University of Kentucky

HAZARDOUS WASTE MANAGEMENT BASICS

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PREPARED BY:

Environmental Quality Management

University of Kentucky – Hazardous Waste Management Basics

Appendices

Tables

Introduction

The information presented in this manual is based on the following strategic imperitives:

1. The University of Kentucky is required by federal and state regulations to ensure the proper disposition of hazardous wastes.

2. Proper handling of such waste is an integral part of a safe workplace.

3. Each faculty, staff and student at UK is responsible for ensuring that wastes are handled in a manner that minimizes personal exposure and the potential for environmental contamination.

This manual provides information that is wide-ranging in its application. While the manual can and should be used as a stand-alone resource for every-day needs, it is also designed to be a valuable reference tool when used in conjuction with training provided through the UK Environmental Quality Management Department. Therefore, both the level of detail and arrangement of the seven primary topic areas within this manual compliment the entire hazardous waste management learning experience.

Topics

1. Regulatory Foundation
2. Waste Determination
3. Waste Labeling & Hazard Warnings
4. Waste Accumulation Management
5. Waste Pick-Up (E-Trax)
6. Emergency Planning
7. Training

Objective

To learn the safe and compliant requirements for identifying, labeling, and managing hazardous waste originating from laboratories and other areas at the University of Kentucky.

☼ KEY POINT ☼

The University supports and maintains a strong commitment to the safety and health of faculty, staff and students and to the protection of the environment – ensuring your understanding of hazardous waste management requirements is a vital component of this commitment.

REGULATORY FOUNDATION

The material presented in this document is based on regulations promulgated by the **US Environmental Protection Agency**. The Resource Conservation and Recovery Act (RCRA) is the federal law established for the compliant generation and management of hazardous waste

The **Kentucky Division of Waste Management** has been delegated authority by the federal government to administer hazardous waste regulations in the Commonwealth.

The **University of Kentucky's** Administrative Regulation (AR) 6:3 has authorized the Environmental, Health, and Safety Division (EHS) to coordinate UK's environmental health and safety programs and to monitor UK's compliance with applicable Federal, State and local laws, regulations and UK policies. The Environmental Quality Management Department (EQM) is the group within EHS charged with ensuring institution-wide compliance of hazardous waste management.

How these regulation may apply to you?

There are many sectors at UK that have the potential to generate regulated hazardous waste and include:

- Academic and Research
  - Science and engineering departments
  - Art studios and theatre departments
  - Research, technology transfer, and business incubator activities
  - Vocational programs, including cosmetology and mechanical
- Medical/dental/Veterinary
  - Medical, Dental, and Veterinary schools
  - Clinics, pharmacies, and athletic training
  - Animal husbandry
- Maintenance and Operations
  - Electronics and computers
  - Maintenance shops and activities
  - Transportation operations
  - Groundskeeping operations
- Museums, Special-Collections Libraries, and Conservation Facilities
- Rifle and Pistol ranges

What You Need to Do

UK sectors that generate hazardous waste must make sure they manage it in a regulatory compliant and safe manner. This manual provides information relative to each of the major components of the responsible management of hazardous and other special waste categories that may be generated at UK.

2.0 WASTE DETERMINIATION

2.1 Who is a Generator?

As defined by regulations, the "generator" of hazardous waste is the entity that creates the waste and incurs the majority of the liability associated with waste. From a regulataory perspective, UK qualifies as the generator, however, indiviual employees act as its legal agents and must adhere to all of the incumbant requirements.

There are three different types of generators defined in regulations, noted as:

- *Very Small Quantity Generator* (VSQG)
- *Small Quantity Generator (SQG)*
- *Large Quantity Generator (LQG)*

Each of these categories are based on the total monthly waste generation amounts as summarized in **Table 1**. Hazardous waste regulations apply in one manner or other to everyone at UK that generates a hazardous waste – so it is critical that EQM be contacted if you have any questions about the proper management requirements for your location.

