

QAM-W-101

Disposal of Laboratory Waste

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Disposal of Laboratory Waste

1. Applicability and Purpose

This procedure applies to all waste generated by the laboratory at the Texas Institute for Applied Environmental Research (TIAER), Tarleton State University, Stephenville, Texas. Several sources have been used to develop this procedure. The purpose of this procedure is to provide a safe and effective method for the disposal of laboratory waste in accordance with all state, federal and university policies and regulations. Not complying with the stringent requirements for waste disposal may result in severe criminal and civil liability for both organizations and individuals. Though Tarleton Risk Management is responsible for offsite disposal of laboratory waste, it is the responsibility of each analyst, as the waste generator, to ensure proper segregation and identification of waste.

2. Definitions

- 2.1. Waste: a material that through process, expiration, use or excess is no longer wanted or is unable to be recycled immediately.
- 2.2. Hazardous waste: a waste that has been identified for special regulation by the USEPA under Title 40, Code of Federal Regulations, part 261. These regulations are too extensive to list in this procedure, but should be used as a reference along with the Tarleton Safety Manual. Many deadly poisons may not be regulated as hazardous waste, and some wastes listed as hazardous may be innocuous to humans, but are hazardous to the environment.
- 2.3. Acutely hazardous waste: a hazardous waste listed in the tables of 40 CFR 261 with a "P" prefix. These are considered to be the most dangerous.
- 2.4. Triple rinsed (EPA): rinsing a container three times with a volume of diluent at least equal to 10% of the container's capacity.
- 2.5. Disposal: the removal of waste from the work area of laboratory personnel for dispensation.
- 2.6. DHCC: Department Hazard Communication Coordinator. A liaison between Tarleton Risk Management Department and

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TIAER who is trained in hazardous waste management. At this time the TIAER DHCC is the Laboratory Manager (LM).

- 2.7. Radioactive waste: laboratory waste containing activity levels of combined or individual isotopes generally > 200 dpm/100 cm^2 removable contamination or >2000 dpm/100 cm^2 fixed activity. Very dependent on the isotope and particle type.
 - 2.8. Contamination: the existence of radioactivity in an area where it is not supposed to be.
 - 2.9. RSO: Radiation Safety Officer
 - 2.10. Sharps: discarded items that can induce subdermal inoculation of infectious agents or toxic/radiological materials, including needles, blades, Pasteur pipettes, broken glass and other sharp items.
3. **Equipment, Reagents and Standards**
- 3.1. Safety Equipment: the following may be used in any necessary combination:
 - 3.1.1. Hands: protective gloves of suitable material appropriate to the waste being handled. Examples are neoprene for acids, nitrile for organic solvents, and latex for general use; long sleeved gloves or added sealant sleeves for extra protection.
 - 3.1.2. Face and eyes: face shields, goggles and safety glasses.
 - 3.1.3. Body: lab coats, rubber or neoprene aprons, disposable overalls.
 - 3.1.4. Safety shower, eyewash and spill control kits should be nearby when handling or transferring wastes.
 - 3.1.5. With proper training, respirators may be used as needed.
 - 3.1.6. Dosimetry is required for work with radioactive materials.
 - 3.2. Waste Storage: Containers must be chosen on basis of chemical characteristics. Various types include:
 - 3.2.1. Approved barrels should be kept in a control dike or spill skid designed to hold contents should drums leak or breach.
 - 3.2.2. Polymer drums: bung-hole type for liquids, open top for solids; sizes may be up to 55 gallons. Polymer drums are good for inorganic acids and other wastes of aqueous composition. High-density polypropylene and polyethylene are recommended types of polymer.

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- 3.2.3. Metal drums: bunghole type for liquids or open top for solids, various sizes. Organic solvents and oily wastes are stored in these. The drums are often lined inside with plastic since some organic wastes (i.e. acids and bases) may corrode metal.
- 3.2.4. Glass containers: generally should not be used due to ease of breakage; however, glass can be used as instrument collection or transfer devices, if they are handled properly and protected from breakage. Transfer containers shall not be considered Hazardous Waste Storage containers for the purposes of this procedure; however, transfer containers should be labeled for contents at a minimum.

