



City and County of Broomfield Environmental & Wastewater Laboratories

CHEMICAL HYGIENE PLAN

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Broomfield Environmental Laboratory	Broomfield Wastewater Laboratory
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1.0 Introduction and General Principles

The Occupational Safety and Health Administration (OSHA) Laboratory Standard, 29 CFR 1910.1450, addresses occupational exposure to hazardous chemicals in laboratories. This rule requires all employers covered by the standard to develop and implement a Chemical Hygiene Plan (CHP).

A CHP is defined as a written program which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace. Components of the CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

As required, this CHP has been prepared for use by the City and County of Broomfield Environmental Laboratory and Wastewater Laboratory. The Superintendent of Environmental Services and Laboratory Supervisor, in cooperation with the Superintendent of Water Treatment and the Superintendent of Wastewater, will maintain the facilities and procedures employed in the laboratory compatible with current knowledge and regulations in laboratory safety. Copies of the CHP are maintained in each laboratory and in the Laboratory Supervisor's office for use by laboratory personnel. The CHP will be reviewed, evaluated, and updated annually.

All laboratory personnel shall receive training on the CHP and must follow the procedures outlined in this plan. All operations performed in the laboratory must be planned and executed in accordance with the enclosed procedures. In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves and co-workers.

2.0 Chemical Hygiene Responsibilities

2.1 Superintendents

The Superintendent of Environmental Services has responsibility for chemical hygiene in the Environmental Laboratory and the Wastewater Laboratory. The Superintendent of Water Treatment Operations has the ultimate responsibility for chemical hygiene throughout the Water Treatment Facility and the Superintendent of Wastewater has the ultimate responsibility at the Wastewater Reclamation Facility, including the smoke detection/heat sensors, fire suppression system, alarms, and fire extinguishers.

2.2 Laboratory Supervisor

The Laboratory Supervisor shall:

- Maintain current knowledge concerning the legal requirements of regulated substances in the laboratory.
- Keep Superintendents informed of any problems and/or changes related to the chemical hygiene plan.
- Maintain overall responsibility for the laboratory operation.
- Ensure that appropriate training has been provided to employees and that the training is documented. Budget and schedule training as needed.
- Monitor procurement and use of chemicals in the lab, including determining that facilities and training levels are adequate for the chemicals in use.
- Monitor the waste disposal program.

2.3 Chemical Hygiene Officer

A laboratory staff member fulfills the responsibilities of the Chemical Hygiene Officer, and shall:

- Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices.
- Perform regular inspections of the laboratory safety equipment according to the *Laboratory Safety Equipment Inspection Schedule* (Appendix A). Inform Laboratory Supervisor of needs for additional and/or replacement safety equipment.
- Perform regular, formal, chemical hygiene and housekeeping inspections according to the *Laboratory Inspection Checklist* (Appendix B).
- Review and update the Chemical Hygiene Plan on an annual basis.
- Ensure that laboratory staff know and follow the chemical hygiene rules.
- Determine the proper level of personal protective equipment, and ensure that such protective equipment is available and in working order.

2.4 Laboratory Staff

Each individual member of the laboratory staff shall:

- Plan and conduct each laboratory operation in accordance with the Chemical Hygiene Plan.

- Practice good personal chemical hygiene habits.
- Notify the Laboratory Chemical Hygiene Officer of any symptoms or unusual effects that might possibly be related to the use of, or exposure to, chemicals, reagents or samples.
- Know where emergency equipment and first aid supplies are located.

3.0 Employee Information and Training

3.1 Hazard Information

All employees must have an awareness of the hazards presented by the chemicals in use in the laboratory. Each employee shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer (or designee).

3.2 Training

As part of new employee orientation, training shall include methods of detecting the presence of a hazardous chemical, physical and health hazards of chemicals in the lab, and measures employees can take to protect themselves from these hazards. The training shall present the details of the Chemical Hygiene Plan, and shall include:

- The contents of the OSHA laboratory standard, and its appendices.
- The location and availability of the Chemical Hygiene Plan.
- Signs and symptoms associated with exposure to the chemicals present in the laboratory.
- Location and availability of Material Safety Data Sheets (MSDS), Safety Data Sheets (SDS), and reference materials on chemical hygiene.
- Location and use of all safety equipment in the laboratory.
- Training will be documented on the personnel roster (cover sheet) attached to this document, or training roster for each training event.
- Other safety training materials that may be used:
 - Audiovisual programs;
 - Written materials;
 - Demonstrations; and
 - Other training programs- such as seminars and workshops.