Table 1. Hazardous Waste Generator Types

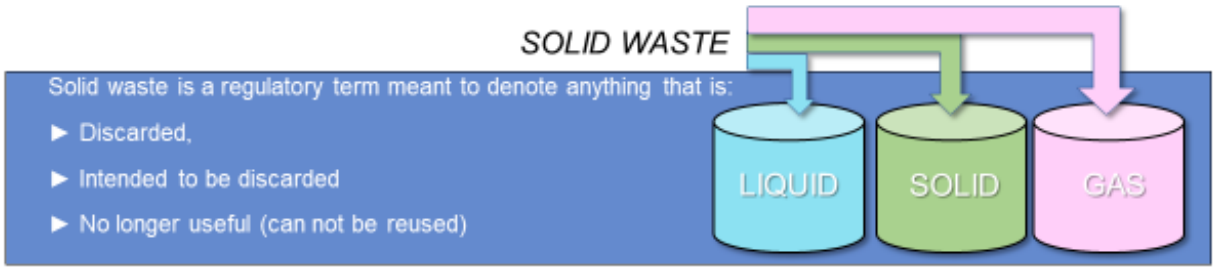
Generator Type	Monthly Generation of Hazardous Waste	Monthly Generation of Acute[1] Hazardous Waste	Applicable UK Locations
Very Small Quantity	< 100 kg	< 1 kg	• Various Off-Campus Locations
Small Quantity	< 1,000 kg		• Center for Applied Energy Research • Veterinary Diagnostic Laboratory
Large Quantity	> 1,000 kg	> 1 kg	• All of Lexington's Main Campus

1 – See Section 2.2.2 for the explantion of "acute hazardous waste"

A generator must maintain records supporting its hazardous waste determination, including records that identify whether a waste is a hazardous waste. These records must comprise the generator's knowledge of the waste and support the generator's waste determination. The remaining portions of Section 2.0 describe the regulatory definitions and the requirements for properly making this waste determination. An accurate waste determination must be made as soon as it is determined that a material is intended to be discarded.

2.2 Solid Waste

"Solid waste" is a regulatory term denoting anything that is no longer needed or no longer desired - even if it is liquid or gaseous. This is an important regulatory principal in that the term "solid" according to hazardous waste regulations (i.e., RCRA) does not actually refer to the physical state of the waste.



2.3 Hazardous Waste

Hazardous waste is a specific category of solid waste, one which is subject to additional regulatory control in comparison to regular garbage or refuse. Ther are two primary categories of hazardous waste, referred to as "listed" and "characteristic". Section 2.3.1 provides additional details on listed wastes and Section 2.3.2 provides additional details on characteristic wastes.

2.3.1 Listed Hazardous Waste

A listed waste is hazardous because it is found on one of the four lists of hazardous waste described below.

The F, P and U-listed categories are applicable to UK and include over 800 different substances as is discussed further in the following paragraphs.

F-Listed Hazardous Waste

The regulated hazardous waste originating from non-specific sources are defined in 40 CFR 261.31. As noted therein, there are 28 F-wastes currently identified and are assigned waste codes ranging from F001 through F039. The concept behind this set of listed wastes is that they are "process wastes" that are produced by a wide variety of activities. The wastes described in waste codes F001 through F005, however, are the most common F-listed wastes encountered in laboratories and in facility maintenance operations. **Table 2** provides a brief description of each of these wastes.

It is important to bear in mind that these are spent solvents (both halogenated and nonhalogenated) and distillation bottoms from recovery systems for these solvents. "Spent" is emphasized here because to be properly classified as an F-listed waste it has to be a solvent that was used for its intended purpose (i.e., have been "spent"). How to assess unused portions of the solvents when they are intended to be discarded is discussed beginning on page 8 under P and U-listed waste.

