Gardner-Webb University Waste Minimization Plan

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Introduction

Gardner-Webb University policy is to maintain an environment for its faculty, staff, students, and visitors that will not adversely affect their health and safety nor subject them to avoidable risk of injury.

Responsibilities

As a chemical user, YOU have a legal and moral responsibility to ensure the proper disposal of any hazardous waste you generate. Various state and federal regulations govern the disposal of chemical wastes. Criminal and civil penalties can result from improper disposal of these wastes. In addition to potential citations, fines, and imprisonment; improper waste disposal can also result in national media attention and damage to the University's reputation. YOU CAN BE PERSONALLY HELD LIABLE FOR "WILLFULLY AND KNOWINGLY" VIOLATING THESE REGULATIONS.

You also have a moral responsibility to properly dispose of chemicals that can pose a present or potential hazard to human health or the environment. This includes accident and injury prevention to students, coworkers, and the campus community.

Director of Environmental & Occupational Safety

The Director of Environmental & Occupational Safety is responsible for managing the waste disposal plan for Gardner-Webb University. In the event of a chemical emergency, please alert the Director immediately. Any questions about waste disposal should be directed to the Director.

Hazardous Waste Minimization

Disposal of hazardous waste is regulated by the U.S. Environmental Protection Agency (EPA) and the North Carolina Department of Natural Resources, (NCDENR) under the Resource Conservation and Recovery Act (RCRA). The Act makes it illegal to mismanage hazardous wastes. The Act's emphasis is on waste reduction and recycling.

Plan Your Experiment

Include waste minimization practices when you are planning for an experiment. Consider the chemicals you will be using and whether or not they will become hazardous waste. Only mix the amount of reagents and stock solutions that you need for the experiment and will be able to use. Do not make excess solutions for potential later use. Know in advance how you will handle any hazardous waste. Read Material Safety Data Sheets (MSDS) BEFORE working with chemicals to understand any hazards and special handling precautions. Allow for time at the end of each day to clean up, and always practice good housekeeping.

Maintain a Current Inventory

The first step to effectively minimizing the amount of hazardous waste you generate is to maintain a current inventory of all chemicals being used and stored in your lab or work area. You should check your inventory first before ordering any new chemicals. It may also be possible to borrow small amounts of chemicals from other labs. Please take the time to check with your colleagues.

Purchasing Chemicals

When ordering new chemicals, only order the amount of chemical that you need for the experiment you are conducting. Do not order a larger size container for an experiment that will only last a semester or for an experiment that may occur in the future. Although chemicals usually cost less per unit when purchased in large containers, when the actual usage, storage, and disposal are factored in, the cost savings diminish significantly and in some cases result in higher costs overall. In addition, chemicals in large containers that are not used frequently can be rendered useless over time by contamination or degradation. In general, you should only order the minimum quantity of a chemical that you need for the experiment, or one year's worth of stock at the most.

Nonhazardous Substitutes

Nonhazardous substitutes can often be used in place of hazardous chemicals. Hazardous chemicals that should be substituted with nonhazardous alternatives particularly those chemicals that are highly toxic, reactive, contain heavy metals, and are known or suspected carcinogens, mutagens, or teratogens.

Appropriate Storage Practices

Storing chemicals properly promotes safer and healthier working conditions and extends the usefulness of chemicals. Improperly stored chemicals can result in degraded containers that allow chemicals to become contaminated. Degraded containers can release hazardous vapors that are detrimental to the health of lab workers or affect the integrity of nearby containers. Also, with time chemicals can become unstable and/or potentially explosive.

Chemical Storage Classes

Chemicals should be stored according to compatibility groups, they should not be stored alphabetically (or otherwise) until they have first been segregated by hazard class. In general, chemicals should first be separated into their organic and inorganic families and then segregated according to hazard class groups. The basic hazard class groups, which are based on the Department of Transportation (DOT) hazard classes, include: Flammable liquids (Class 3); Flammable solids (Class 4.1); Spontaneously combustible (Class 4.2); Dangerous when wet (Class 4.3); Oxidizers (Class 5.1); Organic peroxides

(Class 5.2); Poisons (Class 6.1) Cyanides; Bases; Organic acids; Inorganic acids; Other.

Be sure to check Material Safety Data Sheets (MSDS) for any special storage requirements.