4.0 Criteria for Implementation of Control Measures

4.1 Air Sampling

- Under normal operating conditions using current analytical procedures, routine air monitoring is not necessary. Air sampling for evaluating employee exposure to chemical substances shall be conducted as needed, or as specified by specific codes or regulations.
- Upon addition of new chemicals or changes in control procedures, additional air sampling will be considered to determine the exposures. Air sampling will be conducted if there is reason to believe that exposure levels for regulated substances that require sampling may exceed the action level, or in the absence of an action level, the Permissible Exposure Limit (PEL). Air sampling will be implemented if use of highly toxic substances exceeds three times per week.
- The results of any air sampling studies performed in the laboratory will be recorded and maintained on the *Air Sampling Data Record* (Appendix D).

4.2 Housekeeping

Each laboratory worker is directly responsible for the cleanliness of his or her work space, and jointly responsible for common areas of the laboratory. Laboratory management shall insist on the maintenance of housekeeping standards. The following procedures apply to the housekeeping standards of the laboratory:

- Detailed guidance for laboratory chemical spill response is provided in Section 11. Additional information for spilled chemicals may be found in available resources such as the MSDS, SDS, and the Hazardous Laboratory Chemical Disposal Guide.
- The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.
- The work area shall be cleaned at the end of each operation and each workday.
- All apparatus shall be thoroughly cleaned and returned to storage upon completion of use.
- All floors, aisles, exits, fire extinguishing equipment, eyewashes, showers, electrical disconnects and other emergency equipment shall remain unobstructed.
- Chemical containers shall be clean, properly labeled according to Section 6.8, and returned to storage upon completion of use.

- When a hazardous chemical expires or otherwise becomes hazardous waste, the appropriate information is entered on the *Hazardous Waste Inventory and Disposal Log Sheet* (Appendix C). Once logged in, the waste is then stored in the appropriate hazardous waste storage area until disposal is scheduled (usually on an annual basis, depending on the quantity generated). Waste chemicals must be properly labeled according to Section 6.8 and stored separately from chemicals currently in use. Wastes are separated by compatibility class.

4.3 Safety and Emergency Equipment

- In the event of an emergency, dial 9+911 for immediate assistance. Non-emergency contact information including telephone numbers of supervisors and other facility personnel are posted in the office areas.
- All laboratory personnel should have an awareness of proper use of fire extinguishers according to the **PASS** process (**P**ull the pin, **A**im the nozzle, **S**pray the retardant, **S**weep the base of the fire).
- All employees who might be exposed to chemical splashes shall be instructed in the location and proper use of emergency showers and eyewashes. The eyewash shall be inspected weekly, and the emergency shower monthly. These inspections shall be performed by the laboratory employees, and shall be in accordance with ANSI Z358.1 and manufacturer's specifications. Records shall be maintained.
- Location signs for safety and emergency equipment have been posted.
- Automated External Defibrillator (AED) units are located on the north wall outside the Wastewater Laboratory, and on the north wall outside the lunchroom in the Environmental Laboratory. Although operation of these units is largely self-guided via voice prompts from the AED itself, laboratory personnel are encouraged to attend AED training offered by the HR Training Program.
- A first-aid kit containing disinfectant pads, burn ointment, tweezers, bandages, and other products is located in the main laboratory at each facility. A private medical supply company maintains these supplies on a regular basis.
- Disinfectant shall be used to clean the countertops before and after a microbiological analysis. Used microbiological media shall be autoclaved at 121° C for 30 minutes in biohazard autoclave bags to destroy bacteria. Some autoclave bags have a temperature indicator patch that indicates when contents have been autoclaved. If those aren't used, the bag must be labeled with autoclave tape to identify that contents have been autoclaved. The bag and contents may then be placed into the normal sanitary trash container for disposal.