Table 2. F001 – F005 Spent Solvents Hazardous Waste

Waste Code	Description
F001	Spent halogenated solvents used in large-scale degreasing operations: • Tetrachloroethylene • Tri-chloroethylene • Methylene Chloride • 1,1,1-Trichloroethane • Carbon Tetrachloride • Chlorinated Fluorocarbons
F002	Spent halogenated solvents used for purposes other than large-scale degreasing operations: • Tetrachloroethylene, • Methylene Chloride • Tri-chloroethylene • 1,1,1-Trichloroethane • Chlorobenzene • 1,1,2-Trichloro-1,2,2-Trifluoroethane • Ortho-dichlorobenzene • Trichlorofluoromethane • 1,1,2-trichloroethane
F003	Spent nonhalogenated solvents: • Xylene • Acetone • Ethyl Acetate • Ethyl Benzene • Ethyl Ether • Methyl Isobutyl Ketone, • n-butyl alcohol • Cyclohexanone • Methanol
F004	Wastes resulting from using the following for their solvent properties: • Cresols • Cresylic Acid • Nitrobenzene
F005	Spent nonhalogenated solvents: • Toluene, • Methyl Ethyl Ketone • Carbon Disulfide • Isobutanol • Pyridine • Benzene • 2-ethoxyethanol • 2-nitropropane

P and U-Listed Hazardous Waste

The P and U-lists of hazardous waste are defined in 40 CFR 261.33. The lists are comprised of discarded commercial chemical products that are defined as hazardous wastes only under the following conditions:

- Unused product is discarded or intended to be discarded and the listed chemical is the sole active ingredient.
- Unused off-specification product is discarded or intended to be discarded.
- Container residues of the product are discarded or intended to be discarded.
- Contaminated soil, water or other debris is generated from cleanup of spills of the substance on either the P or U-list..

The chemicals on the U-list are included because they have been determined to be **toxic**. Whereas the P-listed chemicals are defined as **acutely toxic**

Designating a waste as acutely toxic means it possesses extremely hazardous properties that makes it lethal in very small quantities. So understandably, there are significantly reduced accumulation thresholds for P-listed waste and further information is provided in the discussion under *Satellite Accumulation Area* in Section 4.2.1.

There are some common mistakes made in deciding if a waste is P or U-listed and most often these mistakes tend to result in an overuse of the codes. Additionally, trying to locate a chemical name among the long regulatory lists can be quite cumbersome especially considering the issue of inconsistent chemical nomenclature. In most cases using the CAS number will be an easy way for dependable verification. In lieu of using printed resources there are electronic search tools that may be more efficient like the following:

E-Trax (aka, Chematix): https://etrax.chematix.com/Chematix/
EPA's "List of Lists: http://www.epa.gov/epcra/consolidated-list-lists

2.3.2 Characteristic Hazardous Waste

Solid waste not found on any of the lists described in Section 2.3.1 must be evaluated to determine if they posses any of four hazardous characteristics as defined in 40 CFR 261.21 - 261.24. These four characteristics are:


Ignitable


Reactive


Corrosive


Toxic

Table 3 provides a summary of the descriptions of each of these four catagories. As noted, each waste type is identified with idividual numeric codes beginning with the alphanumeric notation of "D". Additional information is provided for each type in Sections 2.3.1 – 2.3.4.

Table 3. Characteristic Hazardous Waste

Characteristic (Waste Code)	Description
Ignitable (D001)	Liquid - Any liquid waste or liquid waste mixture having a flashpoint of 140º F (60º C) or lower. Solid – Any solid waste that can cause fire through friction or absorption of moisture or can undergo spontaneous chemical change resulting in persistent burning.
Corrosive (D002)	Any waste liquids or waste liquid mixtures having a pH less than or equal to 2 or greater than or equal to 12.5. Examples include hydrochloric acid, phosphoric acid, sulfuric acid, sodium hydroxide, and corrosive cleaning agents. *
Reactive (D003)	Any material which is unstable, explosive, shock sensitive, water or air reactive, a strong oxidizer, or an organic peroxide. Cyanide and sulfide bearing materials are also reactive and may produce toxic, deadly gases when mixed with acids.
Toxic (D004-D043)	Any waste which contains concentrations of certain constituents in excess of regulatory limits is a toxic hazardous waste. The 40 constituents that must be considered when evaluating a waste for potential toxic concentrations include eight heavy metals, six pesticides and 26 solvents and other organics as noted separately in **Table 4**.

*NOTE: Liquids or liquid mixtures having a pH less than 5.5 or greater than 11.5 are not permitted to be disposed of via sink drains or other wastewater conveyances. Disposal of such liquids is specifically prohibited by the University's wastewater discharge permit.