Disposal of Non-Hazardous Waste

Some of the chemical products used at Gardner-Webb University may be disposed of safely and legally in the normal trash and sanitary sewer. However, in general, our policy is not to dispose of questionable chemicals by either method. Although a chemical may not be regulated today, the generator of chemical wastes can still be held liable in the future if a particular chemical becomes regulated. This is referred to as "retroactive liability" under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), i.e. "Superfund". A good example of this is the disposal of PCBs before they were regulated. There are numerous sites across the country that are now Superfund sites because of past disposal practices of PCBs – even though the disposal practices were acceptable at the time. Many institutions, including universities, that followed these accepted disposal practices are now being asked to fund the cleanup of these Superfund sites.

A stigma can be attached to the disposal of chemicals in the normal trash. This is especially true when chemicals are discovered in the trash by other members of the campus community who may not have the technical knowledge needed to identify and evaluate those chemicals. This type of situation can quickly escalate into unwarranted attention from the media and regulatory agencies. Please be aware of the concerns people have with regard to their health and safety when discovering strange and unknown chemicals in the trash.

Disposal of any type of material into a storm drain is strictly prohibited by EPA Storm Water Regulations. Storm drains outflow untreated into natural waterways. Only storm water is allowed in storm drains.

In general, nonhazardous waste chemicals are those that have relatively low toxicity, contain no toxic metals, and have no positive determination of carcinogenicity, mutagenicity, or teratogenicity. Chemicals that may be disposed of in the sanitary sewer include chemicals that are NOT regulated as hazardous waste, but ARE water soluble, biodegradable, and of low toxicity. Examples include: sugars, amino acids, simple proteins, aqueous salt solutions, and neutral aqueous solutions. Solid chemicals of this type can be disposed of in the sanitary sewer if they are first dissolved in water.

All chemicals poured into the sewer must be followed by at least 20 parts of water. Please keep in mind that improper disposal of hazardous wastes can result in fires, chemical reactions, release of toxic or noxious gases and vapors, corrosion of the

plumbing system, and can result in other environmental problems at the sewage treatment plant.
NOTE: Dilution is not allowed as a treatment method for hazardous waste.

Prohibitions

Chemicals with the following characteristics may not be disposed of through the sanitary sewer or normal trash. This list serves as a guide and is not intended to be an exhaustive listing.

- any liquids or solids that can cause fires or explosions or be injurious to the treatment works or employees of the treatment works either alone or by interaction with other substances
- flammable liquids (flashpoint <140o F)
- solid or viscous substances which may cause obstruction to the flow in a sewer or interference with the operations of the treatment plant
- any wastewater having a pH less than 6.0 or higher than 10.0, or wastewater having any other corrosive property
- toxic pollutants (either singly or by interaction with other pollutants)
- any noxious or malodorous liquids, gases, or solids which either singly or by interaction with other wastes are sufficient to create a public nuisance or hazard to life or are sufficient to prevent entry into the sewers for their maintenance and repair
- any heated wastewater which exceeds 150°F or in such quantities that the temperature of wastewater at the POTW treatment plant exceeds 104° F

When in doubt, dispose of chemical wastes through the hazardous waste management program.

Empty Chemical Containers

Empty containers that held non-hazardous material may be disposed of in normal trash after the container has been thoroughly rinsed with water. Mark out the container's label with a permanent marker.

Empty container that held hazardous material must be rinsed thoroughly. The rinse solvent must be disposed of through the hazardous waste plan. The clean, empty container can be disposed of in the normal trash. Mark out the container's label with a permanent marker.

The Hazardous Waste Management Program

The variety of chemical waste can include:

- flammable, corrosive, reactive, and toxic laboratory waste
- waste solvents from vehicle maintenance, printing, and painting operations
- corrosive wastes from cleaning operations
- waste fixer and photographic chemicals from darkrooms
- paints, thinners, corrosives, and metal containing wastes from art studios
- other miscellaneous wastes from across campus

The management of hazardous waste generated on campus includes:

- information on safe chemical handling, storage, use, and disposal
- hazardous waste collection and disposal
- laboratory and work area cleanouts
- spill response

The first step in the hazardous waste management program is for you to recognize your responsibilities as a chemical user according to the hazardous waste regulations, understand the hazardous waste management system, and implement the procedures described in this guide. You are also responsible for making every technical and economically feasible effort to minimize the volume of surplus chemicals and the amount of hazardous waste that you generate.

