hydrogen carbonate, hydrogen sulfate, hydrogen sulfite, and hydrogen tartrate.
- 5 = All acids must be neutralized before sink disposal.
- 6 = Except for Hydrobromic, Hydrochloric, Hydriodic, Phosphoric, Sulfuric, Sulfurous acids and water, acid names in the table are derived by dropping "ate" from the end of the anion name and adding "ic acid."
- 7 = Ferric, also known as Iron (III).
- 8 = Ferrous, also known as Iron (II).