Table 4. Characteristic Toxic Hazardous Wastes & TCLP Limits

Hazardous Waste Number	Constituent	CAS No.	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D018	Benzene	71-43-2	0.5
D006	Cadmium	7440-43-9	1.0
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D007	Chromium	7440-47-3	5.0
D023	o-Cresol	95-48-7	200.0
D024	m-Cresol	108-39-4	200.0
D025	p-Cresol	106-44-5	200.0
D026	Cresol		200.0
D016	2,4-D	94-75-7	10.0
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D012	Endrin	72-20-8	0.02
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D008	Lead	7439-92-1	5.0
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	[3]5.0
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D039	Tetrachloroethylene	127-18-4	0.7
D015	Toxaphene	8001-35-2	0.5
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D017	2,4,5-TP (Silvex)	93-72-1	1.0
D043	Vinyl chloride	75-01-4	0.2

Ignitable Hazardous Waste

Liquids with a flash point below 60ºC make up the majority of the category of ignitable hazardous wastes. Nonchlorinated solvents is one example of waste that exhibit the ignitable hazardous waste characteristic and other examples are noted in **Table 5.**

Table 5. Examples of Ignitable Hazardous Wastes

Ignitable Waste Type	Examples
Liquid	Organic solvents such as acetone, toluene, xylenes, paint thinner
Nonliquid	Sodium, lithium aluminum hydride
Gas	Cylinders of propane and acetylene
Oxidizer	Nitrate, salts, peroxides, all DOT Oxidizers

Corrosive Hazardous Waste

Certain acidic and basic liquids comprise much of the typical corrosive characteristic hazardous wastes. Under most circumstances determining whether a liquid waste has a pH below 2 or above 12.5 is straightforward. It is important to note that there are no corrosive solids since this charactersistic pertains only to aqueous or liquid waste.

Reactive Hazardous Waste

Wastes that are unstable, readily undergo a violent change, react vioilently with water, or are capable of detonation or an explosive reaction if subjected to a strong initiating source are characterized as reactive hazardous waste. A cyanide or sulfide-bearing waste is also considered reactive, as are other wastes that have the potential to generate toxic gases, vapors or fumes. Examples of reactive wastes are noted in **Table 6**.

Table 6. Examples of Reactive Hazardous Wastes

Reactive Waste Type	Examples
Reactive	Sodium, potassium and other alkali metals
Potentially explosive	Dry picric acid, either-containing peroxides
Toxic gas source	Cyanide or sulfide solutions

Toxic Hazardous Waste

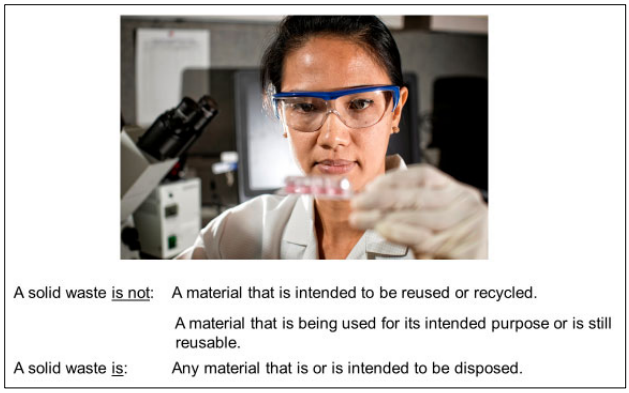
Regulations define the toxicity characteristic for hazardous waste on the basis of the concentrations of certain constituents that can leach from the waste. If the concentration of any of the toxic constituents found in **Table 6** exceeds the applicable regulatory threshold for that constituent as determined by a special laboratory analysis procedure (i.e., the Toxicisty Characterisitc Leaching Procedure, TCLP), the waste is determined to be a toxic hazardous waste. The reason why such waste is classified as hazardous is to prevent its disposal in landfills

and thus prohibiting releases of toxic metals, pesticides and organic chemicals that would adversely impact groundwater quality.

2.4 Waste Determination Steps

A hazardous waste determination is a two-step process integrating the prinicpal of "solid waste" as described in Section 2.1.2 as the first step and the definition of "hazardous waste" as explained in Sections 2.2 and 2.3.

STEP 1: The first step is to determine whether a waste is a regulated solid waste.