Hazardous Waste Regulations

Hazardous waste is regulated by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA). Gardner-Webb University is regulated as a Conditionally Exempt Small Quantity Generator (CESQG) of hazardous wastes. This guide is intended to provide an overview of managing hazardous wastes on a university campus. The complete regulations and additional environmental compliance assistance information for colleges and universities can be found at the EPA www sites:

http://www.epa.gov/region02/waste
http://www.epa.gov/region02/p2/college/

Managing Hazardous Waste

As a generator of hazardous waste, specific requirements must be followed to properly handle, store, and dispose of hazardous wastes. These requirements include:

- Determining if the chemical wastes you are generating are considered hazardous
- Following Satellite Accumulation Area requirements
- Following proper hazardous waste storage and disposal procedures

Hazardous Waste Determination

The U.S EPA considers a waste to be hazardous if it: (a) is a Listed hazardous waste (see Section 6.2)
OR
(b) exhibits certain hazardous characteristics (see Section 6.3)

In addition to the two criteria above, chemical waste can be considered to be hazardous if it:
(c) has an oral Lethal Dose (LD50) for a rat of less than 500 mg/kg
OR
(d) if the original container identifies the chemical as toxic or poisonous
OR
(e) if the chemical is a known or suspected carcinogen, mutagen, or teratogen

To summarize, a chemical waste exhibiting any one of these five criteria is to be considered as hazardous waste and must be managed accordingly.

When in doubt, dispose of chemical waste through the hazardous waste management program.

Listed Hazardous Wastes (F, U, and P lists)

The EPA has several lists of chemical wastes that are regulated as hazardous wastes.

F-Listed Waste

Chemical wastes found on the F-list are hazardous wastes from nonspecific sources. Although there are 39 listings (F001– F039), the most common F-listed wastes generated on campuses are F001, F002, F003, F004, and F005. The chemicals listed are primarily both halogenated and nonhalogenated organic solvents. See Appendix B for a description of the chemicals on the F-list.

Some common examples of F-listed hazardous wastes include:

- A student working in a science laboratory uses Acetone as a final rinse for cleaning glassware, the Acetone waste that results is considered a F003 listed

hazardous waste. This Acetone rinse cannot be disposed of down the drain and must be managed as a hazardous waste.

- A maintenance worker uses a 10% solution by volume (or greater) of Methylene chloride as a degreasing agent. The waste that results is considered a F001 listed hazardous waste and must be disposed of through the hazardous waste management program.
- A student working in a Fine Arts department uses a trade name paint brush cleaner that contains 10% or more (by volume) of Toluene. The waste that results is considered a F005 listed hazardous waste and must be managed accordingly.

U and P Listed Waste

The EPA regulates certain chemical wastes as being Toxic Wastes (U-list) and Acutely Hazardous Wastes (P-list). The EPA regulates any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill involving a U or P listed chemical as hazardous waste. Any mixture of chemicals that contain ANY concentration of U or P listed chemicals is considered to be hazardous waste and must be disposed of through the hazardous waste management program. The U and P lists of chemicals can be found in Appendix C.
A number of commonly used chemicals can be found on the U and P lists. Some examples include:

Acrylamide	Mercury	Osmium tetroxide
Chloroform	Methanol	Potassium cyanide
Ethyl acetate	Phenol	Sodium azide
Formic acid	Xylene	Sodium cyanide

Please note that if you spill a chemical found on the U or P lists, the resulting cleanup debris is still considered a hazardous waste. For example, if you spill a 100ml bottle of Chloroform, the paper towels used to clean up the spill are considered as hazardous waste and must be disposed of through the hazardous waste management program. Any container that was used to contain P-list chemicals, such as beakers, flasks, must be cleaned by triple rinsing. The rinse solvent is considered to be P-list waste and counts toward the total volume of P-list waste generated by the University. This is critical because Gardner-Webb is classified as a CESQG. Acquiring more than 2.2 pounds of P-list waste in 1 calendar month will cause a change in that status. See Section 7 for details.

Polychlorinated Biphenyls (PCBs)

PCBs and PCB contaminated materials are regulated as hazardous waste. Oils in or from electrical equipment whose PCB concentration is unknown or not otherwise clearly marked as “No PCBs”, must be disposed of through the hazardous waste management program. Due to the high cost for disposal of PCB waste, it is very important to keep PCB waste clearly identified and separated from other wastes. If PCB waste is added to

a container of non-PCB waste, the resulting mixture will have to be treated as PCB waste. Make every attempt to minimize the amount of PCB waste that you generate.