4. Procedure

- 4.1. The LM is responsible for supervising the proper handling, storage, labeling and disposal of laboratory waste, while each individual analyst or technician who generates the waste is ultimately responsible for ensuring the waste is disposed of in accordance with the law. The LM may also assist other groups in TIAER with waste disposal. He/she also ensures that each laboratory employee is trained in the handling and disposal of laboratory waste. He/she identifies and segregates radioactive, hazardous and acutely hazardous wastes through the use of 40 CFR 261 or by contacting Tarleton Risk Management if there is any question.
- 4.2. Each employee is responsible for the proper handling and disposal from their work area of each waste they generate, under the guidance of the LM, RSO and/or the DHCC.
- 4.3. Organic solvents are not disposed of by evaporation in the vent hood unless the loss of solvent is part of the normal preparation or extraction procedure.
- 4.4. Very few waste types may be disposed of down the drain. The LM, RSO or DHCC is consulted prior to anything being poured down the drain. Examples include completed samples, standards solutions of certain salts, and neutralized acids.
- 4.5. Completed water samples may be disposed of down the drain, if they are not hazardous. Acidified samples may be

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neutralized to pH >2 prior to disposal down the drain. Nonhazardous soil samples may be disposed of by spreading on the ground outside. Samples not collected by TIAER are returned to the client or agency submitting them, unless the TIAER laboratory is directed to dispose of them. The Laboratory Manager alone is responsible for authorizing sample disposal. He/she shall document sample disposal on the Chain-of-Custody (Q-110-1) in accordance with QAM-Q-110, "Sample Receipt and Login".

- 4.6. Except for temporary transfer containers, all Hazardous Waste Storage containers are labeled with the following words verbatim:

“Hazardous Waste- Federal laws prohibit improper disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.”

- 4.7. Any and every Hazardous Waste Storage container is labeled with the date that waste accumulation began and with the contents of the container. Transfer containers in which waste is stored for less than an 8-hour period are not labeled with the date.
- 4.8. Upon accumulation in the laboratory of 55 gallons of any hazardous waste or accumulation of 1 kilogram of acutely hazardous waste in the satellite waste storage area, the Laboratory Manager seals and date the container, and has it transferred to the locked waste storage area outside the laboratory. On a periodic basis, no less than annually, the Tarleton Safety Department is contacted to remove the waste from the cabinet.
- 4.9. Wastes are segregated according to the following classes or more:
- 4.9.1. Solid/Liquid (separate into different waste streams)
 - 4.9.2. Hazardous/Acutely Hazardous/Non-hazardous
 - 4.9.3. Acids or Bases (neutralized if only hazard)
 - 4.9.4. Contains toxic metals (per 40 CFR 261),
 - 4.9.5. Organics (chlorinated/nonchlorinated, if organic)
 - 4.9.6. Bacteriological (known pathogens)
 - 4.9.7. Phenol (separate from organic solvents)
 - 4.9.8. Radioactive (see 10 CFR 20) > 200 dpm/100 cm²

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- 4.10. It is very important not to mix wastes and to label all containers properly. Improper mixture can result in high disposal costs and dangerous chemical reactions.
- 4.11. The Tarleton Environmental Services Department has a recycling program for plastic, glass and paper. This program should be used wherever practical. If a waste contains or becomes contaminated with a hazardous material, the entire waste is defined as hazardous. Items not contaminated, such as paper, plastics, boxes and other material, may be disposed of in the recycle or trash bins. Glass (broken or not) is not discarded in the trash. Glass must be compacted carefully to reduce volume, double bagged and taped securely in a box labeled "Glass" or "Broken Glass".
- 4.12. Prior to disposal, empty containers that once held hazardous chemicals, wastes or other materials are rendered non-hazardous by triple rinsing with diluent in portions equal to 10% of the container volume. The residues of volatile compounds will be allowed to evaporate in a fume hood.
- 4.13. A professional waste disposal company is contracted annually by Tarleton to dispose of hazardous waste drums and containers. The laboratory personnel never actually dispose of any hazardous waste, other than to remove it from their immediate work area, segregate and store in appropriate containers, unless it is first rendered innocuous prior to dispensation (poured down the drain).
- 4.14. Appropriate safety attire is always worn and correct equipment used when handling or disposing of hazardous waste, in accordance with QAM-S-101, "Laboratory Safety".
- 4.15. Transfer of waste is performed carefully and any spill shall be cleaned up immediately. Spills of radioactive materials require special precautions to not spread contamination.
- 4.16. The satellite waste storage area, located in the laboratory, is inspected at least weekly and documented on the weekly maintenance check schedule described in QAM-Q-103, "Equipment Maintenance".
- 4.17. Waste disposal and shipping are documented on the Waste Disposal Log (or Elog) (Attachment 1, W-101-2).
- 4.18. Wastes generated by certain chemical procedures are listed in the specific chemistry SOP. It is the duty of each analyst