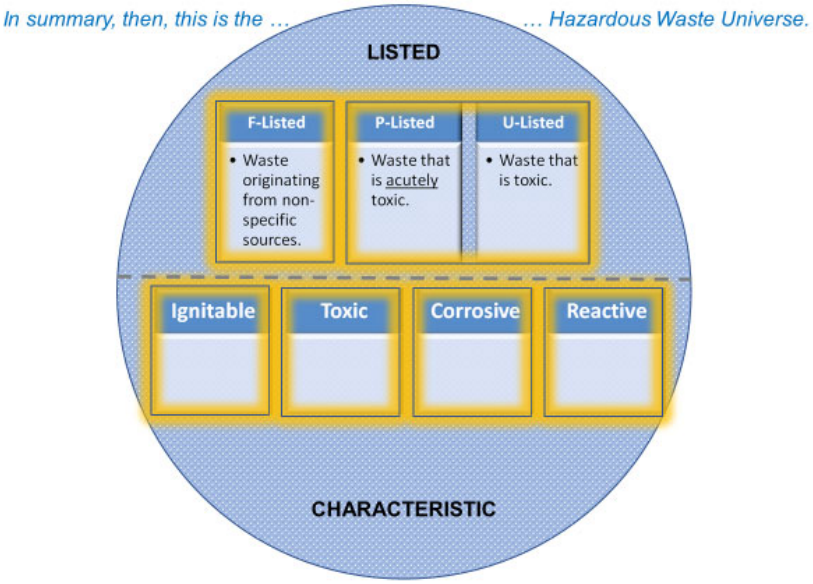


STEP 2: The second step is to determine whether the solid waste meets the definition of hazardous waste. Regulations identify two types of hazardous waste; those that are explicitly **LISTED** (Section 2.3.1) and those that are hazardous by **CHARACTERISTIC** (Section 2.3.2).

It is important to note that failure to make a timely waste determination is the number one cited violation by state and federal inspectors!

2.4 Summary

In summary, hazardous waste classification can be complex and each waste generated requires close evaluation to determine which of the seven primary categories is most appropriate.



Section 2.0 has provided an explanation of the steps to safe and compliant hazardous waste determination and some of these are summarized below along with other important items for consideration:

- ☑ Develop and keep a list of all wastes you generate
- ☑ Keep an updated chemical inventory – Chematix
- ☑ Review 40 CFR 261 for exclusion or exemptions (e.g. for recycling and reuse), and the F, P and U-List.
- ☑ Make a determination
- ☑ Document determinations (e.g. lab reports, SDSs, material specifications, specific knowledge)

3.0 WASTE LABELING & HAZARD WARNINGS

3.1 Types of Waste and Labels

All hazardous waste containers must be properly labeled as described below:

- ✓ Labeled with the words "**Hazardous Waste**" and
- ✓ Must have the hazards clearly identified.
- ✓ Further, it is a UK requirement to also note the contents of the waste on the container. Abbreviations or chemical formulas are not acceptable, the name of the constituents must be writttn out and must be in English.

(The Hazardous Waste "self-adhesive sleeve" shown above and the "hang-tag" version are available from EQM, free of charge.

A **Hazardous Waste Label** and **Hazard Warning Information** must be indicated as soon as hazardous waste is introduced into the container.

The label must read: "Hazardous Waste"

The hazard(s) of the contents must be indicated.

The contents must be indicated (UK required).

Sources of Hazard Warning Information:

- ❑ Utilizing generator knowledge, or
- ❑ Identifying the DOT classification through E-Trax, or
- ❑ Consulting the DOT classification in section 14 of the Safety Date Sheet.

If the original product bottles are being reused as a waste container**, it is required that the product label be removed or defaced to not cause misidenificaion issues**.

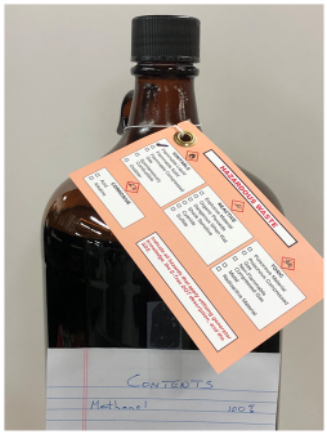
Hazardous waste containers not properly labeled <u>can not</u> be picked up by EQM personnel until all necessary information is affixed to the container.

