

# Guide for Drain Disposal of Laboratory Chemicals

## 1.0 INTRODUCTION

## 2.0 RESPONSIBILITIES

Within individual laboratories, authorization for specific operations, delineation of appropriate safety procedures and instruction about these procedures is a responsibility of the principal investigator.

It is the responsibility of each Cornell laboratory worker to be sure that chemical waste generated from their activities is disposed of properly. Some materials can be safely let into the sanitary sewer and others can cause damage to health, the environment or the functioning of the wastewater plant.

Inappropriate chemicals put down the drain may be incorporated into sludge formed in waste water treatment, contaminating it enough to be classified as a hazardous waste where otherwise it might have been recycled. After treated waste water leaves the plant, it flows to Cayuga Lake, a major recreational and drinking water resource for this area. The stewardship of this important natural resource is our collective responsibility.

Laboratory workers should consult this guide before undertaking drain disposal of any lab chemicals.

## 3.0 GENERAL GUIDELINES

### What

Send down the drain only those materials found on the safe list. Compounds not listed are not suitable for drain disposal.

### Where

Drain disposal must only be used when the drain flows to a sanitary sewer system\* which eventually goes to the waste water treatment plant. Storm drain systems flow directly into surface water (Fall or Cascadilla Creeks, for example) and should NEVER be used for chemical disposal. Floor drains may flow to storm sewers and should never be used for disposal. Laboratory sinks should be used for disposal of chemicals on the safe list as discussed below.

### How Much

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\* Sanitary sewer is the system of sinks, toilets, drains and associated pipes that send waste water to a treatment plant where it is biologically and chemically treated before discharge into the environment.

Quantities of chemical waste for drain disposal should be limited generally to a few hundred grams or milliliters or less per day. Larger amounts should have prior approval from EH&S. Only materials listed as safe for drain disposal in this document are approved for drain disposal in quantities up to 100 grams or 100 milliliter per discharge. Disposal should be followed by flushing with at least 100-fold excess of water at the sink. (That means for 100 ml of chemical run the water for about two minutes at maximum flow.)

Note: Sulfuric, hydrochloric, acetic and phosphoric acids may be discharged in larger quantities since they must be neutralized to a pH of between 5.5 and 9.0 before they can be drain disposed to the sanitary sewer.

### Safety

Understand the hazards and toxicity of the materials you work with by consulting material safety data sheets (available in every department in large red notebooks, on the Internet, or through EH&S). Work slowly to avoid splashes and wear the proper protective equipment (lab coat, goggles, face shield, gloves) during drain disposal.

Chemicals that are not appropriate for drain disposal are collected by Environmental Health and Safety. See pages 7.9-11 of this section.

## **4.0 NOT SAFE FOR DRAIN DISPOSAL**

THE FOLLOWING MATERIALS ARE **PROHIBITED** FROM DRAIN DISPOSAL BY THE CITY OF ITHACA:

- Ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, manure, hair and fleshings, entrails, paint residues, solid or viscous substances capable of causing obstruction to the flow of sewers.
- Some chemicals that are not appropriate for drain disposal include:
  - Halogenated hydrocarbons
  - Nitro compounds
  - Mercaptans
  - Flammables (immiscible in water)
  - Explosives such as azides and peroxides
  - Water soluble polymers that could form gels in the sewer system
  - Water reactive materials
  - Malodorous chemicals
  - Toxic chemicals such as carcinogens, mutagens, teratogens
- Substances that boil below 50° C.
- Mixtures that have a component not found on the safe list.
- Any material not found on the safe list.

Check with Environmental Health and Safety at 255-8200 if you are not certain about drain disposal for a particular material. We may also be able to provide you with instructions for laboratory detoxification for some materials.

## 5.0 SAFE FOR DRAIN DISPOSAL

### Inorganics

Dilute solutions of inorganic salts where both cation and anion are listed below are suitable for drain disposal. Materials listed are considered to be relatively low in toxicity. Compounds of any of these ions that are strongly acidic or basic should be neutralized before drain disposal.

