Agency of Natural Resources

Laboratory Chemical Hygiene Plan and Safety Manual

January 1999

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I. OPENING STATEMENT

It is the policy of the Agency of Natural Resources (ANR) to prevent and control anything that may caus personal injury or property damage. The ANR equates chemical hygiene and safety in importance with quality and productivity. It is the responsibility of the Department to provide a safe as possible working environment, an explanation of the relative hazards of all materials an employee might come in contact w the information on how to safely handle these materials, hazardous or non-hazardous. It is the responsib the employee to know the nature and safe handling of the materials he or she works with, to follow safet and to use common sense while working.

II. PURPOSE

The purpose of this Chemical Hygiene Plan and Safety Manual is to acquaint Laboratory employees an with the building's physical plant, the materials used in the facility, the safe handling of these materials rules employees must follow to work safely. The Manual also contains information on medical monito available to employees of the Analytical Chemisty Unit of six months or more, training in first aid, em cardio-pulmonary resuscitation and the use of fire extinguishers, spill cleanup kits and personal protect devices. It is hoped that the reading of this Chemical Hygiene Plan and Safety Manual will convince A employees located at the laboratory and users of the importance of working safely.

III. LAB SAFETY COMMITTEE

The Laboratory Consolidation Committee's Safety Sub-Committee consists of safety officers from ea laboratory. The Committee meets periodically to conduct internal safety audits, discuss safety proble improvements to the physical plants. The Building's Safety Committee consists of Chemical Hygien Officers from both wings of the building, plus the Supervisors of the Agriculture and Environmental Laboratory Departments. Representatives from other laboratories within the building are invited to a twice-yearly meetings, spring and fall. An employee with a safety complaint or idea to improve the s his or her working environment should submit the complaint or idea to one of the Chemical Hygiene

IV. FLOOR PLAN

The following pages detail both floors of the ANR wing. Note locations of exits and other doors, wind stairs, elevator, closets, restrooms, fire extinguishers, spill cleanup kits, eye wash and shower stations, blankets, hoods, sinks, compressed gas cylinders, still, ovens, muffle furnace, refrigerators, freezers, au incubators, free standing storage cabinets and their contents, chemical and glassware storage areas, lab assorted large pieces of analytical equipment, offices, telephones, emergency telephone numbers and c and data management equipment. Evacuation routes for each floor are indicated by a solid black line. Evacuation routes are also posted on or near the door of each room in the ANR wing.

V. EMERGENCY EVACUATION PLAN

If an incident (fire, chemical spill, bomb threat, chemical release, etc.) occurs which clearly requires evacuation:

1. Pull the fire alarm.
2. Confine the emergency (close doors and fire doors between laboratories).
3. Evacuate the building.
4. Assist injured personnel during evacuation.
5. Notify the appropriate response team (Fire, Police, Ambulance). A phone line is available for this purpose at the front desk of Public Safety next door. Also notify the Deputy Director of the Air Pollution Control Division and the Director of Plant Industry, laboratories and standards.

All incidents, accidents, fires, or spills, no matter how small, must be reported immediately to John Jaworski, Gerald DiVincenzo or a chemical hygiene officer (CHO). If it is not immediately obvious whether or not to evacuate the building, the supervisor or chemical hygiene officer will evaluate the situation and decide whether to evacuate. Evacuation may involve a room, floor, or the entire building. If neither the supervisor nor the CHO is available, or time does not permit locating the supervisor, then it becomes your responsibility to assess the situation and determine whether evacuation is necessary. **The person initiating the evacuation order is responsible for informing laboratory personnel of the need to evacuate.** Evacuation routes are posted throughout the building. All employees should know their evacuation routes **before** an emergency arises.

It is essential that all employees notify their supervisor of their whereabouts on any given day, so as to facilitate the accounting for of employees in the event of evacuation. If a supervisor is absent at the time of an accident his or her designee will perform the emergency duties. After all employees have left the building, laboratory personnel will meet at the sign in front of the Vermont State Hospital, where supervisors will take a head count to ensure that everyone has escaped. Evacuation drills should be conducted every six months.

Points to remember during an evacuation:

1. Move quickly
2. Use **stairs**, not elevators.
3. Keep calm.
4. Never go back into the building after leaving.
5. Always evacuate the building when the fire alarm sounds, unless you have been specifically notified that it is only a test.

First Aid:

When an accident occurs, professional help should be summoned immediately from the local fire department, rescue squad or hospital. Unless absolutely necessary to prevent further injury, an accident victim should not be moved by untrained personnel. Keep the victim on his/her back, quite, comfortable, and warm until professional help arrives.

First aid procedures should only be administered by those who are adequately qualified by professional training. There are a few general actions that can and must be taken until trained help arrives:

1. **Asphyxia or Stoppage of Breathing** -- Remove objects such as false teeth, gum or food from the victim's mouth. Start artificial respiration or cardiopulmonary resuscitation (CPR) at once and continue until the victim breathes on his/her own or until professional help arrives. All laboratory personnel should recognize when a fellow employee is choking and know what to do when it occurs.

2. **Severe Bleeding** — Lay the victim down and keep a bleeding limb elevated. Press firmly and directly on the wound with a clean cloth. Keep pressure on until the bleeding stops or professional help arrives. Do not apply tourniquets.

3. **Eye Injuries** — Acid, alkali, or petroleum products should be flushed from the eye with copious amounts of water for at least 15 minutes using an eyewash station. Foreign objects embedded in the eye should not be removed. The eye should be covered loosely and professional help sought.

4. **Burns** — For chemical burns, flush the area immediately with cool water. Remove or cut away clothing. For thermal burns, immerse the affected area in ice water. Get professional help. If clothing adheres to the skin in a burned area, do not remove it. Do not put any creams etc. on the burns.

5. **Swallowed Poisons** — Determine what has been ingested. Seek professional assistance of the local poison control center by using the telephone. The Vermont Poison Control Center is located in Burlington, Vermont. The phone number is 658-3456. The 24-hour poison control center emergency number in Atlanta, Georgia is (404) 588-4400.

Fire Emergencies:

When there is any doubt that a fire can be brought under control locally with available personnel and equipment, follow evacuation procedures.

Fire extinguishers should be used to extinguish small fires when the individual feels confident in doing so. In case of burning clothing, use drench hoses or roll the individual on the floor to smother the flames. Fire blankets are available at several locations in the building. All employees must be familiar with the location and proper use of fire blankets.

Small fires can be extinguished by the use of the proper extinguisher. Discharge the extinguisher continuously in a sweeping motion until the fire is out. The discharge of the extinguisher should be directed at the base of the flame. An ABC fire extinguisher is suitable for any fire encountered at the laboratory. Whenever a fire extinguisher has been used, report its use to the Safety Officer or Laboratory Supervisor so that he or she can see that it is recharged. **It is to be stressed that in most cases evacuation is of primary importance.**

Chemical Spill Emergencies:

In the event of a major spill or vapor release of hazardous chemicals, follow evacuation procedures. If you are not sure if the spill or release warrants evacuation, report it immediately to your supervisor. The supervisor will evaluate the situation and decide whether or not to initiate evacuation procedures. If the spill or release is small or localized the following actions should be taken:

1. Notify laboratory personnel in the immediate area of the accident, and, if necessary, evacuate the area.

2. Tend to injured or contaminated personnel and, if necessary, call for medical assistance.

3. Exercise extreme caution in the vicinity of the spill. Do not expose yourself to risk of contact or inhalation of hazardous materials. Be especially alert for a potential fire hazard resulting from the spill or release.

4. Take steps to confine and limit the spill if this can be done without risk of injury or contamination.

5. Spill clean-up kits are available in several locations in the building. Clean up the spill using appropriate procedures. Dispose of contaminated materials properly. (Prudent Practices in the Laboratory, 1995).

VI. EMERGENCY RESPONSE TELEPHONE NUMBERS

A) Waterbury
Fire 244-8611
Police 244-7339
Ambulance **244-5511**

B) Vermont State Police
Waterbury 244-8721

C) Hospital Emergency Center
Central Vermont Medical Center 371-4263
(Barre/Berlin)

D) Waste Management Program/Agency of Natural Resources
Days 241-3888
Nights/Weekends/24 hr. . . . . (800) 641-5005

E) Poison Information Center 658-3456
(Burlington)
24 Hr. Poison Control Ctr. in . . . . . (404) 588-4400
Atlanta, Georgia - Emergency #

F) Dr. Gerald DiVincenzo, Supervisor of Laboratory Services
Environmental Conservation Laboratory
Work 244-4522
Home 862-1404

G) Douglas Burnham, Supervisor of Biomonitoring & Aquatic
Studies Unit, Environmental Conservation Laboratory
Work 241-3784
Home 229-9578

H) Occupational Health Division
Work 865-7730

I) Harold Garabedian, Deputy Director, Air Pollution Control Division
Work 241-3849

J) Dick Valentinetti, Director, Air Pollution Control Division
Work 241-3860

K) Buildings Department
Trouble Desk 241-3192

L) Environmental Protection Agency, Lexington, Mass.
(24 hours) . . . . . (617) 223-7265
. . . . . (617) 860-4360

M) U.S. Coast Guard
Light Attendants Station/Champlain
Valley 864-6791
National Response Center . . . . . (800) 424-8802

N) Trish Hansen, Forest Protection Entomologist, Dept. Of Forests, Parks & Rec.
Work 241-3606

O) Tom Jones, Fish Health Biologist, Dept. Of Fish & Wildlife
Work 241-3708

P) Barbara Johnson, Fish Health Biologist, Dept. Of Fish & Wildlife
Work 241-3726

Q) Tim Hogeboom, Chemical Hygiene Officer, Laboratory Services
Work 244-4522

R) Linsey Waterhouse, Loss Prevention Coordinator
Work 828-4616

S) John Jaworski, Supervisor, Agriculture Laboratory
Work 244-4510

T) Kristen Needham, Chemical Hygiene Officer, Agriculture Laboratory
Work 244-4510

VII. BASIC RULES

Basic rules apply in all rooms designated as laboratories. A laboratory is defined as room in which one toxic or hazardous chemicals are stored and/or handled.

1. Unit Supervisors or their designated representatives will maintain a record of which building employ present on any given day. Employees should cooperate with their respective supervisors by calling p if sick and by submitting agendas when leaving the facility. This record becomes very important sh building evacuation be necessary.

2. Each new ANR employee assigned to the building must receive and read a copy of the Chemical Hy Plan and Safety Manual and take a safety orientation tour of the building.

3. All facility employees and users must wear prescription or non-prescription safety glasses while in laboratory designated areas.

4. All facility employees and users will be provided lab coats and asked to wear them while in laborato designated areas.

5. All facility employees and users must wear protective gloves while handling hazardous materials. G selection must be appropriate for the material being handled.

6. All facility employees and users must inform their respective unit supervisors or the supervisor's des representative when working in the laboratory other than during normal working hours.

7. All facility employees and users must know the substances they are working with, the potential haza the substances and how to react in the case of an accident.

8. All facility employees must periodically practice the emergency evacuation plan with Agriculture Laboratory personnel.

9. When hazardous liquids, such as acids or organic liquids, are moved from room to room, they must transported in plastic safety containers. When traveling between floors with hazardous liquids, emp must use the elevator rather than the stairs.