Characteristic Waste

In addition to listed hazardous wastes, the EPA regulates any chemical wastes as hazardous waste if the waste exhibits any one or more of the following characteristics: Ignitability, Corrosivity, Reactivity, and Toxicity.

Ignitability

Ignitable wastes are those that are capable of causing or intensifying a fire during routine handling. Ignitable wastes carry the EPA waste code D001. A waste exhibits the characteristic of ignitability if it has ANY of the following properties:

- A liquid that has a flash point of less than 140°F or 60°C, the exception is an aqueous solution containing less than 24% alcohol by volume
- Is not a liquid and is capable under standard temperature and pressure of causing fire through friction, absorption of moisture, or spontaneous chemical changes, and when ignited burns so vigorously and persistently that it creates a hazard
- Is an ignitable compressed gas
- Is an oxidizer

Examples include most organic solvents such as:

Acetone	Ethyl ether	Paint
Benzene	Heptane	Paint thinner
Ethanol	Hexane	Toluene
Ethyl acetate	Methanol	Xylene

Corrosivity

Corrosive wastes include highly acidic or highly alkaline chemicals. Corrosive wastes carry the EPA waste code D002. A waste exhibits the characteristic of corrosivity if it has ANY of the following properties:

- Is an aqueous waste that has a pH less than or equal to 2 OR a pH greater than or equal to 12.5
- Is a liquid that corrodes steel at a rate greater than 6.35mm (0.25inches) per year

Examples of corrosive hazardous wastes include:

Hydrochloric acid (Muriatic acid)	Sodium hydroxide solution
Sulfuric acid	Sodium hydroxide pellets
Nitric acid	Ammonium hydroxide solution
Acetic acid	Potassium hydroxide flakes

Reactivity

Reactive wastes include highly reactive and/or unstable chemicals. Reactive wastes carry the EPA waste code D003. A waste exhibits the characteristic of reactivity if it has ANY of the following properties:

- It is normally unstable and readily undergoes violent change without detonating
- It reacts violently with water
- It forms potentially explosive mixtures with water
- When mixed with water it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment
- It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment
- Is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure
- It is a forbidden explosive or a Class A or Class B explosive

Examples of reactive hazardous wastes include:

Ammonium sulfide	Picric acid (dry)
Benzoyl peroxide (dry)	Sodium cyanide
tert-Butyllithium in solvent	Sodium metal

Toxicity

Toxicity is determined by a laboratory test which measures the concentration of the toxic material which would most likely leach into the ground water if that waste is improperly managed. The test is known as the "Toxicity Characteristic Leachate Procedure," or TCLP. Any chemical waste that has concentrations greater than or equal to the regulatory limits listed in Appendix D must be disposed of through the hazardous waste management program.

NOTE: Dilution is not allowed as a treatment method for hazardous waste.
Examples of toxic contaminants include:

Barium	Lead
Benzene	Mercury
Chloroform	Pyridine
Chromium	Silver

The Mixture Rule

According to EPA regulations, the Mixture Rule defines whether a mixture of nonhazardous and hazardous waste results in a hazardous waste. The Mixture Rule states:

- If ANY amount of a nonhazardous waste is mixed with ANY amount of a listed hazardous waste (see Section 6.2), then the resulting mixture is considered to be a hazardous waste.
- If ANY amount of a nonhazardous waste is mixed with ANY amount of characteristically hazardous waste (see Section 6.3), then the resulting mixture is not considered to be hazardous if the resulting mixture no longer exhibits one of the hazardous characteristics.

Conditionally Exempt Small Quantity Generator (CESQG)

Gardner-Webb University is a conditionally exempt small quantity generator. The requirements for a CESQG are:

- Generate no more than 220 pounds, 100 kg, of hazardous waste per calendar month.
- Generator no more than 2.2 pounds, 1.0 kg, of acute hazardous waste (P-list) per calendar month.
- Store no more than 2200 pounds, 1000 kg, of hazardous waste at any time.
- Store no more than 2.2 pounds, 1.0 kg, of acute hazardous waste (P-list) at any time.