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to ensure that waste generated by their work performance is disposed of properly and safely. If the waste is not specifically listed or there are questions, contact the Laboratory Manager for disposal directions.

- 4.19. Wastes that are hazardous for pH only, i.e. acids or bases, may be neutralized and disposed of down the drain under the direction of the Laboratory Manager. Disposal of this waste stream is recorded in the Waste Disposal Logbook (Attachment 1, W-101-2).
- 4.20. Bacteriological hazardous waste (pathogens) is autoclaved prior to disposal and recorded in the Equipment Temperature eLog (Q-103-2-rev14). See below for radioactive pathogen requirements.
- 4.21. *Radioactive waste* requires the same security considerations given to other radioactive materials. It is required that this storage be done within a secured, posted radioactive materials area. The volume of radioactive waste generated is kept to a minimum, and items that are known not to be contaminated with radioactive material are not placed into a radioactive waste container. It is important to have long half-life and short half-life radioactive waste containers stored in separate locations within a lab to prevent mixing of long and short half-life radioactive wastes.
- 4.22. Radwaste is segregated by chemical hazard, solid/liquid form, and by half-life of $>$ or $<$ 90 days. If long half-life radioisotopes cannot be separated from short half-life radioisotopes then the waste must always be disposed of into the long half-life waste container. Containers are made of appropriate material to not react or decompose by contact with the waste.
- 4.23. *Solid Radioactive Waste Disposal (S)*: Solid radwaste is segregated by half-life of $>$ or $<$ 90 days.
 - 4.23.1. Do not dispose of the following into any solid dry waste container:
 - 4.23.1.1. Animals, parts of animals, or tissue samples.
 - 4.23.1.2. Liquid scintillation vials
 - 4.23.1.3. Stock vials
 - 4.23.1.4. Sharps
 - 4.23.1.5. Any amount of liquid.

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- 4.23.1.6. Lead metal
- 4.23.1.7. Solid radioactive biohazardous waste, which is autoclaved prior to disposal.
- 4.23.1.8. Gels, If a gel is very solid at room temperature, it may be disposed of as solid waste. If it is soft or semi-solid at room temperature, use a non-hazardous solubilizer to liquefy it and dispose of it as liquid waste.
- 4.23.2. The LM and/or RSO are consulted if there are any doubts about disposal of solid radwaste.
- 4.24. *Liquid Radioactive Waste, Aqueous and Flammable Disposal*
 - 4.24.1. All liquid radwaste generated must be collected in an appropriate and properly labeled waste container provided by the RSO. Containers are not filled above a level 4 inches from the top of the container. Typically these wastes contain no EPA listed hazardous materials and have a pH equal to 7-9. Wastes with a pH outside this range must be neutralized prior to disposal.
Radwaste is never to be poured or flushed down laboratory drains.
 - 4.24.2. Disposal procedure for Water Soluble non-hazardous radioactive liquids:
 - 4.24.2.1. As with solids, segregate long half-life radioisotopes (>90 days) from short half-life radioisotopes (<90 days).
 - 4.24.2.2. Segregate **H-3 and C-14** from all other long half-life radioisotopes and dispose of into separate waste containers.
 - 4.24.2.3. Segregate all short half-life beta and gamma emitters from each other and dispose of into separate waste containers.
 - 4.24.2.4. Segregate **I-125** from all other short half-life gamma emitting radioisotopes and dispose of into a separate container.
 - 4.24.2.5. Place contaminated waste items into the appropriate liquid waste container.
 - 4.24.2.6. When the liquid waste container is full, contact the RSO or LM to set up a waste pick-up.