5.0 Engineering Controls

- The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized.
- No modification of engineering controls will occur unless testing indicates that worker protection will continue to be adequate.
- Improper function of engineering controls must be reported to the Chemical Hygiene Officer or Laboratory Supervisor immediately. The system shall be taken out of service until proper repairs have been executed.
- All employees shall follow proper work practices when using the engineering controls.

5.1 Local Exhaust Ventilation

The following procedures shall apply to the use of local exhaust ventilation intakes (e.g., above AA, GCMS and ICPMS instrumentation):

- Openings of intakes shall be placed as close as possible to the instrument being ventilated.
- Fans are to be "on" when equipment or area is in use, or the potential for release of hazardous chemicals exists. In the Environmental Lab, the fans are automatically activated when the room light switches are on. At the Wastewater Lab, the ICPMS fan is on continuously.
- After analysis, exhaust intake fans should be operated for an additional period of time sufficient to clear residual contaminants from the workspace and ductwork.
- The exhaust intakes shall be inspected monthly. The airflow shall be measured at different levels with a velocity meter and recorded as part of the monthly safety inspection. The exhaust intake face velocity should be approximately 100 feet per minute with a minimum of 70 feet per minute.
- Prior to a change in chemicals or procedures, the adequacy of the ventilation system shall be determined by the Chemical Hygiene Officer (or designee).

5.2 Laboratory Hoods

The laboratory hoods shall be used for all chemical procedures which might result in release of hazardous chemical vapors or dust. As a general rule, the hood shall be used for all chemical procedures involving substances which are appreciably volatile

and have a permissible exposure limit (PEL) less than 50 ppm. PELs (or Threshold Limit Values (TLV's)) are listed on the MSDS or SDS. The hood should also be used with any reacting chemical system because it places a physical barrier between the work and the chemical reaction when the sash is closed. In particular, laboratory work including, but not limited to, these chemicals must be performed inside a hood to the maximum extent practicable:

- Methylene chloride
- Chloroform
- Sulfuric acid
- Acetic acid
- Hydrochloric acid
- Phosphoric acid
- Nitric acid
- Potassium hydroxide
- Sodium hydroxide

The following work practices shall apply to the use of hoods:

- Confirm adequate hood ventilation performance prior to opening chemical containers inside the hood. An inward flow of air can be confirmed by holding a piece of paper at the face of the hood and observing the movement of the paper.
- Keep the sash of the hood closed (at the level of maximum face velocity) at all times except when adjustments within the hood are being made. At these times, maintain the sash height as low (close to the level of maximum velocity) as possible.
- Storage of chemicals and equipment inside the hood shall be kept to a minimum.
- Minimize interference with the inward flow of air into the hood. Do not place equipment or other objects where they will interfere with air flow.
- Leave the hood operating when hazardous chemicals are present inside the hood, or to maintain adequate overall laboratory ventilation.
- When mechanical ventilation is not in operation, hazardous substances in the hood shall be covered or capped off.
- The hood shall not be used as a means of disposal for volatile chemicals.
- Prior to the introduction of new chemicals, the adequacy of hood ventilation systems shall be evaluated by the Laboratory Supervisor or Chemical Hygiene Officer.
- The fume hoods shall be inspected monthly. The airflow shall be measured at

different levels with a velocity meter and recorded as part of the monthly safety inspection. The hood face velocity shall be maintained between 75 and 125 feet per minute.

5.3 Storage Cabinets

- Storage cabinets for flammable and hazardous chemicals are provided and labeled in the laboratory.