<u>Cations</u>	<u>Anions</u>
Al <sup>3+</sup>	BO <sup>3-</sup>
Ca <sup>2+</sup>	B <sub>4</sub> O <sub>7</sub> <sup>2-</sup>
Fe <sup>2+,3+</sup>	Br <sup>-</sup>
H <sup>+</sup>	CO <sub>3</sub> <sup>2-</sup>
K <sup>+</sup>	Cl <sup>-</sup>
Li <sup>+</sup>	HSO <sup>3-</sup>
Mg <sup>2+</sup>	OCN <sup>-</sup>
Na <sup>+</sup>	OH <sup>-</sup>
NH <sup>4+</sup>	I <sup>-</sup>
Sn <sup>2+</sup>	NO <sup>3-</sup>
Sr <sup>2+</sup>	PO <sub>4</sub> <sup>3-</sup>
Ti <sup>3+, 4+</sup>	SO <sub>4</sub> <sup>2-</sup>
Zr <sup>2+</sup>	SCN <sup>-</sup>

- Mineral acids and bases should be neutralized to pH 5.5 to 9 range before disposal, following procedures in Appendix A.
- Copper and Zinc have specific discharge limits required by the Sewage Treatment Plant. Contact Environmental Health and Safety at 255-8200 prior to discharging any copper or zinc.

### Organics

**Materials listed below in quantities up to about 100g or 100 ml at a time are suitable for disposal down the drain while flushing with excess water. These materials are soluble to at least 3 percent, present low toxicity hazards and are readily biodegradable.**

## Alcohols

*Alkanols with 4 or fewer carbon atoms:*

methanol  
ethanol  
propanol and isomers  
butanol and isomers

*Alkanediols with 7 or fewer carbon atoms*

ethylene glycol  
propylene glycol  
butylene glycol  
butanediol + isomers  
pentylene glycol  
pentanediol + isomers  
hexylene glycol  
hexanediol + isomers  
heptamethylene glycol  
heptanediol + isomers

*Alkoxyalkanols with 6 or fewer carbon atoms:*

Methoxyethanol  
ethoxyethanol  
butoxyethanol  
2-methoxyethoxyethanol  
n-C<sub>4</sub>H<sub>9</sub>OCH<sub>2</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>2</sub>OH (2(2-butoxyethoxy)ethanol)

## Aldehydes

*Aliphatic aldehydes with 4 or fewer carbon atoms:*

formaldehyde (10% or less aqueous solution)  
propanal (propionaldehyde)  
butanal (butyraldehyde)  
isobutyraldehyde

## Amides

*RCONH<sub>2</sub> and RCONHR with 4 or fewer carbon atoms and RCONR<sub>2</sub> with 10 or fewer carbon atoms:*

formamide  
N-methyl formamide  
N,N-diethyl formamide

N,N-dimethyl formamide  
N-ethyl formamide acetamide  
N-methyl acetamide  
N,N-dimethyl acetamide  
N-ethyl acetamide propionamide  
N-methyl propionamide  
N, N-dimethyl propionamide  
butyramide isobutyramide

### **Amines\***

*Aliphatic amines with 6 or fewer carbon atoms:*

methylamine  
ethylamine  
trimethylamine  
N-ethyl methylamine  
N-methyl propylamine  
dimethyl propylamine  
isopropylamine  
1-ethyl propylamine  
butylamine  
methyl butylamine  
N-ethyl butylamine  
isobutylamine  
amylamine  
hexylamine

*Aliphatic diamines with 6 or fewer carbon atoms:*

1,2-or 1,3-propanediamine (1,2-or 1,3-diaminopropane)

### **Carboxylic Acids<sup>†</sup>**

*Alkanoic acids with 5 or fewer carbon atom:*

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\* Amines with a disagreeable odor, such as dimethylamine and 1,4-butanediamine should be neutralized, and the resulting salt solutions flushed down the drain, diluted with at least 100 volumes of water. Disposal limit is 100ml of material.