10. All facility employees and users, while working in a laboratory designated area, shall wear enclosed i.e. no sandals. This rule includes field personnel using a laboratory designated area for sample prep

11. Smoking is forbidden in the building. Smoking on the loading docks is permitted only when storage doors are closed tight. Cigarette butts must be properly disposed of.

12. Eating and drinking are forbidden in laboratory designated areas.

13. Seasonal employees and volunteers must not work in a laboratory designated area without a perman full-time laboratory employee present in the building.

14. All chemical containers must be adequately labeled to indicate their contents. A commercial chemic container label must include the date of receipt, opening and the initials of the person who opened it

15. All materials, hazardous and non-hazardous, must be stored and handled according to the specific ru applicable to those materials.

16. A chemical inventory must be kept current.

17. Safety equipment maintenance must be performed according to manufacturer's instructions.

18. Mouth pipetting is forbidden in the laboratory.

19. Accidents, regardless of severity, must be reported to one's supervisor immediately.

20. Near-misses, complaints, or suggestions relating to chemical hygiene and safety should be reported Chemical Hygiene Officer.

VIII. MEDICAL MONITORING

The State has identified permanent staff positions whose occupants regularly assigned duties and responsibilities may place them in direct contact with toxic chemicals or other environmental condition may be harmful to their health, welfare and safety. The Department of Environmental Conservation is implementing a medical screening/monitoring program for these employees who are subject to occupa health work hazards. The intent of the program is: (1) to provide early detection of any occupational h abnormality; and (2) to provide the Department's management with the medical consultation it needs to an employee with a known or suspected occupational health abnormality from further injury.

The Contractor shall provide medical examinations, reports, and record-keeping facilities in accordanc established professional standards and as described in the attached "Medical Monitoring Program Desc and Policy Statement".

The State will submit a monthly list of employees needing to be scheduled for examination. Each emp will be required to have completed work/medical history forms prior to his appointment as requested b Contractor. The Contractor shall contact and schedule the employees during ordinary working hours.

IX. TRAINING

New employees must receive and read this Chemical Hygiene Plan and Safety Manual before actually in the facility. The Chemical Hygiene Officer or a unit supervisor will take new employees on a safety orientation tour of the building, pointing out the location of evacuation routes, building exits, fire alarm stations, emergency phone numbers, and first aid kits. The tour will also cover the location and use of extinguishers, fire blankets, emergency breathing systems, safety showers, full flush and eyewash stati safety glasses, safety gloves, spill kits, bottle carriers, lab coats, repipetors, and material safety data she Courses in first aid and emergency cardio-pulmonary resuscitation will be offered periodically. These are not required, but theAgency strongly urges all employees to attend.

X. HOW TO SAFELY HANDLE LABORATORY MATERIALS

Many of the chemicals used in the laboratory possess properties which can be hazardous to the health an of employees. The hazards vary greatly in type and severity. Some substances are flammable or explos are toxic; some are highly reactive, and others exhibit a combination of these characteristics. Section Th this Manual is a list of all the chemicals used in the laboratory with hazard ratings for each chemical in f health, flammability, reactivity and contact. An "0" rating indicates that no scientific data in the standard references suggests that this substance is hazardous. A "3" rating indicates extreme hazard. All employ familiarize themselves with the properties of the chemicals they handle before starting any test. Regardl danger any given chemical presents, one should always avoid touching, breathing dust or vapors, and ing any chemical in the laboratory. When handling a sample of unknown composition, assume it is extreme hazardous. Never insert a scoop, spatula or pipet into a chemical container. Pour the approximate amou needed into another container and transfer the chemical from this container to a weighing pan or flask. D return the extra chemical to its original container, but dispose of it properly. The following sections con information on the storage, handling, spill cleanup and proper disposal of seven chemical categories:

A. Non-Hazardous Chemicals
B. Microbiology Materials
C. Compressed Gases
D. Flammable Liquids
E. Corrosive Materials
F. Toxic Inorganics
G. Toxic Organics

A. NON-HAZARDOUS CHEMICALS

There are few chemicals used in the laboratory with an "0" rating in all four hazard areas. Chemicals wi or less rating in each hazard area should be stored in Chemistry Storage Room (Rm. #253). The handlin recommendations stated above for all chemicals apply to non-hazardous chemicals. When a water solub chemical in this category is spilled on the floor or a lab bench, it should be swept up and flushed down a drain with plenty of running water. Water insoluble chemicals and empty chemical containers should be deposited in a trash barrel.

B. MICROBIOLOGICAL MATERIALS

Microbiology media are mostly non-hazardous chemicals and are stored at room temperature in the micr lab (Rm. #254). Handle these media as one handles other non-hazardous chemicals. Microbiology wast includes media plates, applicator sticks, and culture and test tubes which have been used to grow microo Store all waste but the culture and test tubes in an autoclavable bag in the microbiology waste container. culture and test tubes in racks in the microbiology room. All these items must be autoclaved for 30 min before disposal in a trash barrel. After autoclaving, media in reusable equipment such as glass petri dish test tubes should be flushed down a sink and the glassware rinsed and washed. Sweep up spilled media deposit it in a trash barrel. Spilled waste which has not been autoclaved must be wiped up with paper to which are then autoclaved. Wash the spill area with disinfectant.

C. COMPRESSED GASES

The storage areas for compressed gas cylinders is in the Gas Tank Storage Room (Rm. #158). Store em cylinders not being used in this room. The compressed gases used in this laboratory include acetylene, a argon/methane, carbon dioxide, helium, hydrogen, nitrogen, nitrous oxide, and propane. Adequate venti essential when using any compressed gas, as many can cause rapid asphyxiation. Acetylene, argon/meth propane are flammable and must be used in a spark-free environment. The following rules apply for the of compressed gases:

1. Always use the minimum size compressed gas cylinder required to perform a test.

2. Cylinders of compressed gases should be handled as high energy sources and therefore as potentia explosives.

3. Do not expose cylinders to temperatures higher than 50°C. Some rupture devices on cylinders wi release at 65°C. Some small cylinders are not fitted with rupture devices and may explode if expo high temperatures.

4. Position cylinders such that identification and warning labels are visible. Never use a cylinder tha be positively identified.

5. Cylinders of toxic, flammable, or reactive gases should be stored and used in fume hoods only.

6. Cylinders of all sizes must be restrained by straps, chains or a suitable stand to prevent them from

7. When moving large cylinders, they must be strapped to a properly designed wheeled cart to insure stability.

8. Rapid release of a compressed gas will cause an unsecured hose to whip dangerously and also may up a static charge which could ignite a combustible gas.

9. Do not extinguish a flame involving a highly combustible gas until the source of the gas has been otherwise, it can re-ignite causing an explosion.

10. When not in use, cylinder and bench valves should be closed tightly.

11. Promptly remove the regulators from empty cylinders and replace the protective caps at once.

12. Never bleed a cylinder completely empty. Leave a slight pressure to keep contaminants out.

13. Use the appropriate regulator on each gas cylinder. Adapters or homemade modifications can be dangerous. Never lubricate, modify, force or tamper with cylinder valves.

14. Oil or grease on the high pressure side of an oxygen cylinder can cause an explosion.

15. Always use a trap to prevent back-siphonage of chemicals into the cylinder.

16. Cryogenic gloves must be used when handling cylinders or other containes holding liquid nitrogen

17. Liquified gases present a hazard in the event of fire, since heat will cause the pressure to increase a rupture the container.

D. FLAMMABLE LIQUIDS

Flammable liquids in this laboratory are stored in yellow metal, flammable liquid cabinets located Environmental Conservation Storage Room (Rm. #159A), and the Air Pollution Storeroom (Rm. # In addition, 5 gallon drums of ethanol are stored in a flammable cabinet in the Biomonitoring Labo (Rm. #157). A flammable liquid itself does not burn; it is the vapor from the liquid that burns. Si vaporization rate increases as the temperature increases, a flammable liquid is more hazardous at e temperatures than at room temperature. The fire and explosion hazards associated with flammable can be minimized by observing the following precautions:

18. Keep only minimum quantities of flammable liquids, including solvents, in the laboratory. Maintain storage for current work only.

2. Use the plastic safety containers when transporting gallon bottles of flammable liquids between rooms. Use the elevator, rather than the stairs, when moving these liquids between floors.

3. Keep flammable liquids away from heat and direct sunlight.

4. Do not heat flammable liquids directly over a burner or an electrical device which can gene sparks or has a surface temperature in excess of that which might cause auto-ignition.

5. Do not locate flammable liquids in the laboratory where they block aisles or exits.

6. Do not store flammable liquids where they might come in contact with strong oxidizers such as chromic acid, permanganates, chlorates or perchlorates.

7. Use a fume hood when conducting chlorophyll-a analyses and when transferring appreciable quantities of flammable liquids from one container to another.

If a flammable liquid is spilled, all flames should be extinguished and all spark producing equipme turned off. Absorb the spilled material with a spill cleanup kit and place the absorbent in the plast provided with the kit. The Laboratory Services Supervisor will decide how to dispose of this bag.

E. CORROSIVE MATERIALS

Never store concentrated acids and bases in the same cabinet. Acids are stored in metal cabinets in first floor storage area (Rm. 159A). The laboratory uses few concentrated bases, and they are stor metal cabinet in the Biomonitoring Laboratory. The following information applies when handling corrosive materials:

1. Always wear lab coats or aprons, and safety glasses, and appropriate gloves when handling corrosive materials.

2. When diluting concentrated corrosives, add the acid or base slowly to water or a less concentrated solution.

3. Handle fuming liquids such as nitric acid in a fume hood.

4. Use the plastic safety containers when moving bottles of liquid corrosives from room to ro and use the elevator rather than the stairs to move between floors.

5. Corrosives may be flushed down the sink after diluting them tenfold and allowing the wate run for several minutes.

6. Use acid and caustic spill cleanup kits to absorb spills, and consult the Laboratory Supervis about disposing of the spilled material.

F. TOXIC INORGANICS

Many inorganic chemicals are stored in the Chemistry Storage Room (Rm. # 253). Facility emplo should consult the chemical chart in Section Thirteen of this Manual for the relative toxicity of the chemicals they are working with and refer to the CRC Handbook of Laboratory Safety and the M Safety Data sheets for the specifics of handling each chemical. As always, the use of gloves and la reduces the chance of exposure. Since exposure occurs most commonly through the mouth, washi hands after handling these materials further reduces the likelihood of ingesting a poison. Wheneve is a possibility of vapors being produced, as during wet digestions with nitric acid, one should perf test under a fume hood. The Laboratory Services Unit stocks a cleanup kit for mercury spills, but employees should refer to the CRC Handbook of Laboratory Safety for information on how to clea spills of other chemicals. The Laboratory Services Supervisor must decide how to dispose of toxi inorganic chemical spills. The storage and disposal of toxic waste generated by tests is discussed Section Eleven of this Manual.

G. TOXIC ORGANICS

Organic chemicals are stored in the Organic Prep Lab (Rm. #243). The number of potentially dan organic compounds is great, so all materials should be considered dangerous. Since these chemica be absorbed through the skin, safety precautions are necessary to guard against all routes of incorp Lab coats and eye protection must be worn at all times, and protective gloves are required while ha pure materials or concentrated solutions. Operations involving toxic organics must be performed u fume hood. All available literature should be checked to assess possible hazards, proper handling, spill cleanup procedures for any given compound. The Laboratory Services Supervisor will decid how to dispose of spilled organic chemicals.