6.0 Standard Operating Procedures for Laboratory Chemicals

6.1 Chemical Procurement

- The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal. The smallest quantity deemed necessary shall be purchased to reduce disposal costs.
- Requests for procurement of new chemicals (not previously handled in the laboratory) shall be submitted to the Laboratory Supervisor for approval. Information on proper handling, storage and disposal shall be provided to all involved personnel. Chemicals used in the laboratory shall be limited to those which are appropriate for the ventilation system and other protective equipment.
- The Material Safety Data Sheet or Safety Data Sheet for the new chemical should be received from the vendor prior to the chemical procurement.
- All chemicals shall be received and unpacked in the sample prep room (Environmental Lab) or the main chemistry laboratory (Wastewater Lab). Personnel who receive the chemicals must check the container for leaks and record on the lab supply order form that the chemical was received. Chemical containers (including cylinders of compressed gas) shall not be accepted without accompanying labels, material safety data sheets and packaging in accordance with all appropriate regulations. All chemicals must be dated when received and again when opened. Upon receipt of each chemical, and when a chemical container is emptied or taken out of service, the chemical inventory database must be updated with appropriate information.

6.2 Chemical Storage

- After receipt and inventory update, chemicals shall be immediately moved to the designated storage area. Large glass containers such as acid bottles shall be placed in carrying containers or shipping containers during transportation.
- The storage area shall be well-illuminated, with all hazardous chemical storage maintained below eye level if possible

- Chemicals shall be segregated by hazard classification and compatibility in a well identified area. Exposure to heat or direct sunlight shall be avoided. The storage area shall be properly ventilated to ensure personnel safety.
- Mineral acids (hydrochloric, sulfuric, nitric) shall be separated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area but separated from incompatible materials by as much space as practicable, or by intervening storage. Organic acids, such as acetic, are to be stored separately from mineral acids.
- Acid-resistant trays shall be placed under bottles of mineral acids. Nitric acid requires high-density polyethylene storage trays.
- Acid-sensitive materials such as cyanides and sulfides (reactives) shall be separated from and protected from contact with acids.
- The storage area shall not be used as a preparation or repackaging area. The original containers are to be taken to the work area, the minimum amount of chemical necessary for the task dispensed, and the original container returned to storage.
- The storage area shall be accessible during normal working hours. The storage area is under the control of the Laboratory Supervisor.
- When chemicals which might pose a risk to worker health or safety are taken from the storage area, they shall be placed in an outside container or bucket. An appropriate container shall be kept in the storage area.
- Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for the immediate task. The container size shall be the minimum convenient. The amounts of chemicals at the lab bench shall be as small as practical.
- Stored chemicals shall be examined at least annually by the Chemical Hygiene Officer (or designee) for replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage area as a result of leaking chemicals.
- Periodic inventories of chemicals shall be conducted by the Chemical Hygiene Officer (or designee). Unneeded and/or expired items shall be removed from the chemical inventory database and properly disposed.
- Laboratory refrigerators are used for the storage of reagents and samples only. Food is prohibited. All containers in the refrigerator must be properly labeled with chemical or sample location name, date of acquisition or preparation, initials of

preparer, concentration (as appropriate), and any potential hazards.

- Never place beakers or unstoppered vessels containing chemicals in the refrigerator.

6.3 Chemical Handling

Each employee should develop and implement good work habits consistent with this CHP to minimize personal and co-worker exposure to the chemicals in the laboratory. There are four exposure routes for chemicals to enter the body:

- **Inhalation** of the chemical into the respiratory tract.
- **Absorption** through direct contact with the skin.
- **Ingestion** of the chemical via the digestive tract by eating with contaminated hands or in contaminated work areas.
- **Injection** of the chemical directly into the bloodstream from contaminated sharp objects.

To minimize or eliminate exposure via these exposure routes, these general precautions shall be followed for the handling and use of all chemicals:

- The engineering controls and safety equipment in the laboratory shall be used and inspected in accordance with Section 5.0. These inspections shall be performed and documented according to the *Laboratory Safety Equipment Inspection Schedule* (Appendix A).
- Direct skin contact with all chemicals shall be avoided.
- All employees shall wash all areas of exposed skin prior to leaving the laboratory.
- Mouth suction for pipeting or starting a siphon is prohibited.
- Avoid pointing the mouth of a vessel being heated towards anyone, including yourself.
- Never add solids such as boiling chips to a hot liquid as the result may be violent boiling. Perform such additions when the liquid is still at room temperature.
- Chemical storage areas, refrigerators, glassware, or utensils also used for laboratory operations shall not be used for the storage or consumption of food or beverages.
- In all cases of chemical exposure, the TLV established by the ACGIH and the

PEL enforced by OSHA shall not be exceeded. If the exposure limits differ for a particular chemical, the more conservative value shall apply.