<sup>†</sup> Organic acids with a disagreeable odor, such as butyric acids and valeric acids should be neutralized and the resulting salt solutions flushed down the drain, diluted with at least 100 volumes of water. Disposal limit is 100 ml. of material.

formic acid  
acetic acid  
propionic acid  
butyric acid  
isobutyric acid  
valeric acid  
isovaleric acid

*Alkanedioic acids with 5 or fewer carbon atoms:*

oxalic acid (1,2-ethanedioic acid)  
malonic acid (1,3-propanedioic acid)  
succinic acid (1,4-butanedioic acid)  
glutaric acid (1,5-pentanedioic acid)

*Hydroxyalkanoic acids with 5 or fewer carbon atoms:*

lactic acid (2-hydroxypropanoic acid)  
3-hydroxybutyric acid  
2-hydroxy isobutyric acid

*Aminoalkanoic acids with 6 or fewer carbon atoms and the ammonium, sodium and potassium salts of these acids.*

*Amino acids and the ammonium, sodium and potassium salts of these acids.*

### **Esters**

*Esters with 4 or fewer carbon atoms:*

methyl formate  
ethyl formate  
isopropyl formate  
propyl formate  
methyl acetate  
ethyl acetate  
methyl propionate  
Isopropyl acetate

### **Ketones**

*Ketones with 4 or fewer carbon atoms:*

acetone  
methyl ethyl ketone (butanone)  
methyl isopropyl ketone (3-methyl butanone)

*Sulfonic Acids and the Ammonium, Sodium, and Potassium Salts of these Acids:*

methane sulfonic acid, sodium or potassium salt  
ethane sulfonic acid, sodium or potassium salt  
1-propane sulfonic acid, sodium or potassium salt  
1-butane sulfonic acid, sodium or potassium salt  
1-pentane sulfonic acid, sodium or potassium salt  
1-hexane sulfonic acid, sodium or potassium salt  
1-heptane sulfonic acid, sodium or potassium salt  
1-octane sulfonic acid, sodium or potassium salt  
1-decane sulfonic acid, sodium or potassium salt  
1-dodecane sulfonic acid, sodium or potassium salt  
1-tetradecane sulfonic acid, sodium or potassium salt  
1-hexadecane sulfonic acid, sodium or potassium salt

## **6.0 RADIOACTIVE MATERIALS**

Radioactive materials **may not be drain disposed** with the following exceptions:

- Wash and rinse water used for cleaning contaminated glassware that has been double rinsed may be drain disposed. The first two rinses of the glassware must be collected in liquid radioactive waste containers.
- With specific written permission from the Radiation Safety Officer, in accordance with procedures stipulated by Federal, State, and Local regulations, Cornell's license to use radiation, and the University Radiation Safety Committee, certain radioactive materials may be approved for drain disposal. Call 255-8200 (Environmental Health and Safety) for specific information.

## APPENDIX A

### NEUTRALIZATION PROCEDURES

#### **General**

- Do neutralizations in a fume hood behind a safety shield, as fumes and heat may be generated. Wear lab coat or apron, gloves and goggles.
- Keep containers cool during process.
- Work slowly.
- Once neutralization is complete, flush to sewer with 20 parts water.

### **Acid Neutralization**

1- While stirring, add acids to large amounts of an ice water solution of base such as sodium carbonate, calcium hydroxide, or sodium hydroxide for concentrated acids.

2- When a pH of at least 5.5 is achieved, dispose of the solution into the sewer, followed by 20 parts water.

### **Base Neutralization**

1- Add the base to a large vessel containing water. Slowly add a 1M solution of HCl.

2- When a pH of 9 or less is achieved, dispose of solution into sewer system followed by 20 parts water.

## **APPENDIX B**

### **WASTE OIL COLLECTION AND DISPOSAL**

#### *1.0 WASTE OIL COLLECTION (INCLUDING VACUUM PUMP OILS)*

Oil should be collected locally and stored temporarily in approved and properly marked containers (30 or 55 gallons drums) provided by Environmental Health and Safety. The Containers must be stored inside the building. The containers must be clearly marked "Waste Oil Only: No Solvents."

#### *2.0 DISPOSAL OF WASTE OILS*

When the oil drums are full please contact the Cornell Purchasing Department at 255-3804 to obtain information on the disposal of oils. A contract with a recycling company has been made through Purchasing. You must supply a purchase order number or an account number to facilitate the pick up of oils in your department or facility.

#### References:

National Research Council, Prudent Practices in the Laboratory, Handling and Disposal of Chemicals, National Academy Press, 1995. American Chemical Society, Safety in Academic Chemistry Laboratories, 1995.

Safety Manuals from the Universities of Wisconsin, Cincinnati and Cornell.

Ithaca Area Sewer Ordinance