H. CHEMICAL HYGIENE GUIDELINES

The MSDSs for many of the chemicals used in the laboratory will state recommended limits or OS mandated limits, or both, as guidelines for exposure. Typical limits are threshold limit values (TL permissible exposure limits (PEL), and action levels. When such limits are stated they will be use assist the Chemical Hygiene Officer in determining the safety precautions, control measures, and s apparel that apply when working with toxic chemicals. Example of such toxics are carbon tetrach formaldehyde, and benzene.

1. When a TLV or PEL value is less than 50 ppm or 100 mg/m^3, the user of the chemical must us an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using t chemical.

2. If a TLV, PEL, or comparable value is not available for that substance, the animal or human m inhalation lethal concentration information, LC_{50}, will be assessed. If that value is less than 20 or 2000 mg/m^3 (when administered continuously for one hour or less), then the chemical must

used in an operating fume hood, glove box, vacuum line, or similar device, which is equipped appropriate traps and/or scrubbers. If none are available, no work should be performed using t chemical.

3. If the above information is not available, the analyst should consult the Chemical Hygiene Offi and they should follow the general principles given on the MSDS.

I. VENTILATION

1. Laboratory ventilation should be not less than eight air changes per hour (Calculated). This flo not necessarily sufficient to prevent accumulation of chemical vapors. Work with toxic chemic that have low air concentration limits, or that have high vapor pressures, should always be don hood.

2. Recommended face velocities for the fume hoods range from 60 fpm to 150 fpm (feet per minu 100 fpm to 125 fpm is recommended for most applications. Air flow will be checked by the a contractor quarterly and documented.

3. Laboratory employees should understand and comply with the following rules regarding fume

   a. A fume hood is a safety backup for condenser, traps, or other devices that collection vapors fumes.
   b. An apparatus inside the hood should be placed on the floor of the hood at least six inches a from the front edge.
   c. Fume hood windows should be lowered (closed) at all times except when necessary to raise (open) them to adjust the apparatus that is inside the hood.
   d. The hood fan should be kept "on" whenever a chemical is inside the hood, whether or not a work is being done inside the hood.
   e. Personnel should be aware of the steps to be taken in the event of power failure or other ho failure.
   f. Hoods should never be used as storage areas for chemicals, apparatus, or other materials.

J. RESPIRATORS

1. Employees should evacuate an area whenever it is possible that engineering controls or work practices could become or are ineffective and that employees might be exposed to vapor or par concentrations greater than the PEL action level, TLV, or similar limit, whichever is the lowes

2. Re-entry for repair or cleanup shall be accomplished by hazardous materials professionals who been trained in the use of appropriate safety equipment such as respirators.

3. Facility policy is that all employees shall perform their routine work in conditions that do not r a respirator. Facility employees who have appropriately been trained, however, may use respir for non-routine work when special circumstances warrant their use.

K. VAPOR DETECTION

Do not use odor as the sole means of determining that inhalation exposure limits are not being exc Whenever there is reason to suspect that a toxic chemical inhalation limit might be exceeded, whe not a suspicious odor is noticed, notify the Supervisor and/or Chemical Hygiene Officer.

Management shall assess the situation and, if necessary, shall bring in professionals to do air moni and/or cleanup. If there is no reason for the Supervisor to believe that a toxic chemical inhalation being exceeded, he/she may authorize re-entry.

L. SAFETY GLOVES

Appropriate safety gloves are required for handling toxic and hazardous materials and also for mat whose temperature extremes might cause injury. **Selection of the proper glove type is critically important**, since many toxic and lethal compounds can quickly permeate the wrong glo material and cause injury and even death.

Breakthrough time is the elapsed time between initial contact of a chemical on the glove surface an analytical detection of the chemical on the inside of the glove. Always select the glove with the hi breakthrough time for the chemical being used. "Your Guide to Chemical Resistant Gloves" is po the wall in Room 256 to help analysts select the proper glove, according to the breakthrough times many commonly used chemicals. In general, use neoprene gloves for acids and caustics, nitrile gl for, oil, grease, and petroleum products, butyl gloves for esters and ketones, silver shield gloves fo methylene chloride, cryogenic gloves for liquid nitrogen, and autoclave gloves for high temperatur materials. If you are unsure of which glove to select, consult the Chemical Hygiene Officer of the Laboratory Supervisor.

M. PROCEDURES FOR CARCINOGENS, REPRODUCTIVE TOXINS, SUBSTANCES THAT HAVE A DEGREE OF ACUTE TOXICITY, AND CHEMICALS OF UNKNOWN TOXICITY

Follow the procedures described in this section when performing laboratory work with any select carcin reproductive toxin, substance that has a high degree of acute toxicity, or a chemical whose toxic properti unknown, when using or handling amounts greater than the amount specified for each such chemical in current list available from the Chemical Hygiene Officer.

1. The following definitions will apply:

   a. Select carcinogen: Any substance defined as such in 29 CFR1910.1450 and any other substance described as such in the applicable MSDS.
   b. Reproductive toxin: Any substance described as such in the applicable MSDS.
   c. Substance with a high degree of acute toxicity: Any substance for which the LD_{50} data described i applicable MSDS cause the substance to be classified as a "highly toxic chemical" as defined in ANSIZ129.1.
   d. Chemical whose toxic properties are unknown: A chemical for which there is no known statistica significant study conducted in accordance with established scientific principles that establishes its

e. For the purposes of the CHP, chemicals in the above four categories will be called "inimical" (inju harmful in effect).
f. Designated area: A hood, glove box, portion of a laboratory, or an entire laboratory room designa the only area where work with quantities of the inimical chemicals in excess of the specified limit conducted.

2. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to w inimical chemicals will work with those chemicals in a designated area. All such persons will:

a. Use the smallest amount of chemical that is consistent with the requirements of the work to be don
b. Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect va lines and pumps.
c. Store inimical chemicals or remove them from storage.
d. Decontaminate a designated area when work is completed.
e. Prepare wastes from inimical chemicals for waste disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) and as designate the Chemical Hygiene Officer or Laboratory Services Supervisor.

3. Store all inimical chemicals in locked and enclosed spaces with a slight negative pressure compared to of the building.

4. Because the decontamination of jewelry may be difficult or impossible, do not wear jewelry when wo designated areas.

5. Wear long-sleeved clothing and gloves known to resist permeation by the chemicals to be used when w in designated areas.

N. INFORMING CONTRACTORS

It is the responsibility of the Laboratory Services Supervisor and/or the Chemical Hygiene Officer to prov contractors working within the grounds of the facility with the following information:

1. Explain the Chemical Hygiene Policy to the contractor.

2. The hazardous chemicals to which their workforce might be exposed while on the job site.

3. Explain that if the workforce has any questions concerning MSDSs, he or she should consult with the Chemical Hygiene Officer.

4. Suggest to the contractor what personal protective equipment might be needed by the workforce and d the hazards against which the equipment protects.

5. Assist the contractor so he or she can comply with his Hazard Communication Standard.

XI. HAZARDOUS WASTE DISPOSAL

The hazardous waste generated by the Laboratory Services Unit consists of spilled toxic chemicals, sampl containing high levels of toxic materials, empty toxic containers, outdated toxic chemicals and toxic resid resulting from various tests. Depending on the level of hazard, this waste is either recycled, flushed down disposed of at a landfill, or picked up by a commercial hazardous waste disposal firm. Disposal of the firs categories of hazardous waste depends on the characteristics of the materials concerned and is decided by Laboratory Services Supervisor. Toxic residues resulting from tests performed by the laboratory may be r When recycling is impossible, these wastes are stored until a sufficient amount accumulates to warrant pic commercial firm. Storage and recycling procedures for these residues are explained below:

1. CHEMICAL OXYGEN DEMAND (COD)

Mercuric sulfate and sulfuric acid used in tests for COD produce a toxic, corrosive waste. This waste mat stored in a drum in the Hazardous Waste Storage Room (Rm. #159B) until it is removed by a hazardous w disposal firm.

2. CHLORIDE

The automated analysis for chloride uses mercuric thiocyanate as a reagent. The waste generated by this t stored in a polyethylene-lined drum in the Hazardous Waste Storage Room (Rm. #159B) until it is remov commercial hazardous waste disposal company.

3. CHLOROPHYLL-A

Chlorophyll-A is extracted from water samples by acetone. The entire procedure must be run under a fum After analysis, the waste acetone is placed in a glass bottle to be removed by a disposal firm.

4. NITRATE-NITRITE

Granulated cadmium metal is used in the colorimetric determination of nitrate-nitrite. To recycle cadmium granules are washed in 6N hydrochloric acid and a 2% solution of copper sulfate. Details of this procedur found in section number 353.2 of Methods for Chemical Analysis of Water and Wastes. As cadmium is v it should be handled with gloves under a fume hood.

5. SEMIVOLATILES (W+S), PESTICIDES/PCB

Methylene chloride is used to extract semivolatile organics and pesticides/PCBs in a separatory funnel an Soxhlet extractor. Waste methylene chloride is evaporated and condensed for collection. This condensate commonly contains trace amounts of hexane, acetone, and methyl alcohol, is stored in a drum in the Haza Waste Storage Room (Rm. #159B) until it is removed by a commercial disposal firm.

XII. LABORATORY TEST AND CHEMICAL USE

The purpose of this section is to give an analyst a concise idea of what substances he or she will be expos while performing any given chemical analysis. This section lists tests performed and chemicals needed t complete each test. The tests are listed alphabetically and followed by the code given each test by the Da Management System. When two or more tests use the same reagents, these tests are listed together follo the list of reagents. Tests for inorganic compounds are grouped separately from those for organic compo those for bacteria. This section also includes tests performed by Biomonitoring and Aquatic Studies Uni personnel which are not catalogued by the Data Management System and lists chemicals used for cleanin glassware. The chemicals listed for each test are those an analyst come in contact with while performing This include preservatives and substances used to facilitate sample evaluation such as pH buffers. Chem for equipment maintenance such as lubricating oils are not included in the list. Analysts should refer to S Thirteen for information on the relative dangers of the substances they will encounter.