- Risk determinations shall be conservative in nature. Therefore, any chemical mixture shall be assumed to be as toxic as its most toxic component (e.g. arsenic in phenylarsine oxide titrant). Substances of unknown toxicity shall be assumed to be toxic.
- Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure. This information is included in the MSDS's or SDS's and should be reviewed by employees when a new or unfamiliar chemical is used.
- The intent and procedures of this CHP shall be continuously exercised and adhered to.

6.4 Compressed Gas Cylinders

- Keep compressed gas cylinders secured at all times by using a cylinder bracket, strap, chain, or stand to prevent tipping or falling.
- Identify the contents with a legible label.
- Do not expose cylinder to temperatures above 125° F.
- Use a cylinder cart to move cylinders. Always remove regulator and install protective cylinder cover prior to movement.
- Do not modify or tamper with a cylinder valve or regulator.
- Gases utilized in the Wastewater Lab are argon (liquid), helium, hydrogen, and nitrogen. Nitrogen is located in the gas storage building behind the ICP/MS room. Helium and hydrogen are stored in the ICP/MS room. An additional bottle of helium is stored in the main laboratory. The liquid argon is in a large dewar secured on a concrete pad behind the laboratory. No smoking is allowed.
- Gases utilized in the Environmental Lab are acetylene, helium, and nitrogen. All compressed gas cylinders in use are located next to the instrument or process they support, except for acetylene. Acetylene and gas cylinders not currently in use are kept in the gas storage room just north of the main chemistry lab, accessed from the east side of the WTF. No smoking is allowed.
- To detect for gas leaks, soapy water should be used except during freezing weather, when a 50% glycerin water solution shall be used. If a leak is present, bubbles will form.

- Pressure regulators are visually inspected each time the gas is turned on. If a problem is detected, the regulator will be inspected and replaced if necessary.

6.5 Laboratory Equipment and Glassware

- Each employee shall keep the work area clean and uncluttered.
- All chemicals and equipment shall be properly labeled in accordance with Section 6.8.
- At the completion of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

- All laboratory equipment shall be used only for its intended purpose.
- All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
- Protective gloves must be worn when picking up broken glass. Small pieces shall be swept up with a broom and dustpan which is located in the laboratory.
- Labels shall be attached to all chemical containers, identifying the contents and related hazards.
- Receptacles for in-process collection of wastes shall be identified as such.

6.6 Personal Protective Equipment (PPE)

- Employees will wear safety glasses meeting ANSI Z87.1 at all times when performing analytical activities, transferring chemicals and handling chemicals. Contact lenses are inadvisable in laboratory environments, but are permitted in the laboratory provided that safety glasses are worn at all times, and the Chemical Hygiene Officer and co-workers are aware that the employee wears contact lenses. All full-time and part-time employees are provided with an allowance toward the purchase of safety frames and lenses. Employees who require prescription lenses must obtain and furnish the prescription.
- Chemical goggles and/or a face shield should be worn when the possibility of splashing exists, such as when acid-washing glassware.
- A rubber apron, gloves, safety glasses and a face shield must be worn at the Wastewater Lab when acid-washing glassware.
- Jeans or long pants must be worn in the laboratory. Shorts are prohibited.

- Thermal-resistant gloves shall be worn for operations involving the handling of heated materials. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated. Tongs are also available for handling heated materials.
- Sandals, perforated shoes, sneakers (canvas), and bare feet are prohibited. Safety shoes, per ANSI 47 are required where employees routinely lift heavy objects. Safety shoes are also required when sampling. All employees are provided with an allowance toward the purchase of approved safety shoes.
- Lab coats and aprons are provided as PPE for usage in the laboratory. Laboratory coats and aprons shall be replaced as needed. At the Environmental Lab, the employee may launder these items as needed. At the Wastewater Lab, dirty lab coats and aprons shall be placed on the bench in the lobby on Friday to be laundered every weekend by the operator on duty.
- Appropriate chemical-resistant gloves based on vendor specifications shall be worn to eliminate direct skin contact with chemicals. Chemical resistant gloves shall be worn when acid-washing glassware, during chemical handling and as the situation demands. A list of proper chemical resistant gloves is in Appendix G. Durable gloves shall be washed after each use to avoid contamination. Used gloves shall be inspected prior to re-use. Damaged or deteriorated gloves should be immediately replaced.