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- 4.24.2.7. Care should be taken when pouring liquids into the liquid waste container to avoid spilling around the outside of the bottle. If spillage occurs, the waste container will not be moved from the laboratory until it has been satisfactorily decontaminated.
- 4.24.2.8. Liquid radwaste containers must not be filled above a level four inches from the top of the container. Containers filled to the top will not be removed from the lab, instead the user will be instructed to correct the overfilling.
- 4.24.2.9. **DO NOT** mix any hazardous "mixed wastes" with aqueous wastes.
- 4.24.2.10. **GELS**, if it is soft or semi-solid at room temperature, use a non-hazardous solubilizer to liquefy it and dispose of it as liquid waste. If a gel is very solid at room temperature, dispose of it as a solid waste.
- 4.24.2.11. No paper, plastics, pipette tips, soil, tissue or other solids are to be placed in liquid containers.
- 4.24.2.12. Acids and bases are to be neutralized before disposal (pH 7-9). Use pH paper to determine pH. All neutralization procedures should be conducted in a hood and with protective clothing.
- 4.24.2.13. If the waste contains a component that may biologically decompose, (i.e., compost, media), the waste must be chemically treated to prevent odor and rotting. If the waste contains a biohazardous agent (pathogen), the agent must be inactivated prior to disposal.
- 4.24.2.14. Do not mix bleach with radioiodine wastes, strong acids, or ammonia.
- 4.24.2.15. Improper selection of a deactivation agent could result in a volatile radioactive release. Use a Phenol solution for radioiodine and a 15% bleach solution for all other radioisotopes. Contact the RSO/LM for instructions.

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- 4.24.2.16. If bleach was added to the liquid waste for deactivation it is required to neutralize the liquid to a pH of 7-9.
 - 4.24.2.17. All liquid radioiodine waste is collected in a separate liquid radioactive waste container that is labeled "Radioiodine Waste Only." This is to prevent possible reactions that may release volatile radioiodine. To minimize potential volatilization of liquid radioiodine, add 50ml dry, granular sodium thiosulfate to liquid radioiodine containers prior to use. **Note:** Anytime there is a liquid or solid spill outside of a waste container perform a smear survey of containers and the immediate area. Corrective Action is taken if contamination is found > 250 dpm/smear.
- 4.24.3. Disposal of chemically hazardous radioactive liquid wastes (Mixed Wastes).
- 4.24.3.1. In general chemically hazardous wastes or "Mixed Wastes" are defined as any waste which contains a radioactive material in combination with an EPA regulated hazardous chemical waste.
 - 4.24.3.2. Again, segregate long half-life radioisotopes (>90 days) from short half-life radioisotopes (<90 days).
 - 4.24.3.3. Segregate **H-3** and **C-14** from all other long half-life radioisotopes and dispose of into separate waste containers.
 - 4.24.3.4. Segregate all short half-life beta and gamma emitters from each other and dispose of into separate waste containers.
 - 4.24.3.5. Segregate **I-125** from all other short half-life gamma emitting radioisotopes and dispose of into a separate container.
 - 4.24.3.6. Place contaminated waste items into the appropriate waste container.
 - 4.24.3.7. Do not combine or add mixed wastes to a radwaste that contains no EPA regulated hazardous chemicals.
 - 4.24.3.8. Minimize volume of mixed waste generated by using a separate liquid radwaste container.