Hazardous waste must be stored at or near the point of generation and under the control of the generator. If the quantities exceed 2200 pounds of hazardous waste for the entire University, the University will be subject to a change in status to a small quantity generator. If the quantity of acute hazardous waste at the University exceeds the 2.2 pound limit, the University will be subject to a change in status to a large quantity generator. Large quantity generators must comply with many more regulations than CESQG or small quantity generators. Some of the additional requirements are: waste can only be stored for 90 days before disposal; contingency, waste minimization, and preparedness and prevention plans must be in place; biennial reporting to the EPA is required; and the University would need to employ an emergency coordinator. Therefore, care must be taken with hazardous waste generation, specifically acute hazardous waste, to ensure the University does not exceed the CESQG limits.

Waste Streams

Routine laboratory experiments result in well defined waste streams. Waste generated in student labs must be characterized and a waste stream identified. The waste streams currently in use in the Department of Natural Sciences are described in the Appendix.

Waste Storage

Hazardous waste must be labeled with the words “hazardous waste.” Each container must be identified in a way that the content can easily be identified and labeled with the date it was first used.
Emergency contact information must be posted in an easily accessible location.
All containers must be kept closed except when adding waste to the containers.
Log in all additions to the waste containers. Only professors and trained staff are authorized to make additions to waste containers.
When full, mark the container with the date if the last addition. Be sure the label the container in such a way that no one will mistake a full container for one that is still in service.

Provide secondary containment whenever possible.

Management Procedures for Specific Waste Types

The following procedures and requirements are for the management of specific types of hazardous waste. Please adhere to these guidelines.

Concentrated Solutions of Acids and Bases

Concentrated solutions of mineral acids and bases can be disposed of through the hazardous waste management program OR as a means of waste minimization, can be neutralized first and then disposed of down the drain. Please note that concentrated solutions of acids and bases that contain other chemicals such as heavy metals cannot be disposed of down the drain.
THESE PROCEDURES SHOULD ONLY BE PERFORMED BY PROFESSORS OR OTHER TRAINED PERSONNEL.

Do not attempt to neutralize strong oxidizing acids such as Perchloric acid and Chromic acid

Neutralization Procedures

Only perform these procedures in a well ventilated area. Always wear safety glasses and gloves for protection. CAUTION: Vapors and heat are generated during neutralization. Keep containers cool while neutralizing and perform all steps slowly. Solutions should be neutralized to a pH range of 6 to 10, and then flushed down the drain with at least 20 parts of water.

Acid Neutralization

Highly concentrated acids should first be diluted with cold water (always add the acid to the water) to a concentration below 10%. While stirring, add the dilute acid solution to large amounts of water solution of base such as sodium carbonate/bicarbonate, calcium hydroxide, or sodium hydroxide for concentrated acids. When a pH between 6 and 10 has been achieved, the solution can be flushed down the drain followed by 20 parts water. Solution pH can be checked using pH paper.

Base Neutralization

Highly concentrated bases should first be diluted with cold water (always add the base to the water) to a concentration below 10%. Add the dilute solution to a large container of ice water. While stirring, slowly add a dilute solution of Hydrochloric acid. When a pH between 6 and 10 has been achieved, the solution can be flushed down the drain followed by 20 parts water.

Chromic acid

Chromic acid is a powerful oxidizing agent that is both toxic and corrosive and can explode on contact with organic materials. Chromium (VI) is also classified as a carcinogen. Accidents involving Chromic acid cleaning solutions can result in burns to both skin and clothing. Chromic acid cleaning solutions leave a residue of Chromium (VI) on the glass surface, which is difficult to remove. This residue has been known to interfere with certain research procedures since the material can leach into solution. Alternatives such as “No Chromix”, “Alconox”, or similar type products are strongly recommended.

Organic Solvents

Organic solvents should be collected in specially labeled containers. Do not dispose of organic solvents down the drain. Keep nonhalogenated waste solvents separated from halogenated waste solvents to the fullest extent possible.

Aqueous Solutions of Toxic Chemicals

Aqueous solutions containing heavy metals and chemicals found in Appendix C and Appendix D must be disposed of through the hazardous waste management program. Do not dispose of this type of waste down the drain.

Oil

Uncontaminated oil is not considered hazardous waste and can be collected and recycled. Do not mix other chemical wastes with used oil. If a hazardous waste, such as flammable solvents or heavy metals, is added to used oil, then the resulting mixture cannot be recycled and must be handled as hazardous waste. Be sure to note any contaminants when disposing of contaminated used oil. If you remove oil from a piece of electrical equipment, verify whether or not the oil contains PCBs.