INORGANIC CHEMICAL AND PHYSICAL TESTS - LABORATORY SERVICES UNIT

TEST NAME REAGENTS	TEST CODE
Alkalinity	ALK
Alkalinity-Gran	ALK2
pH 4 Buffer	
pH 7 Buffer	
sodium carbonate	
sulfuric acid	
Aluminum, Water	WAL
aluminum metal	
argon	
hydrochloric acid	
nitric acid	
potassium chloride	
pyrolytic graphite	
Aluminum, Solid	SAL
acetylene	
aluminum metal	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
nitrous oxide	
potassium chloride	
Antimony, Water	WSB
antimony potassium tartrate	

argon
hydrochloric acid
nitric acid
pyrolytic graphite

Arsenic, Solid SAS

Arsenic, Water WAS
argon
arsenic trioxide
hydrochloric acid
hydrogen peroxide
nickel nitrate
nitric acid
pyrolytic graphite
sodium hydroxide

Barium, Water WBA
argon
barium chloride
nitric acid
pyrolytic graphite

Barium, Solid SBA
argon
barium chloride
hydrochloric acid
hydrogen peroxide
nitric acid
potassium chloride

Beryllium, Water WBE
argon
beryllium sulfate
nitric acid
pyrolytic graphite

BOD, - Carbonaceous -20 day CB20
BOD, Carbonaceous - 5 day CB5
BOD, Total - 20 day BOD20
BOD, Total - 5 day BOD5
ammonium chloride
calcium chloride
2-chloro-6-(trichloromethyl) pyridine
ferric chloride
glucose
glutamic acid
magnesium sulfate
potassium phosphate, dibasic
potassium phosphate, monobasic
sodium hydroxide
sodium phosphate, dibasic
sodium sulfite
sulfuric acid

Cadmium, Water WCD
acetylene
air, compressed
cadmium sulfate
hydrochloric acid
nitric acid

Cadmium, Solid SCD
acetylene
air, compressed
cadmium sulfate
hydrochloric acid
hydrogen peroxide
nitric acid

Cadmium, Fish FCD
sulfuric acid
nitric acid
hydrogen peroxide
cadmium sulfate
acetylene
air, compressed
hydrochloric acid

Calcium, Water	WCA
acetylene	
air, compressed	
calcium carbonate	
hydrochloric acid	
lanthanum chloride	
nitric acid	
Calcium, Solid	SCA
acetylene	
air, compressed	
calcium carbonate	
hydrochloric acid	
hydrogen peroxide	
lanthanum chloride	
nitric acid	
Chemical Oxygen Demand	COD
ferrous ammonium sulfate	
ferrous sulfate	
mercuric sulfate	
1,10-phenanthroline	
potassium dichromate	
silver sulfate	
sulfuric acid	
Chloride, Filtered-Ion Chromatography	CLI
nitrogen	
sodium bicarbonate	
sodium carbonate	
sodium chloride	
sulfuric acid	
Chloride, Solid	SCL
Chloride, Water	CL
ferric nitrate	
methanol	
mercuric thiocyanate	
nitric acid	
sodium chloride	

Chlorine, Post Dechlorination	CL2D
Chlorine, Residual-Free	CL2F
Chlorine, Residual-Total	CL2
acetic acid	
hydrochloric acid	
phenylarsine oxide	
potassium iodide	
potassium phosphate, monobasic	
sodium acetate	
sodium hydroxide	
sodium hypochlorite	
sodium phosphate, dibasic	
Chlorophyll-A-Fluorometric	CHA
acetone	
hydrochloric acid	
sodium bicarbonate	
Chromium, Water	WCR
argon	
calcium nitrate	
chromium trioxide	
hydrogen peroxide	
nitric acid	
pyrolytic graphite	
Chromium, Water	WCR
acetylene	
air, compressed	
chromium trioxide	
hydrochloric acid	
nitric acid	
Chromium, Hexavalent	HCR
ammonium hydroxide	
ammonium sulfate	
argon	
calcium nitrate	
glacial acetic acid	
hydrogen peroxide	
lead nitrate	
nitric acid	
potassium dichromate	
Chromium, Solid	SCR
acetylene	

air, compressed
chromium trioxide
hydrochloric acid
hydrogen peroxide
nitric acid

Chromium, Fish FCR
acetylene
air, compressed
sulfuric acid
nitric acid
hydrogen peroxide
hydrochloric acid

Cobalt, Water WCO
acetylene
air, compressed
cobaltous chloride
hydrochloric acid
nitric acid

Cobalt, Solid SCO
acetylene
air, compressed
cobaltous chloride
hydrochloric acid
hydrogen peroxide
nitric acid

Color, Dissolved-Visual Method DC
Color, Total-Visual Method TC
crystalline cobaltous chloride
hydrochloric acid
potassium chloroplatinate

Color, Dissolved-
Spectrophotometric DC2
Color, Total-Spectrophotometric TC2
no reagents

Conductivity	COND
chloroplatinic acid	
hydrochloric acid	
isopropanol	
potassium chloride	
Conductivity-Field	CONDF
no reagents	
Copper, Water	WCU
acetylene	
air, compressed	
electrolyte copper	
hydrochloric acid	
nitric acid	
Copper, Solid	SCU
acetylene	
air, compressed	
electrolyte copper	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
Copper, Fish	FCU
acetylene	
air, compressed	
sulfuric acid	
nitric acid	
hydrogen peroxide	
hydrochloric acid	

Dissolved Oxygen-Probe	DO
Dissolved Oxygen-Winkler	
chloroform	
manganous sulfate	
phenylarsine oxide	
potassium biiodate	
potassium fluoride	
potassium hydroxide	
potassium iodide	
sodium azide	
sodium hydroxide	
sodium iodide	
sodium thiosulfate	
starch	
sulfuric acid	
Flow	FLOW
Flow-WWTF	FLOWM
drierite (calcium sulfate)	
silica gel	
Hardness Total-Calculated	THC
no reagents	
Iron, Water	WFE
acetylene	
air, compressed	
hydrochloric acid	
iron wire	
nitric acid	
Iron, Solid	SFE
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
iron wire	
nitric acid	

Lead, Water	WPB
acetylene	
air, compressed	
hydrochloric acid	
lead nitrate	
nitric acid	
Lead, Solid	SPB
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
lead nitrate	
nitric acid	
Lead, Fish	FPB
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
sulfuric acid	
Magnesium, Water	WMG
acetylene	
air, compressed	
hydrochloric acid	
lanthanum chloride	
magnesium oxide	
nitric acid	
Magnesium, Solid	SMG
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
lanthanum chloride	
magnesium oxide	
nitric acid	

Manganese, acetylene air, compressed hydrochloric acid manganese metal nitric acid	WMN
Manganese, Solid acetylene air, compressed hydrochloric acid hydrogen peroxide manganese metal nitric acid	SMN
Mercury, Water hydroxylamine sulfate mercuric chloride nitric acid potassium permanganate potassium persulfate sodium chloride stannous sulfate sulfuric acid argon hydrochloric acid	WHG
Mercury, Solid hydrochloric acid hydroxylamine hydrochloride mercuric chloride nitric acid potassium permanganate sodium chloride stannous sulfate sulfuric acid argon	SHG
Mercury, Fish argon hydrochloric acid hydrogen peroxide hydroxylamine hydrochloride mercuric chloride nitric acid sulfuric acid sodium chloride stannous chloride	FHG

vanadium pentoxide

Molybdenum, Solid SMO
Molybedenum, Water WMO
argon
hydrogen peroxide
Molybdenum Reference Solution
nitric acid
pyrolytic graphite

Nickel, Water WNI
acetylene
air, compressed
hydrochloric acid
nickel nitrate
nitric acid

Nickel, Solid SNI
acetylene
air, compressed
hydrochloric acid
hydrogen peroxide
nickel nitrate
nitric acid

Nickel, Fish FNI
acetylene
air, compressed
hydrochloric acid
hydrogen peroxide
nitric acid
sulfuric acid

Nitrogen, NO3-Ion Chromatography NO3I
nitrogen
sodium bicarbonate
sodium carbonate
sodium nitrate
sulfuric acid

Nitrogen, Soil Nitrate/Nitrite SNOX

Nitrogen, Total Kjeldahl TKN
copper sulfate

clorox
potassium sulfate
sulfuric acid
sodium salicylate
sodium nitroprusside
sodium phosphatedibasic heptahydrate
disodium EDTA
ammonia sulfate

Nitrogen, Total Nitrate/Nitrite NOX

ammonium chloride
ammonium hydroxide
Brij-35
cadmium-granulated
copper sulfate
ethylenediamine tetracetic acid, (EDTA) disodium salt
hydrochloric acid
N-(1-naphthyl) ethylene diamine dihydrochloride
phosphoric acid
potassium nitrate
potassium nitrite
sulfanilamide
sulfuric acid

Nitrogen, Total Ammonia NH3

ammonium sulfate
Brij-35
ethylenediamine tetracetatic acid, (EDTA) disodium salt
phenol
sodium hypochlorite
sodium hydroxide
sodium nitroprusside
sodium potassium tartrate
sulfuric acid

Nitrogen, Total Nitrite NO2
N-(1-naphthyl) ethylene diamine dihydrochloride
phosphoric acid
potassium nitrite
sulfanilamide

pH PH
pH-Field PHF
pH 4 buffer - potassium biphthalate
pH 7 buffer - may contain potassium phosphate
sodium hydroxide
sodium phosphate
pH 10 buffer - may contain potassium borate
potassium carbonate
potassium hydroxide
sodium borate
sodium carbonate
potassium chloride
silver chloride

pH-CO2 Bubble PH2
air, compressed
pH 4 buffer - potassium biphthalate
pH 7 buffer - may contain potassium phosphate
sodium hydroxide
sodium phosphate
potassium chloride
silver chloride

Phosphorus, Ortho - Filtered OP
ammonium molybdate
antimony potassium tartrate
ascorbic acid
dodecyl sodium sulfate
ethanol
phenolphthalein
potassium phosphate

Phosphorus, Filtered/Digested DP
Phosphorus, Solid SP

Phosphorus, Digested	TP
ammonium molybdate	
ammonium persulfate	
antimony potassium tartrate	
ascorbic acid	
dodecyl sodium sulfate	
ethanol	
phenolphthalein	
potassium phosphate	
sulfuric acid	
Potassium, Water	WK
acetylene	
air, compressed	
nitric acid	
potassium chloride	
Potassium, Solid	SK
acetylene	
air, compressed	
hydrogen peroxide	
nitric acid	
potassium chloride	
Secchi Transparency	SECC
no reagents	
Selenium,	WSE
Selenium, Solid	SSE
argon	
hydrogen peroxide	
nickel nitrate	
nitric acid	
pyrolytic graphite	
selenous acid	
Silica as SiO_2, Total	TSI
Silica as SiO_2, Filtered	DSI
ascorbic acid	
ammonium molybdate	
acetone	
Levor IV	
sodium hydroxide, 10N	
sodium metasilicate	
oxalic acid	

sulfuric acid

Silver, Water — WAG
- ammonium hydroxide
- argon
- iodine
- nitric acid
- potassium cyanide
- potassium iodide
- pyrolytic graphite
- silver nitrate

Silver, Solid — SAG
- acetylene
- air, compressed
- ammonium hydroxide
- hydrochloric acid
- hydrogen peroxide
- iodine
- nitric acid
- potassium cyanide
- potassium iodide
- silver nitrate

Sodium, Water — WNA
- acetylene
- air, compressed
- nitric acid
- sodium chloride

Sodium, Solid — SNA
- acetylene
- air, compressed
- hydrogen peroxide
- nitric acid
- sodium chloride

Solids, Total Dissolved — TDS
Solids, Total Settleable — TPS
Solids, Total Suspended — TSS
Solids, Total Volatile — TVS
Solids, Total Volatile Suspended — TVSS
Solids, Percent — PSOL
- no reagents

Sulfate, Ion Chromatography SO4I
- nitrogen
- potassium sulfate
- sodium bicarbonate
- sodium carbonate
- sulfuric acid

Sulfate, Water SO4
- ammonium chloride
- ammonium hydroxide
- barium chloride
- Bio-Rex 70, sodium form, cation exchange resin
- Brij-35
- ethanol
- ethylenediamine tetracetatic acid (EDTA), tetrasodium salt
- hydrochloric acid
- methylthymol blue
- sodium hydroxide
- sodium sulfate

Sulfide WS
- hydrochloric acid
- n,n-dimethyl-p-phenylene diamine dihydrochloride
- sodium hydroxide
- ferric chloride hexahydrate
- sodium sulfide nonahydrate