6.7 Personal Work Practices

- Laboratory supervision must ensure that each employee knows and follows the rules and procedures established in this plan.
- All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The supervisor must correct unsafe practices and or conditions promptly.
- Avoid eating, drinking, gum chewing, or application of cosmetics in the analytical laboratory.
- Loose-fitting clothing shall be confined close to the body to avoid chemical spills, glassware breakage, or chemical contamination caused by the loose garments.
- Avoid unnecessary exposure to all chemicals by any route.
- Never taste any chemical. If it is necessary to smell a chemical, hold the container away from the face and use hand to wave vapor toward nose.

- Encourage safe work practices in co-workers by setting the proper example. Horseplay and startling or distracting other employees is strictly forbidden.
- Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.
- Use engineering controls in accordance with Section 5.0.
- Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

6.8 Labeling

- All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The label shall contain the chemical name (preferable the name and not the symbol), indication of associated hazards and date of acquisition, at a minimum. If the container has been opened then the date opened shall be indicated.
- The vendor label shall be informative and durable, and at a minimum will identify contents, source, acquisition date, storage requirements, and indication of hazard.
- Portable containers, such as volumetric flasks or reagent bottles, shall be labeled by the individual using the container. The minimum information required includes the identity and concentration of the contents, the analyst, and date made.
- Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer. If employee leaves the laboratory, the container must be labeled.
- The labeling program shall be periodically inspected by the Chemical Hygiene Officer to ensure that labels are intact, readable and complete.

6.9 Chemical and Waste Disposal

- Before a chemical is procured, the waste characteristics and appropriate disposal procedures will be determined. All waste will be identified, treated, stored and disposed in accordance with applicable waste regulations.
- The Chemical Hygiene Officer (or designee) is responsible for providing training to ensure that all personnel know the proper disposal procedures for the

chemicals they use.

- All non-hazardous solid waste discarded in the general trash will be wrapped securely to prevent exposure to both on- and off-site personnel. Sharp items must be wrapped or taped to prevent cutting or puncture hazards, and can be disposed in the broken glass container.
- Non-hazardous waste disposed of via drains should be diluted with sufficient cold tap water to thoroughly flush the drain. The container shall be placed in the appropriate receptacle (glass in the broken glass receptacle and plastic in the trash can) and disposed.
- When a hazardous chemical expires or otherwise becomes hazardous waste, the appropriate information is entered on the *Hazardous Waste Inventory and Disposal Log Sheet* (Appendix C). The waste is then stored in the appropriate hazardous waste storage area until disposal can be scheduled (usually on an annual basis, depending on the quantity generated). Waste chemicals must be clearly labeled and stored separately from chemicals currently in use. Wastes are separated by compatibility class.

7.0 Approval of Laboratory Activities

- Laboratory personnel are not authorized to work after hours in the lab, except when permitted.
- At no time shall work be performed in the laboratory when the only person in the building is the laboratory person performing the work. Any work to be performed alone can only be approved by the Laboratory Supervisor.
- All hazardous operations are to be performed during a time when at least two employees are present at the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the Laboratory Supervisor.
- When laboratory operations are performed which will be unattended by laboratory personnel (e.g., operation of the ICPMS in conjunction with autosampler, overnight reactions, etc.), the laboratory supervisor will review work procedures to ensure the safe completion of the operation.

8.0 Medical Consultations and Examinations

An opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory. The opportunity for medical attention will be made available to employees whenever an employee develops signs or symptoms

associated with a hazardous chemical to which the employee may have been exposed in the laboratory. The exposure may be due to an event such as a spill, leak, explosion or other occurrence.

- Medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician.
- All employees must obtain evaluation and treatment of work-related injuries or illnesses from one of the City's designated medical providers:
 - Arbor Occupational Medicine, 290 Nickel Street Suite 200, Broomfield, CO 80020, (303) 460-9339.
 - HealthOne Occupational Medical Centers – North Suburban Clinic, 9195 Grant Street, Suite 100, Thornton, CO 80229, (303) 292-0034.
 - Each facility is open during normal business hours. The injured employee will need to call and make an appointment prior to going to the medical provider unless the injury requires immediate care and/or treatment.
- If appropriate, the Supervisor will direct the employee to receive immediate medical treatment at Avista Adventist Hospital Emergency Room, 100 Health Park Drive, Louisville (303) 673-1000.
- Use of an ambulance may be obtained by dialing 9+911.
- These medical consultations and examinations shall be provided without cost to the employees, without loss of pay and at a reasonable time and place.
- Failure to use the City's designated medical providers/facilities will result in unauthorized medical treatment for which the employee will be financially responsible.
- Accidents and/or injuries require completion of the City's Accident/Injury Report and must be submitted within 24 hours of the injury.

9.0 Special Precautions

None of the routine operations conducted in the laboratory at this time involves frequent or prolonged exposure to allergens, embryotoxins, or materials of moderate chronic or high acute toxicity. If laboratory procedures change to increase the frequency or quantity of these additional classifications of chemicals, special precautions as specified in the OSHA Laboratory Standard 29 CFR 1910.1450 shall be implemented as deemed necessary by the Laboratory Supervisor.

9.1 Effects on Reproductive Health and Pregnancy

Employees need to be careful not to expose their families to workplace chemicals which may unintentionally be brought home on work clothes and shoes. Assessments of

reproductive hazards in the workplace for both women and men in the workplace are continually being revised to include the latest research. The best way to protect yourself and your offspring is to keep your exposure to all chemicals as low as possible. Laboratory personnel should refer to the MSDS's or SDS's for special precautions and make use of PPE and other laboratory safety equipment.

10.0 Recordkeeping

- Accident investigations will be conducted by the Laboratory Supervisor with assistance from other personnel as deemed necessary.
- Accident reports will be written and retained indefinitely.
- Medical and/or exposure records for employees exposed to hazardous chemicals and harmful physical agents will be maintained by the Human Resources Department for the duration of employment plus 30 years.
- Inventory and usage records for high-risk substances (amounts of substances on hand, amounts used and names of employees involved) shall be maintained indefinitely.
- Records of any equipment inspections will be maintained in the laboratory files for the life of the equipment.

11.0 Chemical Spills/Releases, Fire, and Accidents

The types of small chemical spills that can occur in the laboratory shall be anticipated and the necessary equipment to respond to the minor spill will be obtained (spill kits and personal protective equipment). Learn how to clean up minor spills of the chemicals that are used regularly. The MSDS or SDS contains spill clean-up information and should also be consulted. Following a spill, the Chemical Hygiene Officer or Laboratory Supervisor should be notified so they can determine if the lab should be evacuated.

11.1 Cleaning Up Chemical Spills

If you are cleaning up a small spill yourself, make sure that you are aware of the hazards associated with the materials spilled, have adequate ventilation (open windows, chemical fume hood on) and proper personal protective equipment (minimum - gloves, goggles, and lab coat). Consider all residual chemical and cleanup materials (adsorbent, gloves, etc.) as hazardous waste. Place these materials in a sealed container (plastic bags) and store in a chemical fume hood. Contact the Chemical Hygiene Officer for disposal instructions.

11.2 Minor Chemical Spill

- Alert people in immediate area of spill.

- If spill contacts eyes or skin, immediately and thoroughly flush eyes or skin with eyewash and/or safety shower.
- Wear protective equipment including safety goggles, gloves, and long-sleeve lab coat.
- Avoid breathing vapors from spill.
- Increase ventilation in area of spill (open windows, turn on hoods).
- Use appropriate kit to neutralize and absorb inorganic acids and bases. Collect residue, place in container, and dispose as neutralized (non-hazardous) chemical waste.
- For other chemicals, use appropriate kit or absorb spill with vermiculite, dry sand, diatomaceous earth or paper towels. Collect residue, place in container, and dispose as hazardous chemical waste.
- Clean spill area with water.