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- 4.24.3.9. No acids, bases or solids are to be placed with flammable liquids.
 - 4.24.3.10. No paper, plastics, or animal tissues are to be placed in the liquid containers.
 - 4.24.3.11. The laboratory director is responsible for assuring that a non-hazardous substitute is used if feasible, or for minimizing the volume of mixed waste generated.
 - 4.24.3.12. If liquid radioiodine waste is combined with hazardous chemicals this mixed waste must be collected in a separate radwaste container that is labeled "RADIOIODINE WASTE ONLY." This is to prevent possible reactions that may release volatile radioiodine and to allow for storage and decay of radioiodine wastes. To minimize potential volatilization of liquid radioiodine, add 50 g dry, granular sodium thiosulfate to liquid radioiodine containers prior to use.
 - 4.24.3.13. Care should be taken when pouring liquids into the liquid waste container to avoid spilling around the outside of the bottle. If spillage occurs, the waste container will not be picked up from the laboratory until it has been satisfactorily decontaminated.
 - 4.24.3.14. Liquid radwaste containers must not be filled above a level four inches from the top of the container. Containers filled to the top will not be removed from the laboratory. Instead, the approved user's laboratory personnel will be instructed to correct the overfilling.
 - 4.24.3.15. When the liquid waste container is full, contact the RSO/LM.
 - 4.24.3.16. Note: Anytime there is a liquid or solid spill outside of a waste container perform a smear survey of containers and the immediate area and initiate Corrective Action if contamination is found > 250 dpm/smear.
- 4.25. Scintillation Waste (SW): The lab may generate radwaste from the use of the scintillation counter to either count a sample or measure lab smears. To avoid generation of a

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mixed waste, TIAER uses an environmentally safe/biodegradable scintillation cocktail. Biodegradable, nonhazardous scintillation waste vials generated must be collected in a scintillation waste container, or vials may be packed in the original shipping box. Do not pour scintillation waste into a radioactive liquid waste container. When the container is full, contact the RSO/LM.

- 4.26. Sharps Waste (SHRP) disposal procedure:
 - 4.26.1. All sharps are required to be disposed of into a puncture resistant sharps disposal container.
 - 4.26.2. Label all radioactive sharps containers with "Caution Radioactive Material" tape to avoid mixing with non-radioactive sharps.
 - 4.26.3. Do not over fill sharps containers.
 - 4.26.4. Disposal containers must be shut (i.e. capped or tapped) prior to being collected and transported.
 - 4.26.5. Do not place sharps containers inside of a solid radioactive waste container.
 - 4.26.6. When the radwaste sharps container is full, notify the RSO/LM. Non-radwaste sharps containers, properly labeled as "sharps" or "broken glass" may be disposed of through Environmental Services.
- 4.27. Biohazardous/Radioactive Waste Disposal procedures:
 - 4.27.1. All biohazardous/radwaste is required to be disposed into authorized (clear) autoclave bags.
 - 4.27.2. Do not use orange or red (non-clear) Biohazard bags.
 - 4.27.3. All biohazardous/radwaste must be inactivated by a process (autoclave or chemical inactivation) approved by the RSO/LM.
 - 4.27.4. Prior to autoclaving the waste will be required to place a piece of autoclave tape on the waste bag to show that the waste has been autoclaved.
 - 4.27.5. Once inactivation has been completed place the autoclave bag into the appropriate solid or liquid radioactive waste container and follow the appropriate steps for isotope segregation for those waste forms.

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5. Quality Control and Safety Aspects

- 5.1. All laboratory waste is also handled, treated and disposed of in accordance with the guidelines established in QAM-Q-101, "Laboratory Quality Control" and QAM-S-101, "Laboratory Safety", and policies of Tarleton State University.
- 5.2. Nonconformance issues with waste disposal or storage are addressed by notification of the LM and/or RSO.
- 5.3. The DHCC (however named) should obtain periodic training specific to the performance of his/her duties with regards to hazardous chemical and waste storage.

6. References

- 6.1. *Code of Federal Regulations*, Title 40, Part 160: Good Laboratory Practice Standards, National Archives, 2014.
- 6.2. Hazardous/Toxic Waste Management, Lion Technology, Inc., Lafayette, NJ, 1994.
- 6.3. Standard Methods for the Examination of Water and Wastewater, latest online edition (EPA approved), ed. by A. E. Greenberg, et al., APHA, AWWA, Washington, D.C.
- 6.4. National Environmental Laboratory Accreditation Conference, The NELAC Institute, TNI Standard, 2016.
- 6.5. University of Wisconsin-Milwaukee Radiation Protection Program.

7. Attachments

- 7.1. Example Waste Disposal Log, W-101-2