Surfactants, Anionic ASUR
- chloroform
- linear alkyl sulfonate (LAS)
- methylene blue
- monosodium dihydrogen phosphate
- phenolphthalein (alcoholic)
- sodium hydroxide
- sulfuric acid

Temperature TEMP
- no reagents

Thallium, Water WTL
- argon
- nitric acid
- pyrolytic graphite
- thallium nitrate

Tin, Water WSN
- acetylene
- hydrochloric acid
- nitric acid
- nitrous oxide
- tin metal

Tin, Solid SSN
- acetylene
- hydrochloric acid
- hydrogen peroxide
- nitric acid
- nitrous oxide
- tin metal

Toxic Characteristic Leaching Procedure TCLP
- glacial acetic acid
- hydrochloric acid
- nitric acid
- sodium hydroxide

Turbidity TURB
- AMCO-AEPA turbidity stds. = styrene (divinylbenzene) beads in water
- hexamethylenetetramine
- hydrazine sulfate
- methanol

Vanadium, Water WV
- aluminum nitrate
- argon
- nitric acid
- pyrolytic graphite
- vanadium pentoxide

Vanadium, Solid	SV
acetylene	
aluminum nitrate	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
nitrous oxide	
vanadium pentoxide	
Zinc, Water	WZN
acetylene	
air, compressed	
hydrochloric acid	
nitric acid	
zinc metal	
Zinc, Solid	SZN
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
zinc metal	
Zinc, Fish	FZN
acetylene	
air, compressed	
hydrochloric acid	
hydrogen peroxide	
nitric acid	
sulfuric acid	

ORGANIC CHEMICAL TESTS - LABORATORY SERVICES UNIT

Aldehyde in Air TO11 — TO11

- cyclohexanone-2,4-DNPH
- acetonitrile
- formaldehyde-2,4-DNPH
- acetaldehyde-2,4-DNPH
- acrolein-2,4-DNPH
- acetone-2,4-DNPH
- propionaldehyde-2,4-DNPH
- crotonaldehyde-2,4-DNPH
- methacrolein-2,4-DNPH
- 2-butanone-2,4-DNPH
- butyraidehyde-2,4-DNPH
- benzaldehyde-2,4-DNPH
- valeraidehyde-2,4-DNPH
- m-tolualdehyde-2,4-DNPH
- hexaldehyde-2,4-DNPH

Volatile Organics - Water — W8260

Volatile Organics - Soil — S8260

- Bromochloromethane (IS1)
- 1,4-Difluorobenzene (IS2)
- Chlorobenzene-D5 (IS3)
- 1,2-Dichloroethane-D4 (Surrogate 1)
- Toluene-D8 (Surrogate 2)
- 4-Bromofluorobenzene (Surrogate 3)
- Vinylchloride
- Chloromethane
- Bromomethane
- Chloroethane
- Trichlorofluoromethane
- Acetone
- 1,1-Dichloroethene
- Carbon Disulfide
- Methylene Chloride
- Methyl-t-butylether (MTBE)
- 1,2-Dichloroethene
- 1,1-Dichloroethane
- Vinyl Acetate
- 2-Butanone
- Chloroform
- 1,1,1-Trichloroethane
- Carbon Tetrachloride
- Benzene

1,2-Dichloroethane
Trichloroethene
1,2-Dichloropropane
Bromodichloromethane
4-Methyl-2-Pentanone
cis-1,3-Dichloropropene
Toluene
Trans-1,3-Dichloropropene
1,1,1-Trichloroethane
Hexanone
Tetrachloroethene
Dibromochloromethane
Chlorobenzene
Ethylbenzene
o-Xylene
Styrene
Bromoform
p&m-xylene
1,1,2,2-Tetrachloroethane
n-propylbenzene
t-butylbenzene
1,3-dichlorobenzene
1,2,4-trichlorobenzene
1,2-dichlorobenzene
1,4-dichlorobenzene
Sylon-CT
HCl concentrated
Methanol (optima)
4-Bromofluorobenzene

Pesticide/PCB's - Water	W8080
Pesticides/PCB's - Solid	S8080

Methylene Chloride
Methanol
Hexane
Sodium Sulfate
Aldrin
alpha-BHC
beta-BHC
gamma-BHC
Lindane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin

Chlordane
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene
Decachlorobiphenyl
2,4,5,6-Tetrachloro-m-xylene
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Acetone
Nitrogen
Florisil
Alumina
Ethyl Ether

PCB's in Oil OPCB

Decachlorobiphenyl
2,4,5,6-Tetrachloro-m-xylene
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Methylene Chloride
Methanol
Hexane
Sodium Sulfate

Petroleum	8021
fluorobenzene	
ααα-trifluorotoluene	
4-bromofluorobenzene	
MTBE	
benzene	
toluene	
ethylbenzene	
m-xylene	
p-xylene	
o-xylene	
1,2,4-trimethylbenzene	
1,2,5-trimethylbenzene	
naphthalene	
chlorobenzene	
1,1-dichloroethene	
trichloroethene	
methanol	
Semivolatile Compounds in Water Using GC/MS	W8270
Semivolatile Compounds in Solid Using GC/MS	S8270
N-Nitrosodimethylamine	
Aniline	
Phenol	
Bis(2-chloroethyl)ether	
2-Chlorophenol	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
1,2-Dichlorobenzene	
Benzyl alcohol	
2-Methylphenol	
Bis(2-chloroisopropyl)ether	
Hexachloroethane	
4-Methylphenol	
N-Nitroso-di-n-propylamine	
Nitrobenzene	
Isophorone	
2-Nitrophenol	
2,4-Dimethylphenol	
Bis(2-chloroethoxy)methane	
2,4-Dichlorophenol	
1,2,4-Trichlorobenzene	
Naphthalene	

Benzoic acid
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylphenol
2-Methylnaphthalene
Hexachlorocyclo-pentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Acenaphthylene
Dimethylphthalate
2,6-Dinitrotoluene
Acenaphthene
3-Nitroanaline
2,4-Dinitrophenol
Dibenzofuran
2,4-Dinitrotoluene
4-Nitrophenol
Fluorene
4-Chlorophenyl-phenyl ether
Diethylphthalate
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-Nitrosodiphenylamine
Azobenzene
4-Bromophenyl phenyl ether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-n-butyl phthalate
Fluoranthene
Pyrene
Butylbenzylphthalate
Benzo(a)anthracene
Chrysene
3,3-Dichlorobenzidene
Bis(2-ethylhexyl)phthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Di-n-octylphthalate
Benzo(a)pyrene
Indeno(a,h,2,cd)Pyrene
Dibenzo(a,h)anthracene

Benzo(g,h,i)perylene
Fluorophenol
2-Fluorobiphenyl
Phenol-D_8 (deuterated phenol)
2,3,4-Tribromophenol
Nitrobenzene-D_5
4-Terphenyl-D_{14}
Acenaphthene
4-Chloro-3-methylphenol
1,4-Dichlorobenzene
2-Chlorophenol
2,4-Dinitrotoluene
4-Nitrophenol
N-Nitrosodi-n-propylamine
Pentachlorophenol
Pyrene
Phenol
1,2,4-Trichlorobenzene
Decaflurotriphenylphosphine (DFTPP)
1,4-Dichlorobenzene-D_4
Phenanthene-D_{10}
Naphthalene-D_8
Chrysene-D_{12}
Acenaphthlene-D_{10}
Perylene-D_{12}
Sodium Sulfate
Reagent Water
Nitrogen
Methylene Chloride
Fused Silica Capillary Column
Methylene Chloride
Sodium Sulfate
Methanol
Sodium Hydroxide
Sulfuric Acid
Acetone

Polynuclear Aromatics in Aliphatic Oil
Using GC/MS OPAH

Naphthalene
2-Methylennaphthalene
Acenaphthylene
Acenaphthene

Dibenzofuran
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benzo[a]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Indeno[1,2,3,cd]pyrene
Dibenz[a,h]anthacene
Benzo[g,h,i]perylene
Nitrobenzene-D_5
2-Flurobiphenyl
4-Terphenyl-D_{14}
1,4-Dichlorobenzene
N-nitroso-di-N-propylamine
1,2,4-Trichlorobenzene
2,4-Dinitrotoluene
Acenaphthene
Pyrene
1,4-Dichlorobenzene-D_4
Naphthalene-D_8
Acenaphthlene-D_{10}
Phenanthene-D_{10}
Chrysene-D_{12}
Perylene-D_{12}
Alumina-neutral
Sodium Sulfate
Methylene Chloride
Toluene
Hexane
Fused Silica Capillary Column

Polynuclear Aromatic Hydrocarbons	FPAH
PCB's Organochlorine Pesticides in Fish and Mussel Tissue	FPCBP

Naphthalene
2-Methylnaphthalene
1-Methylnaphthalene
Acenaphthylene
Dibenzofuran
Fluorene
Phenanthrene

Anthracene
Fluoranthene
Pyrene
Benzo[a]anthracene
Chrysene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Indeno[1,2,3,cd]pyrene
Dibenz[a,h]anthracene
Benzo[g,h,i]perylene
Chlorobiphenyl (single congener)
Dichlorobiphenyl (single congener)
Trichlorobiphenyl (single congener)
Tetrachlorobiphenyl (single congener)
Pentachlorobiphenyl (single congener)
Hexachlorobiphenyl (single congener)
Heptachlorobiphenyl (single congener)
Octachlorobiphenyl (single congener)
Lindane
Aldrin
Heptachlor epoxide
DDE
Dieldrin
Endrin
DDD
DDT
Methoxychlor
Pesticides Surrogate Spike Mix
Supelpreme - HC Pesticides Mix
Supelpreme - HC Internal Standards
Supelpreme - HC PAH Mix
Supelpreme - HC Hazardous Sub Mix 2
DCMA PCB Mixture
Sodium Sulfate
Methanol
Hexane
Methylene Chloride
Soxhlet Extraction Thimbles
Alumina-neutral:80-200 Mesh

Sulfur Hexafluoride - Air ASF6
Sulfur Hexafluoride/Air Mixture
(concentration less than 1%)

Volatile Organics in Air TO15

dichlorodifluoromethane (12)
methyl chloride
1,2-dichloroetetrafluoroethane (114)
vinyl chloride
bromomethane
ethyl chloride
trichlorofluoromethane (11)
1,1-dichloroethene
methylene chloride
1,1,2-trichlorotrifluoroethane (113)
1,1,-dichloroethane
1,2-dichloroethene
chloroform
1,2-dichloroethane
1,1,1-trichlorothane
benzene
carbon tetrachloride
1,2-dichloropropane
trichloroethylene
cis1,3-dichloropropene
trans-1,3-dichloropropene
1,1,2-trichloroethane
toluene
1,2-dibromoethane
tetrachloroethylene
chlorobenzene
ethylbenzene
m-xylene
p-xylene
styrene
o-xylene
1,1,2,2-tetrachloroethane
1,3,5-trimethylbenzene

1,2,4-trimethylbenzene
m-dichlorobenzene
p-dichlorobenzene
o-dichlorobenzene
1,2,4-trichlorobenzene
hexachloro-1,3-butadiene
nitrogen VOC free
bromochloromethane
1,4-difluorobenzene
chlorobenzene d5

4-bromofluorobenzene

BIOLOGICAL TESTS - BIOMONITORING AND AQUATIC STUDIES UNIT

TEST NAME
REAGENTS

Algae Studies
immersion oil
Lugol's Solution: iodine
potassium iodide
Permount
potassium dichromate
Pro-TEXX: butylbenzylphthalate
2,6-di-t-butyl-p-cresol
methyl-n-butyl methacrylate copolymer
toluene