Asbestos

Asbestos is a fibrous material that was once widely used in a number of products that can still be found in laboratories and throughout other buildings. Products that can contain asbestos include: electrical equipment insulation (ovens, heating mantles, heating pads, and wires), older vinyl floor tiles and mastic, pipe fittings, pipe insulation, caulking compounds, fireproofing, and transite (cement-like) panels such as those found in and under fume hoods.

Asbestos is a known human carcinogen and must be disposed of properly. The hazard of asbestos is greatest when the asbestos product becomes “friable” – able to be pulverized from finger pressure – and when the asbestos becomes airborne. For older vinyl asbestos tile (VAT), an additional slipping hazard occurs when these tiles “pop” out of the floor.

Mercury

All waste mercury must be managed and disposed as a hazardous waste through the hazardous waste management program. It should be packaged in a tightly sealed and leak-free container such as a bottle or vial with a screw top lid. Place broken mercury thermometers in a leak proof container or a secured plastic bag. When collecting metallic mercury, DO NOT mix with other chemicals or waste if at all possible. Elemental mercury can be recycled through the waste management plan.

Do not use the past practice of adding sulfur, nitric acid, or water in an attempt to contain vapors. This only results in more hazardous waste being generated. However, the use of commercial 'Hg Absorb' powder found in mercury spill kits is acceptable. Mercury is a highly toxic chemical and ALL mercury spills, including broken thermometers, must be cleaned up and the spill debris must be disposed of through the hazardous waste management program.

Aerosol Cans and Cylinders

Aerosol cans and small propane cylinders can contain flammable, corrosive, and toxic chemicals and propellants. These items will be emptied of their contents, depressurized, and then recycled for scrap metal. Contact the Director of Environmental and Occupational Safety (DEOS) for to have aerosol cans and small cylinders collected.

Paint, Paint Thinner, Adhesives, and Printshop Chemicals

Paint (oil-based), paint thinner, adhesives, and many printshop chemicals are flammable and are regulated as hazardous waste. These items cannot be poured down the drain or left out to evaporate. They must be disposed of through the hazardous waste management program. Latex paint that has solidified completely can be placed in the normal trash.

Photographic Chemicals

Photographic chemicals can contain heavy metals such as Silver, Chromium, and Selenium that may be above regulatory levels and must be handled as hazardous waste. All photographic chemicals must be disposed of through the hazardous waste management plan; contact the DEOS.

Reactive and Potentially Explosive Chemicals

Reactive chemicals such as strong oxidizers and reducers, and air/water reactive chemicals must be disposed of through the hazardous waste management program. Because of their reactive nature, it is important to minimize the quantity of reactive chemicals in storage. If the integrity of the container appears to be compromised, then

dispose of the chemicals promptly. Never dispose of reactive chemicals, such as sodium metal, regardless of the quantity, down the drain or in the normal trash. Such practices can result in fires, toxic vapors and gases being released, and injury to people. When disposing of these compounds, please note any special hazards when tagging the container.

Some of these compounds can also become unstable and potentially explosive over time due to contamination with air, water, other material, or when the chemical dries out. If you come across any chemical that you suspect could be potentially explosive, do not attempt to move the container as some of these compounds are shock, heat, and friction sensitive. Be sure to let others in the lab or work area know the chemical exists and the potential explosion hazard. Inform the DEOS immediately.

Examples of potentially explosive chemicals include:

- Benzoyl peroxide (dry)
- Diazo compounds
- 2,4-Dinitrophenyl hydrazine (dry)
- Nitrocellulose Trinitro- compounds
- Peroxide forming compounds
- Picric acid (dry)
- Sodium amide

Peroxide Forming Chemicals

The general policy is to avoid purchase or synthesis of peroxides. The exception is 3% USP type hydrogen peroxide used for first aid. However, many commonly used chemicals, organic solvents in particular, can form shock, heat, and friction sensitive peroxides upon exposure to oxygen through concentration, evaporation, and distillation. Guidelines can be found in Appendix D.

Unknowns

Make every effort to provide an accurate description of all chemicals that you dispose of through the hazardous waste management program. Without an accurate description, the chemical cannot be handled or disposed of safely. Waste disposal companies do not accept unknown chemical waste without an analysis, which can be very expensive. Many unknown chemicals are generated due to a lack of good housekeeping and good laboratory safety practices. ALL containers used to store chemicals must be labeled. Containers in which the labels are degrading or falling off should be given a new label. Every effort should be made to prevent the occurrence of unknown chemicals and to properly identify any unknowns that are discovered.