11.3 Major Chemical Spill

- Attend to injured or contaminated persons and remove them from exposure. If spill contacts eyes or skin, immediately and thoroughly flush eyes or skin with eyewash and/or safety shower.
- Alert people in the laboratory to evacuate and meet at the assembly area.
 - For the Environmental Lab, the assembly area is in the parking lot outside the south doorway of the facility.
 - For the Wastewater Lab, the assembly area is the gate at the west end of the Wastewater Reclamation Facility.
- If spilled material is flammable, turn off ignition and heat sources. Place other containment device (pan, e.g.) over spilled material to slow down volatilization.
- Close doors to affected area.
- Notify the Building Superintendent and/or call 9+911 for emergency response personnel.
- Have a person with knowledge of the incident and laboratory available to answer questions from responding emergency personnel.

- The hazardous materials disposal company currently under contract with the City is Veolia Environmental Services, (303) 289-4827.

11.4 Mercury Spills

The mercury spill response kits are stored in the following locations:

- In the Environmental Lab room 4612 (main lab) on the upper safety shower shelf.
- In the Wastewater Lab next to small fume hood on the north wall

Follow these instructions to respond to incidental mercury from broken thermometer bulbs:

- Wear latex gloves.
- Sprinkle HG Absorb™ powder (powdered zinc) over spilled mercury.
- Wet the powder with water – a zinc/mercury amalgam will form.
- Wipe/sweep the wetted amalgam over area to pick up all mercury beads.
- Pick up amalgam with sponge from spill kit.
- Place sponge/amalgam into a labeled plastic cup, install lid, and dispose of as hazardous chemical waste.

12.0 Annual Chemical Hygiene Plan Inspection and Document Review

The Chemical Hygiene Officer will conduct an annual Chemical Hygiene Plan Inspection and Document Review. Results will be provided to the Superintendents, Laboratory Supervisors, and laboratory staff. Supervisors are responsible for taking corrective action.

13.0 Respiratory Protection Program

13.1 General Policy

The purpose of this program is to establish that the City and County of Broomfield Environmental and Wastewater Laboratories are following industry standards and guidelines.

No work operations at the City and County of Broomfield Environmental and Wastewater Laboratories require employees to wear respiratory protection.

The Laboratory Supervisors perform the functions of the Respiratory Protection Program Coordinator, providing overall responsibility for the program.

13.2 Procedure

Respiratory Hazards Assessment

The Laboratory Supervisors shall determine, using objective data and process or task knowledge, work practices to be followed so that respiratory protection is not required. This evaluation shall include a reasonable estimate of employee exposures to respiratory hazards and identification of the contaminants' chemical state and physical form. The calculations and results of the hazard assessment are provided as Appendix I.

The following are examples of work practices and control techniques used to reduce airborne contamination as low as practical (listed in order of preference depending on the nature of the hazard):

Substitution: Replacing hazardous materials with materials with a lower hazard potential (e.g. substituting a chlorinated solvent with a non-chlorinated solvent).

Local exhaust ventilation: Capturing hazardous materials at the point of generation by means of exhaust ventilation (e.g. exhaust ventilation hood).

Voluntary Use

Voluntary use of respirators, including dust masks, is not permitted in the laboratories.

Appendices

- A Laboratory Safety Equipment Inspection Schedule
- B Laboratory Inspection Checklist
- C Hazardous Waste Inventory and Disposal Log Sheet
- D Air Sampling Data Record
- E New Employee Chemical Hygiene Orientation and Training Checklist
- F New Chemical Purchasing Requisition
- G Chemical Glove Compatibility
- H New Chemical Training Checklist
- I Respiratory Hazards Assessment

Appendix A
Laboratory Safety Equipment Inspection Schedule

Appendix B
Laboratory Inspection Checklist

Appendix C
Hazardous Waste Inventory and Disposal Log Sheet

Appendix D
Air Sampling Data Record

Appendix E
New Employee Chemical Hygiene Orientation and Training Checklist

Appendix F
New Chemical Purchasing Requisition

Appendix G
Chemical Glove Compatibility

Appendix H
New Chemical Training Checklist

Appendix I
Respiratory Hazards Assessment