Fish Studies
tricaine methanesulfonate

Flow
rhodamine B

Hardness-EDTA Titrimetric Method
ammonium chloride
ammonium hydroxide
calcium carbonate
calmagite
Eriochrome Black T
ethylenediaminetetracetic acid, magnesium disodium salt
ethylenediaminetetracetic acid, disodium salt
hydrochloric acid
magnesium chloride
magnesium sulfate
methyl red indicator
sodium hydroxide
sodium sulfide

Macroinvertebrate Studies
canada balsam
ethanol
formaldehyde
Hoyer's Media: chloral hydrate
glycerin
gum arabic
Permount
phloxine B
polyvinyl lactophenol
Pro-TEXX: butylbenzyl phthalate
2,6-di-t-butyl-p-cresol
methyl-n-butyl methacrylate copolymer
toluene

Toxicity Studies
acetone
alfalfa, dried
cadmium chloride
calcium sulfate
hydrochloric acid
magnesium sulfate
potassium chloride
potassium phosphate, monobasic
sodium bicarbonate
sodium dodecylsulfate
sodium hydroxide
trout chow
yeast, dried
sodium nitrate
manganese chloride
EDTA
cupric chloride
magnesium chloride
boric acid
ferric chloride
cobaltous chloride
zinc chloride
sulfuric acid
sodium thiosulfate

N,N-diethyl-p-phenylene diamine
ferrous ammonium sulfate
potassium iodide
phosphate buffer

MICROBIOLOGY TESTS - LABORATORY SERVICES UNIT

TEST NAME REAGENTS	TEST CODE
Coliform Fecal bacto agar M-FC broth base ethanol hydrochloric acid magnesium chloride pH 4 buffer pH 7 buffer potassium chloride potassium dihydrogen phosphate rosolic acid silver chloride sodium hydroxide sodium thiosulfate	FCOL
Coliform Fecal-Soil (Dried) EC medium ethanol hydrochloric acid laurel tryptose broth magnesium chloride pH 4 buffer pH 7 buffer potassium chloride potassium dihydrogen phosphate silver chloride sodium hydroxide	SFCO
E. coli ethanol hydrochloric acid mTEC agar EC medium magnesium chloride pH 4 buffer pH 7 buffer potassium chloride sodium hydroxide	ECOL

sodium thiosulfate
urea
phenol red
potassium dihydrogen phosphate
N,N,N',N' tetramethyl-p-phenylene diamine dihydrochloride
p-dimethylaminobenzaldehyde
isoamyl alcohol

MPN Fecal — FMPN
EC medium
ethanol
hydrochloric acid
laurel tryptose broth
magnesium chloride
pH 4 buffer
pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium hydroxide
sodium thiosulfate

Coliform Total — TCOL
bacto agar
m-Endo broth
ethanol
hydrochloric acid
laurel tryptose broth
magnesium chloride
pH 4 buffer
pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium hydroxide
sodium thiosulfate

Coliform Total-Soil (Dried) — STCO
brilliant green bile broth
ethanol
hydrochloric acid
laurel tryptose broth
magnesium chloride
pH 4 buffer

pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium hydroxide

Coliform - Total - MPN TMPN

brilliant green bile broth
ethanol
hydrochloric acid
laurel tryptose broth
magnesium chloride
pH 4 buffer
pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium hydroxide
sodium thiosulfate

Coliform - Fecal Streptococcus FSTR

ethanol
hydrochloric acid
magnesium chloride
pH 4 buffer
pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium carbonate
sodium hydroxide
sodium thiosulfate
m-Enterococcus Agar
2,3,5-triphenyltetrazolium chloride

Heterotrophic Plate Count	HPC
Standard Plate Count	SPC

ethanol
hydrochloric acid
magnesium chloride
pH 4 buffer
pH 7 buffer
potassium chloride
potassium dihydrogen phosphate
silver chloride
sodium hydroxide
sodium thiosulfate
tryptic soy agar

GLASSWARE CLEANING

Persons cleaning laboratory glassware and performing cleaning and maintenance on the glass still are exposed following chemicals. The contents of cleaners are listed when available.

GLASSWARE

sulfuric acid
FL-70
hydrochloric acid
Liqui-Nox
Micro
nitric acid
Octagon
sulfuric acid
Sparkle

XIII. CHEMICAL CHART

This chart provides a brief summary of chemicals used in this facility and ranks their degree of haza accordingly. These ratings are no substitute for the Material Safety Data Sheets (MSDS). Analysts required to read the MSDS for each chemical used in the analyses they are assigned, and to be knowledgeable about the hazard of each chemical they are using. The rating system for Health, Flammability and Reactivity is based on Fisher's MSDS; the assigned ratings are based on regulatio promulgated under CERCLA by EPA.

1. HEALTH - The danger or toxic effect a substance presents, if inhaled, ingested or absorbed.

2. FLAMMABILITY - The tendency of a substance to burn.

3. REACTIVITY - The potential of a substance to explode or react violently with air, water or othe substances.

4. CONTACT - The danger a substance presents when exposed to skin, eyes and mucous membran

3: Severe Toxicity

a. Acute local. Materials which on single exposure lasting seconds or minutes cause injury to (dermal) or mucous membranes of sufficient severity to threaten life or to cause permanent physical impairment or disfigurement.

b. Acute systemic. Material which can be absorbed into the body by inhalation, ingestion (or through the skin and which can cause injury of sufficient severity to threaten life following single exposure lasting seconds, minutes, or hours, or following ingestion of a single dose.

c. Chronic local. Materials which on continuous or repeated exposures extending over period days, months, or years can cause injury to skin or mucous membranes of sufficient severity threaten life or cause permanent impairment, disfigurement, or irreversible change.

d. Chronic systemic. Materials which can be absorbed into the body by inhalation, ingestion through the skin and which can cause death or serious physical impairment following conti or repeated exposures to small amounts extending over periods of days, months or years.

2: Moderate Toxicity

a. Acute local. Materials which on single exposure lasting seconds, minutes, or hours cause moder effects on the skin or mucous membranes. These effects may be the result of intense exposure fo matter of seconds or moderate exposure for a matter of hours.

b. Acute systemic. Materials which can be absorbed into the body by inhalation, ingestion, or throu skin and which produce moderate effects following single exposures lasting seconds, minutes, or or following ingestion of a single dose.

c. Chronic local. Materials which can be absorbed into the body by inhalation, ingestion, or throug skin and which produce moderate effects following continuous or repeated exposures extending periods of days, months, or years.

d. Chronic systemic. Materials which can be absorbed into the body by inhalation, ingestion, or thr the skin and which produce moderate effects following continuous or repeated exposures extendi periods of days, months, or years.

Those substances classified as MOD or having "moderate toxicity" may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or pro serious physical impairment.

1: Slight Toxicity

a. Acute local. Materials which on single exposures lasting seconds, minutes, or hours cause only s effects on the skin or mucous membranes regardless of the extent of the exposure.

b. Acute systemic. Materials which can be absorbed into the body by inhalation, ingestion or throu skin and which produce only slight effects following single exposures lasting seconds, minutes, o hours, or following ingestion of a single dose, regardless of the quantity absorbed or the extent o exposure.

c. Chronic local. Materials which on continuous or repeated exposures extending over periods of d months, or years can cause only slight and usually reversible effects following continuous or rep exposures extending over days, months, or years. The extent of the exposure may be great or sm

d. Chronic systemic. Materials which can be absorbed into the body by inhalation, ingestion, or thr the skin and which produce only slightly usually reversible effects following continuous or repea exposures extending over days, months, or years. The extent of the exposure may be great or sm

In general, those substances classified as having "slightly toxicity" produce changes in the human body are readily reversible and which will disappear following termination of exposure, either with or witho medical intervention.

0: No Toxicity

a. Materials which cause no harm under any conditions of normal use.

b. Materials which produce toxic effects on humans only under the most unusual conditions or by overwhelming dosage.

FLAMMABILITY

3: Very flammable gases, very volatile flammable liquids, and materials that in the form of dusts or readily form explosive mixtures when dispersed in air. Shut off flow of gas or liquid and keep co water streams on exposed tanks or containers. Use water spray carefully in the vicinity of dusts s not to create dust clouds.

OR

3: Liquids which can be ignited under almost all normal temperature conditions. Water may be ine on these liquids because of their low flash points. Solids which form coarse dusts, solids in shred fibrous form that create flash fires, solids that burn rapidly, usually because they contain their ow oxygen, and any material that ignites spontaneously at normal temperatures in air.

2: Liquids which must be moderately heated before ignition will occur and solids that readily give o flammable vapors. Water spray may be used to extinguish the fire because the material can be co below its flash point.

1: Materials that must be preheated before ignition can occur. Water may cause frothing of liquids this flammability rating number if it gets below the surface of the liquid and turns to steam. How water spray gently applied to the surface will cause a frothing which will extinguish the fire. Mo combustible solids have a flammability rating of 1.

0: Materials that will not burn.

REACTIVITY

3: Materials which in themselves are readily capable of detonation or of explosive decomposition o explosive reaction at normal temperatures and pressures. Includes materials which are sensitive mechanical or localized thermal shock. If a chemical with this hazard rating is in an advance or m fire, the area should be evacuated.

OR

3: Materials which in themselves are capable of detonation or of explosive decomposition or of exp reaction, but which require a strong initiating source or which must be heated under confinement initiation. Includes materials which are sensitive to thermal or mechanical shock at elevated temperatures and pressures or which react explosively with water without requiring heat or confi Fire fighting should be done from an explosion resistant location.

2: Materials which in themselves are normally unstable and readily undergo violent chemical chang do not detonate. Includes materials which can undergo chemical change with rapid release of en normal temper-atures and pressures or which can undergo violent chemical changes at elevated temperatures and pressures. Also includes those materials which may react violently with water which may form potentially explosive mixtures with water. In advanced or massive fires, fire fig should be done from a protected location.

1: Materials which in themselves are normally stable but which may become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not vi Caution must be used in approaching the fire and applying water.

0: Materials which are normally stable even under fire exposure conditions and which are not reacti water. Normal fire fighting procedures may be used.

CONTACT

3: A three rating for contact is a corrosive material under the US Department of Transportation regu It is a liquid or solid which causes visible destruction or irreversible alterations in human skin at of contact. In addition, a three rating would include those chemicals which can quickly penetrate skin and cause internal damage.

2: A two rating for contact is a liquid or solid which is an irritant or causes a burning reaction on th It may sensitize some individuals to further exposure.

1: A one rating for contact is a liquid or solid which can cause a mild irritation on skin contact.

0: A zero rating for contact is a liquid or solid which produce no known skin problems on contact.

CARCINOGENS

A "+" symbol denotes any substance that is one or more of the following:

1. a human carcinogen.

2. an animal carcinogen.

3. a suspected human or animal carcinogen.

4. a compound that has earned even limited tumorigenic data insufficient for definitive classification as a carcinogen.

Any compound denoted by a "+" symbol should be handled as if it were a known human carcinogen.