Household Hazardous Waste

Universal Waste

Under the Universal Waste Rule, published as a revision to RCRA, universities can recycle batteries, certain pesticides, mercury-containing thermostats, and certain types of lamps.

Gardner-Webb University recycles all of its universal wastes. The containers used to store the waste must be maintained in good condition. The containers must be labeled as "Universal Waste" and with the date that the wastes were first put in the container. Containers must be kept closed except when filling. Universal wastes cannot be kept for more than 1 year, and treatment is not allowed. Treatment means crushing or other manipulation.

Fluorescent Tubes

Fluorescent tubes and other mercury bearing lamps such as high pressure sodium lamps, mercury vapor, and metal halide lamps must be disposed as Universal Wastes. These items cannot be placed in the normal trash. However, fluorescent tubes with green end caps can be placed in the normal trash. Broken fluorescent tubes must be handled as hazardous waste. If a bulb breaks, ventilate the area immediately. Every attempt should be made to keep these items intact and to prevent breakage.

Batteries

Batteries that meet the definition of Universal Waste include nickel-cadmium batteries and lead-acid batteries. Alkaline batteries do need to be disposed of through the Hazardous waste management plan.

Computer Equipment

Old computer equipment cannot be disposed of in the normal trash. If you are planning to dispose of computer equipment, contact Information Technology for assistance.

Hazardous Waste Disposal Procedures

Generators of hazardous waste must characterize their waste streams. The DEOS or Chemistry Department are available to assist. Generators are responsible for ensuring that their waste streams and volumes meet the CESQG requirements. The waste will be picked up at your lab or work area on a scheduled pickup day. In general, the hazardous waste disposal vender comes once near the end of each semester. Generators must be present for pickup. All waste must be labeled in accordance with this plan.

When emailing a request for disposal, please include the following information:

Contact name
Contact phone number
Building and room number
Type and amount of waste, this list must be as specific as possible
Location of the waste

WHAT HAPPENS TO THE HAZARDOUS WASTE GENERATED ON CAMPUS

After a chemical waste has been generated, determined to be hazardous, and sent through the hazardous waste management program, the waste is managed by a qualified hazardous waste vendor. Most chemicals are Lab Packed into drums. Lab packing first involves segregating chemicals according to hazard class. Chemicals in the same hazard class are placed into various size drums (55-gallon is the most common), then a packing material, such as vermiculite, is added to prevent the containers from breaking during transportation.

Chemicals such as oil, mercury, and silver from photographic fixer may be sent for recycling/reclamation. Please note that the addition of chemicals or other solid waste to these items can result in the material being unable to be reclaimed and having to be disposed as hazardous waste instead.

MATERIAL SAFETY DATA SHEETS

As part of the OSHA Hazard Communication Standard, employers are required to have Material Safety Data Sheets (MSDS) available to any employee working with hazardous chemicals. Students must also have access to MSDS. All persons have a need and a right to know what hazards and the identities of the chemicals they are exposed to when working. MSDS also state the type of protective equipment needed.
Information that can be found in a MSDS includes:

the identity of the chemical substance

physical and chemical characteristics
- physical and health hazards
- primary routes of entry
- OSHA Permissible Exposure Limits (PELs)
- carcinogenic status
- precautions for safe handling and use (including personal protective equipment)
- spill response
- emergency and first aid procedures
- date of the MSDS

Maintain a file of MSDS sheets for all of the chemicals used in your lab/work area. A central campus file is maintained by the DEOS. Any chemical shipment received should be accompanied by an MSDS. The purchaser is responsible for making sure that an MSDS in on file for any chemical. In most cases, MSDS will accompany chemical shipments. MSDSs can also be found on the internet.

1) Interactive Learning Paradigms, Inc. http://www.ilpi.com/msds/index.html
This site has 85 links to search for MSDSs and other related information including:
2) http://www.MSDSprovider.net/Site/msdsprovider.nsf.about

CHEMICAL SPILLS

Many chemical spills can be avoided by good housekeeping and best management practices. Plan out your experiments or work ahead of time and think about where your apparatus/equipment will be located in relation to where you will be using chemicals. If at all possible, work with chemicals over some form of secondary containment (ie. plastic trays or buckets) and store chemicals in secondary containment. Always read the MSDS BEFORE working with a chemical so you are familiar with the chemical hazards, any precautions to take, and what you will need in the event of a spill.