COMPRESSED GASES

GAS	HAZARD RATING			
	Health	Flammability	Reactivity	Contact
acetylene	2	2	2	0
air	0	0	0	0
argon	1	0	0	0
argon/methane	1	0	0	0
carbon dioxide	0	0	0	0
helium	0	0	0	0
hydrogen	0	3	3	0
liquid nitrogen				
nitrogen	0	0	0	0
nitrous oxide	2	0	3	2
oxygen	0	0	3	0
propane	0	3	0	0

LIQUIDS

LIQUID	HAZARD RATING				
	Health	Flam.	React.	Contact.	Carcin.
acetic acid	3	2	2	2	
acetone2	3	0	1		
acetonitrite	3	3	1	2	
aluminum ref. std. sln.	3	0	0	1	
ammonium hydroxide	2	0	0	3	
ammonium sulfide	3	3	1	2	
antimony ref. std. sln.	3	0	0	1	+
Aresol 22					
arsenic ref. std. sln.	U	0	0	1	+
azide, solution	3		3	3	
barium ref. std. sln.	0	0	0	1	
benzene3	3	0	2	+	
Brij-35					
bromochloromethane	2	U	U	U	
bromodichloromethane					
4-bromofluorobenzene					
bromoform	3	U	U	3	
bromomethane	3	1	0	3	
buffer solutions pH 9-11	U	U	U	2	
buffer solutions pH 6-8	2	0	0	1	
buffer solutions pH 3-5	0	0	0	1	
1-butanol (butyl alcohol)	1	3	0	1	
butyl benzyl phthalate	2	1	0	2	+
n-butylacetate	1	3	0	1	
n-butylbenzene	2	2	0	2	
t-butyl benzene	2	2	0	2	
cadmium ref. std. sln.	0	0	0	1	+
calcium hypochlorite	2	0	2	3	
calcium ref. std. sln.	0	0	0	1	
canada balsam	U	0	0	0	
carbon disulfide					

| | Health | Flam. | React. | Contact. | Carcin. |

Carbon tetrachloride	3	0	0	2	+
chlorobenzene	2	3	0	1	
chloroethane	2	3	1	2	
chloroform	3	0	0	2	+
chloromethane	2	3	0	2	
o-chlorotoluene	3	2	1	2	
2-chloro-6-(trichloro methyl) pyridine					
chromic acid	2	0	2	3	+
chromium ref. std. sln.	3	0	0	1	+
cobalt ref. std. sln.	0	0	0	1	
copper ref. std. sln.	0	0	0	1	
cyclohexane	2	3	0	0	
cyclohexanone	1	2	0	1	
detergent biodegradable	U	0	0	1	+
dibromochloromethane					
o-dichlorobenzene	2	2	0	1	+
1,3-dichlorobenzene		2			
1,4-dichlorobenzene	3	2	0	2	+
1,1-dichloroethane	2	3	0	2	
1,1-dichloroethene	2	3	2	2	
1,2-dichloroethene	2	3	2	2	
dichlorodifluoromethane (Freon-12)					
1,2-dichloroethane	2	3	0	1	+
1,4-diflourobenzene	3				
1,2-dichloropropane	2	3	0	2	
cis-1,3-dichloropropene	3	3	0	2	
trans-1,3-dichloropropene	3	3	0	2	
dimethyl mercury	3				
Eriochrome Black T. Soln.	1	3	0		
ethanol (ethyl alcohol)	1	3	0	0	+
ethyl acetate	2	3	0	1	
ethylbenzene	2	3	0	1	+
ethylene glycol	1	1	0	0	
ethyl ether	2	3	1	1	
FL-70 U	0	0	0		
formaldehyde	3	2	0	1	+

	Health	Flam.	React.	Contact.	Carcin.
glycerin	1	0	1		

gum turpentine	1	3	0	1	
hexadecane	U	U	U	U	
hexanes[1]	3	0	0		
2-hexanone	2	3	0	2	
hydrochloric acid	3	0	0	3	
hydrogen peroxide	2	0	1	3	+
iron ref. std. sln.	U	0	0	1	
isoamyl alcohol	1	2	0		
isopropanol (isopropyl alcohol)	1	3	0	0	
lactic acid (85%)	2	1	0	2	
lead ref. std. sln.	3	0	0	1	+
Levor IV					
Liqui-Nox	U	0	0	0	
magnesium ref. std. sln.	0	0	0	1	
manganese ref. std. sln.	0	0	0	1	
mercury[3]	0	0	2	+	
mercury ref. std. sln.	U	0	0	1	
methanol (methyl alcohol)	1	3	0	1	
2-methoxyethylene methyl-n-butyl methacrylate copolymer					
methyl-t-butylether	2	2	0		
methylethyl ketone	2	3	0	1	
methylisobutyl ketone	2	3	0	1	
methylene chloride	2	0	1	2	+
Micro U	0	0	1		
molybdenum ref. std. sln.	U	0	0	1	
n-propyl benzene	2	3	0	2	
nickel ref. std. sln.	U	0	0	1	+
nitric acid	3	0	0	3	
Octagon U	0	0	0		
2-octanol	2	2	0		

	Health	Flam.	React.	Contact.	Carcin.
oils: immersion pump (Technicon)					+

x-448 semi-fluid lubricant					
phosphoric acid	2	0	1	2	
pentane[1]	3	0	1		
perchloric acid	3	0	3	3	
Permount	2	3	0	1	
petroleum ether	1	3	0	1	
pH buffers:	2	0	0	0	
4	0	0	0	0	
7	0	0	0	0	
10	U	U	U	0	
phenylhydrazine	2	0	0	1	
phosphoric acid	2	0	1	3	
platinum chloride	3	0	0	0	
polyvinyl lactophenol					
potassium ref. std. sln.	0	0	0	1	
Pro-TEXX					
propionic acid	2	2	0	2	
n-propyl alcohol	3	3	0	2	
n-propylbenzene					
purgeable mixture A	1	3	0	2	+
purgeable mixture B	1	3	0	2	+
purgeable mixture C	1	3	0	2	+
purgeable aromatics	1	3	0	2	+
pyridine[2]	3	0	1		
refractive index liquids					
selenium ref. std. sln.	0	0	0	1	
silver ref. std. sln.	0	0	0	1	
sodium hypochlorite	U	0	0	2	
sodium n-dodecylbenzene sulfonate					
sodium ref. std. sln.	0	0	0	0	
strontium ref. std. sln.	2	0	0	0	
styrene monomer, inhibited	2	3	2	1	+

	Health	Flam.	React.	Contact.	Carcin.
sulfuric acid Sylon-CT	3	0	2	3	
1,1,2,2-tetrachloroethane	3	U	U	2	+
tetrachloroethene	2	U	U	2	+
tetrahydrofuran	2	3	0	1	
tin ref. std. sln.	3	0	0	1	
titanium ref. std. sln.	3	0	0	1	
toluene2	3	0	2		
1,2,4-trichlorobenzene	2	1	0		
1,1,1-trichloroethane	2	2	0	2	+
1,1,2-trichloroethane	2	2	0	2	+
trichloroethylene	3	1	0	2	+
trichlorotrifluoroethane (Freon)	1	0	0	1	
triethanolamine	3	1	1	2	
trimethylbenzene	2	0	0	1	
2,2,4 trimethylpentane	0	3	0	1	
vanadium ref. std. sln.	3	0	0	1	
vinyl acetate	2	3	2	1	
xylenes2	3	0	2		
zinc ref. std. sln.	3	0	0	1	

SOLIDS

SOLID	HAZARD RATING				
	Health	Flam.	React.	Contact.	Carcin.
acid spill kit	U	0	0	1	
alfalfa, dried					
alizarin[1]	1				
alizarin sodium monosulfonate					
alkyl benzene sulfonate	U	0	0	0	
1-allyl-2-thiourea	3				
alumina (aluminum oxide)	0	0	0	1	+
aluminon	3	0	0	U	
aluminum metal sticks	U	0	0	0	
aluminum nitrate	1	0	1	2	
aluminum potassium sulfate[1]	0	0	1		
4-aminoantipyrine	2	0	0	0	
1-amino-2-naphthol-4-sulfonic acid					
ammonium acetate	3	0	0	0	
ammonium chloride	2	0	1	1	
ammonium citrate, dibasic	1	0	0	1	
ammonium fluoride	3	0	1	3	
ammonium molybdate	1	0	0	1	
ammonium nitrate	0	0	3	1	
ammonium oxalate	U	0	0	1	
ammonium phosphate	1	0	0	1	
ammonium peroxydisulfate	2	0	1	1	
ammonium pyrolidine dithiocarbamate	U	0	0	1	
ammonium sulfamate	1	0	1	1	
ammonium sulfate	2	0	1	3	
ammonium thiocyanate	3	0	0	1	
ammonium vanadate	3	0	0	3	
anhydrone					
antimony	3	0	1	2	+
antimony potassium tartrate[3]	0	0	3	+	
d-araboascorbic acid	0	0	0	0	
arsenic trioxide	3	0	0	1	+
	Health	Flam.	React.	Contact.	Carcin.

1-ascorbic acid	0	0	0	0	
Ascante					
Ascarite II					
bacto agar	U	U	U	U	
barbituric acid	1	0	0	1	
barium chloride	3	0	1	1	
basic fuchsin					
benzoic acid	1	0	0	0	
beryllium sulfate	3	0	1	2	+
boric acid	3	0	0	2	
Brilliant Green Bile broth	U	U	U	U	
bromocresol green	U	0	0	3	
bromophenol blue					
bromothymol blue	U	U	0		
bromothymol blue, sodium salt					
brucine sulfate	3	0	0	3	
butyric acid	2	2	0	2	
butyric acid, sodium salt			0		
cadmium metal (dust)	3	2	2	1	+
cadmium carbonate	2	0	0	0	
cadmium chloride	2	0	0	0	+
cadmium nitrate	3	0	3	0	+
cadmium sulfate	3	0	0	1	+
calcium carbonate					
calcium chloride	3	0	1	2	+
calcium hydroxide	1	0	0	3	
calcium hypochlorite	2	0	2	2	
calcium nitrate	2	0	2	0	
calcium oxide	1	0	2	2	
calcium phosphate, tribasic	0	0	0		
calcium sulfate	1	0	0	0	
calmagite					
carbon, deodorizing, neutral	1	0	0		
celite					

	Health	Flam.	React.	Contact.	Carcin.
cellulose acetate	0	0	0	0	
ceric ammonium nitrate	U	U	U		

ceric sulfate	1	0	0	2	
chromium chloride	2				
chromotropic acid					
chloral hydrate	3	2	0	1	+
chloramine-T	1	0	0	1	
p-chloroaniline	3			3	
chlorocresol	3			3	
chloroplatinic acid	3	0	0	2	
chromium trioxide	3	0	3	2	+
citric acid	2	0	0	1	
cobalt(ous) chloride	2	0	0	1	
congo red					
copper foil					
copper powder	2	0	0	1	+
cupric sulfate	3	0	0	1	
cuprous chloride	2	0	0	1	
Curcumin					
dextrose	0	0	1		
diaminobenzidine tetra hydrochloride					+
p-dichlorobenzene	2	2	0	1	
N,N-diethyl-p-phenylene diamine					
N,N-diethyl-p-phenylene-diamine-oxalate	U	0	0	1	
4,5-dihydroxy-3-(p-sulfophenylazo)-2, 7-naphthalene disulfonic acid, trisodium salt					
p-dimethylamino-benzaldehyde	1	0	1	1	
s-(p-dimethylaminobenzylidene) rhodamine					+
dimethylarsenic acid	2				+
3,3'-dimethyl-1,1-diphenyl-(4,4', bi-2-pyrazoline)-5,5'-dione					
dimethylglyoxime	3	0	0	1	