When a spill does occur, take prompt and appropriate action. The type of response to a spill will depend on the quantity of the chemical spilled and the severity of the hazards associated with the chemical. The first action to take is to alert others in your lab or work area that a spill has occurred. Then you must determine if you can safely clean up the spill yourself. Only attempt to clean up minor spills.

Minor Spills

A minor spill consists of a small quantity of chemical involved – a rule of thumb is less than 1 liter, The quantity may be less if the chemical is particularly hazardous a known chemical of limited danger, such as methylene chloride.

Minor Spill Cleanup Procedures

Notify other people in the area that a spill has occurred. Prevent others from coming in contact with the spill—for example, to prevent people from walking through the spilled

chemical. Wear the personal protective equipment (PPE) such as safety glasses and gloves before beginning cleanup.

Try to prevent spilled chemicals from entering waterways by building a dike around access points (sink, cup sinks, and floor drains inside and storm drains outside) with absorbent material if you can safely do so. Some areas, such as laboratories, have spill clean-up kits available. Be sure to use the appropriate absorbent material for liquid spills. Use an acid kit for acid, a base kit for bases, and absorbent pads or vermiculite for other materials.

Slowly add the absorbent material on and around the spill and allow the chemical to absorb. Sweep up the absorbed spill from the outside towards the middle. Scoop up and deposit in a leak-proof container. A plastic bucket or trash can be used. Label the container and dispose of through the hazardous waste management program. Wash the contaminated surface with soapy water.

All spills require that an incident form be filled out. Be sure to complete spill clean up before filling out the form. The forms can be found in Appendix.

Major Spills

A major spill consists of a large quantity of chemical or a mixture of chemicals. In general, a large quantity is more than a gallon liquid or 5 pounds dry material if that material is highly toxic, corrosive, and/or flammable.
A spill is considered major if gases or vapors are present, and if the spill is not confined to the immediate area.

The Department of Natural Sciences has a more restrictive definition of a major spill. Refer to the SOP.

Major Spill Cleanup Procedures

Evacuate the room, floor, or building as necessary. In the event of a major situation, do not hesitate to pull the fire alarm to evacuate the building. Report the major spill by contacting University Police at x4444. Limit access to the area. Stand by until help arrives while keeping yourself away from danger. This could mean standing outside of the room or in the case of a building evacuation, standing by an outside door waiting for the University Police to arrive.
When you report a spill, the University Police will ask for the following information:

- Location of the spill, building and room number
- Materials involved
- Amount of material spilled
- Number of injuries,
- Immediate actions already taken
- How the spilled occurred

Appendix D

Guidelines for Peroxides and Peroxide Forming Substances

Due to the serious fire and explosion hazards these chemicals can present, the following guidelines must be followed when using peroxide forming chemicals.

1) See Appendix for a listing of common peroxide forming chemicals. Please note this list is not all-inclusive, there are numerous other chemicals that can form peroxides. Check Material Safety Data Sheets (MSDS).
2) All peroxide forming chemicals MUST be dated when received and dated when opened. Chemicals designated as Class III compounds (in Appendix E) should be disposed of within 3 months of opening and Class I and Class II compounds should be disposed of within 12 months of opening.
3) All peroxidizable compounds should be stored away from heat and light. Sunlight is an especially good promoter of peroxidation.
4) Refrigeration does not prevent peroxide formation.
5) As is the case with all hazardous chemicals, and in particular with peroxide forming chemicals, only order the amount of chemical that you need. Do not order excess chemicals that will not be used right away.
6) Be sure to tightly close containers after use. Loose or leaky closures may allow for evaporation of the chemical which can result in peroxide formation.
7) There are a number of inhibitors that can be used to help prevent peroxide formation. Examples include Hydroquinone, Alkyl phenols, and Aromatic amines. Check with the chemical manufacturer to determine which inhibitor is the best to use.
8) Never distill peroxide forming solvents unless they are known to be free of peroxides. Peroxides concentrated in still residue can be a serious explosion hazard.
10) Compounds that are suspected of having very high peroxide levels because of age, unusual viscosity, discoloration, or crystal formation should be considered extremely dangerous. If you discover a container that meets this description, DO NOT attempt to open or move the container. Make other people working in your area aware of the potential explosion hazard and contact the University Police immediately.