	Health	Flam.	React.	Contact.	Carcin.
2,9-dimethyl-1,10-phenanthroline	U	0	0	0	
diphenylamine sulfonic acid sodium salt					

diphenylcarbazone	U	0	0	1	
1,5-diphenylcarbon-hydrazide	U	0	0	1	
4,7-diphenyl-1,10-phenanthroline	U	0	0		
N,N'-diphenyl-p-phenylenediamine	2	1			+
diphenylthiocarbazone	3	0	0	2	
2,6-di-t-butyl-cresol	2	1			+
dithizone					
dodecyl sodium sulfate	3	1	0		
Drierite (calcium sulfate)	0	0	0	0	
EC medium	U	U	U	U	
m-endo broth	U	O	O	U	+
eriochrome Black T					
ethylenediamine dihydrochloride	2	0	0	0	
ethylenediaminetetraacetic acid (EDTA):	3	0	0	1	
dipotassium salt of EDTA	0	0	0	1	
disodium salt of EDTA	0	0	0	1	
magnesium disodium salt of EDTA	U	0	0	1	
tetrasodium salt of EDTA	1	0	0	1	
ethylmercurithiosalicylic acid, sodium salt	3	0	0	1	
mFC broth	U	U	U	U	
ferric chloride	2	0	0	1	
ferric nitrate	2	0	0	1	
ferrous ammonium sulfate	1	0	0	1	
ferrous sulfate	2	0	0	1	
ferrous sulfide	U	0	0	1	

	Health	Flam.	React.	Contact.	Carcin.
Florisil (magnesium silicate)	1	0	0	1	
fluorescein	1	0	0	U	
gallic acid	2	0	1	2	
glucose0	0	0	0		
glutamic acid	2	0	0	1	

gold metal	0	0	0	1	
gum arabic	0	0	0	1	
gum tragacanth	1	0	0		
hydrazine sulfate 3	0	0	3	+	
hydroxylamine hydrochloride	3	0	3	1	
hydroxylamine sulfate	2	0	1	1	
8-hydroxyquinoline	3	0	0	2	+
iodine 1	0	1	3		
ion exchange resins:	1	0	0	0	
Amberlite IR-120 plus (H) anion resins					
Bio-Rex 70, sodium form, cation cation resins					
Permutit S-100					
iron dust	0	0	0	0	
iron wire	0	0	0	0	
kaolin	1				
lactose broth	U	U	U	U	
lanthanum chloride	U	0	0	1	
lanthanum oxide	0	0	0	1	
laurel tryptose broth	U	U	U	U	
lead	3	0	0		
lead acetate	3	0	0	2	+
lead carbonate	2	0	0	1	+
lead dioxide	3	0	0	1	
lead nitrate	1	0	0	1	
linear alkyl sulfonate (LAS)	0	0	0		
lithium carbonate	2	0	0	0	
lithium chloride	2	0	0	0	+

	Health	Flam.	React.	Contact.	Carcin.
magnesium carbonate	U	0	0	0	
magnesium chloride	3	0	0	1	
magnesium disodium ethylene diamine tetraacetate	U	0	0		
magnesium metal (ribbon)	3	3	2		

magnesium nitrate	2	0	0	2	
magnesium oxide	2	0	0	1	
magnesium perchlorate	2	0	0		
magnesium sulfate	2	0	0	1	
malachite green-oxalate	3	0	0		
manganese dioxide	2	0	0	1	
manganese metal	3	2			+
manganous sulfate	U	0	0	1	
mercuric chloride	3	0	0	2	
mercuric iodide	3	0	0	1	
mercuric nitrate	3	0	3	2	
mercuric oxide	3	0	0	1	
mercuric sulfate	3	0	0	1	
mercuric thiocyanate	3	0	0	1	
mercurous chloride	3	0	0	3	
methenamine	3	0	0		
3-methyl-1-phenyl-2-pyrazolin-5-one					
methylene blue	3	0	0	1	
methylene blue double zinc salt					
methyl red	U	0	0	0	+
methyl thymol blue	U	0	0	0	
methyl violet B					
molybdic acid (85%)	1	0	0		
mordant blue B					
murexide					
naphthalene	2	2	0	1	
2,7-naphthalene disulfonic acid, trisodium salt					
1-naphthol	1	0	0	2	
1-naphthylamine hydrochloride	3	0	0	0	
N-1-naphthylethylenediamine dihydrochloride					
nickel(ous) chloride	3	0	0	1	+
nickel cyclohexane butyrate					
nickel(ous) nitrate	2	0	0	1	+
nickel(ous) sulfate	3	0	0	1	+
N-serve nitrogen stabilizer					
p-nitrophenol, sodium salt	U	0	0	3	

nitroso R salt					
oxalic acid	3			2	
palladium on alumina					
1-10-phenanthroline	U	0	0	1	
phenol 3	2	0	3	+	
phenolphthalein	1	0	0	2	
phenol red	2	0	0	0	
phenylarsine oxide	3	0	0	1	+
phenylhydrazine hydrochloride	3	0	0	2	+
o-phenylphenol, sodium salt	2	1	0	1	
phloxine B	U	0	0	1	
phosphomolybdolic acid	U	0	0	1	
phosphoric tungstic	2	0	0		
platinum(ic) potassium chloride	3	0	0	1	
poirrer's blue					
polyvinyl alcohol	2	2	1	2	+
potassium biiodate	1	0	0	1	
potassium biphthalate	0	0	0	0	
potassium bisulfate	2	0	0	3	
potassium bitartrate	0	0	0	0	
potassium borate	2	0	0	1	
potassium bromate	1	0	0	1	
potassium bromide	2	0	0	1	
potassium carbonate	U	0	0	2	
potassium chlorate	2	0	0	2	
potassium chloride	1	0	0	0	
potassium chromate	3	0	1	2	+
potassium cyanate	2	0	U	1	
potassium cyanide	3	0	U	1	

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potassium dichromate	3	0	1	2	+
potassium ferricyanide	2	0	0	1	
potassium ferrocyanide	1	0	0	1	
potassium fluoride	3	0	0	2	
potassium hydrogen phthalate	0	0	0	0	
potassium hydroxide	3	0	1	3	
potassium iodate	1	0	0	0	

potassium iodide	2	0	0	1	
potassium nitrate	3	0	0	1	
potassium nitrite	3	2	1	2	
potassium oxalate	3	0	0	2	
potassium periodate	1	0	0	1	
potassium permanganate	3	0	0	1	
potassium persulfate	2	0	0	2	
potassium phosphate, dibasic	U	0	0	1	
potassium phosphate, monobasic	U	0	0	1	
potassium platinum chloride	3	0	0		
potassium pyrosulfate					
potassium sulfate	2	0	0	1	
potassium thiocyanate	3	0	0	1	
pyrogallic acid	2	2	0	2	
pyrocatecholsulfonephthalein					
pyrolytic graphite					
Rexyn 101	U	U	0		
rhodamine B	U	0	0	0	
rosolic acid	U	U	U	U	
safranin O	U	0	0	0	
salicylic acid	1	0	0	2	
selenium dioxide	3	0	0	0	
selenium powder	3	0	0	0	
selenous acid	3	0	0	2	
silica gel (silicon dioxide)	U	0	0	1	

	Health	Flam.	React.	Contact.	Carcin.
silicic acid	3	0	0	U	
silicon carbide	1				
silver amalgam					
silver chloride	U	0	0	1	
silver diethyldithio-carbamate	U	0	0	1	
silver nitrate	2	0	3	1	
silver oxide	2	0	0	U	
silver sulfate	U	0	0	1	
sodium acetate	2	0	0	1	
sodium aluminate	2	0	0	3	
sodium ammonium phosphate	U	0	0	1	

sodium arsenite	3	0	0	1	+
sodium azide	3	0	2	1	
sodium bicarbonate	1	0	0	1	
sodium bisulfite	3	U	U		
sodium borate	2	0	0	1	
sodium borohydride	2	0	3	3	
sodium carbonate	3	0	0	1	
sodium cobaltinitrite	U	0	0		
sodium chloride	2	0	0	0	
sodium citrate	U	0	0	U	
sodium cyanide	3	0	0	1	
sodium dichlorotriazine trione					
sodium dichromate	3	0	1	2	+
sodium dodecylsulfate	2	0	0	0	
sodium fluoride	2	0	0	2	
sodium formate	2	0	0		
sodium hydroxide	3	0	1	3	
sodium iodide	2	0	0	1	
sodium lauryl sulfate	2	0	0	1	
sodium meta silicate	U	0	0	2	
sodium nitrate	1	0	0	1	
sodium nitrite	3	0	0	1	
sodium nitroprusside	3	0	0	1	
sodium oxalate	3	0	0	2	
sodium periodate	3	0	0	1	
sodium phosphate, dibasic	2	0	0	1	
sodium phosphate, monobasic	2	0	0	2	
sodium potassium tartrate	0	0	0	0	
sodium salicylate	1	0	0	1	
	Health	Flam.	React.	Contact.	Carcin.
sodium selenate anhydrous	3			+	
sodium selenite	3	0	0	0	
sodium silicate	1	0	0	0	
sodium sulfate	1	0	0	1	
sodium sulfide	1	3	3	2	
sodium tartrate	0	0	0	0	
sodium tetraethylene diamine tetra acetate	3	1	0		
sodium thiosulfate	2	0	0	1	
sodium tungstate	3	0	0	1	
d-sorbitol	0	0	0	0	
stannous chloride	3	0	0	1	
stannous sulfate	U	0	0	1	
starch	0	0	1		

KF streptococcus agar	U	U	U	U	
sulfamic acid	3	1	1	2	
sulfanilamide	2	0	0	0	
sulfanilic acid	1	0	0	0	
sulfosalicylic acid	2	U	U		
sulfur, sublimed	1	1	0	0	
tannic acid	1	1	0	1	+
tartaric acid	0	1	0	1	
tetra acetic acid dipotassium salt (ethylene dinitrilo)					
tetrabromophenol sulfonphthalein					
thallium nitrate	3	0	0	0	
thallous chloride	3	0	0	0	
thiazole yellow (Titan yellow)					
thymol blue	U	U	0		
trimethyldichlorosilane					
tris (hydroxymethyl) aminomethane (Tham)	1	0	0	1	
thioacetamide	3	0	0	1	+
thiourea3	0	0	1	+	
thorin					
tin nitrate	1	0	0	0	
o-tolidine dihydrochloride	3	0	0	1	+
tricaine methanesulfonate					
2,3,5-triphenyltetrazolium chloride	3	0	0	1	

	Health	Flam.	React.	Contact.	Carcin.
trout chow					
tryptic soy agar	U	U	U	U	
uranine2	0	0			
uranium nitrate	3	0	3	1	
uranyl acetate, dihydrate	3	0	0	1	+
urea	0	0	1		
vanadium oxobis- (1-phenyl-1,3-butane) dionate					
vanadium pentoxide	3	0	0	2	
Variamine blue B hydrochloride					
xylene cyanol FF					
yeast	0	0	0	0	

zinc acetate	2	0	0	1	
zinc metal amalgam (contains Hg)	3	0	0	2	+
zinc sulfate	2	0	0	1	
zirconium sulfate	3				

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