3.2 Hazard Warning Information

The hazards of the constituents in a hazardous waste container must be indicated on the container as soon as waste is added to the container. EQM has developed labels and hang tags as shown below for hazardous waste containers to assist generators in indicating these hazards.

Example: "Spent Methanol"

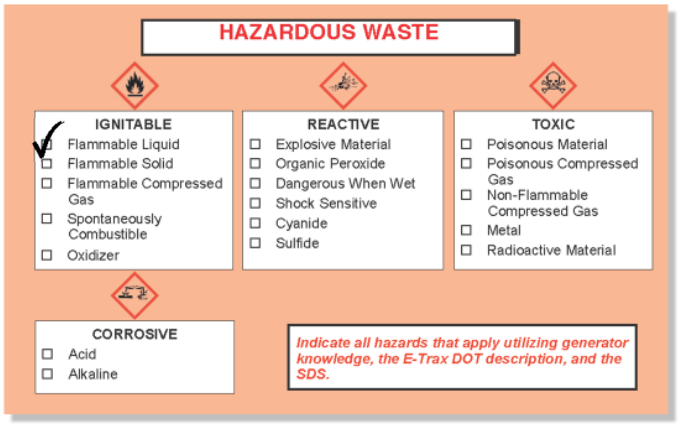
Self-Adhesive Sleeve



Hang-Tag

These labels and tags are available free of charge from EQM.

Provided below is a close-up example of the hazard warning information section on the self-adhesive sleeves and hang-tags. It has been designed to integrate applicable pictograms of the Global Harmonized System, the four regulated characteristics of hazardous waste (summarized in Section 2.3) as well as DOT classification terminology such as flammable liquid, shock sensitive, and so on. All of this information is necessary to be on each container to provide an easily recognizable notation of the hazards posed by the waste.

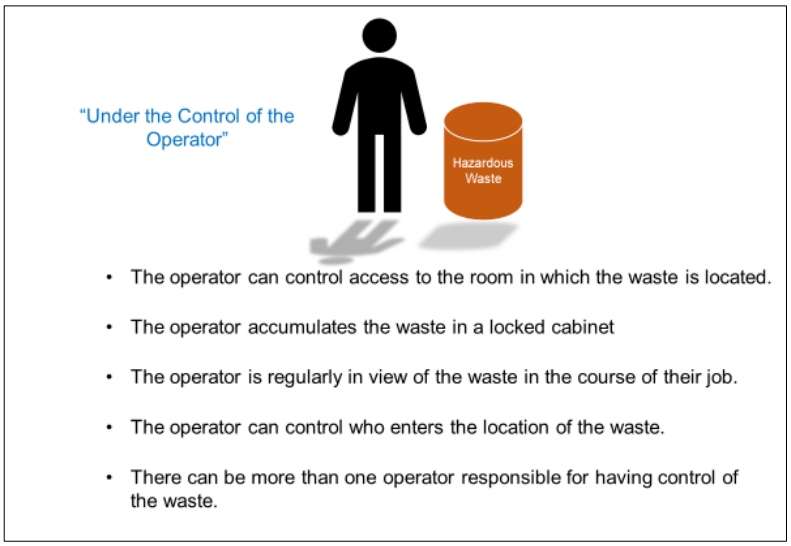


Using the menu-selection approach available on the labels, a hand-written check mark can be indicated next to the applicable hazard(s) – as has been done above for the example of a flammable liquid such as waste methanol. The appropriate hazard warning box(es) must be checked on the labels and hang-tags as soon as waste is introduced into the container.

4.0 WASTE ACCUMULATION MANAGEMENT

4.1 Waste Control

The initial requirement for compliant and safe hazardous waste accumilation management is that the waste be maintained "under the control of the operator". "Operator" refers to an individual or individuals responsible for the equipment or processes generating the hazardous waste. The "operator" in a laboratory setting, for example, can range from the PI to a research assistant, to a student assistant. An "operator" is the person(s) who is the one responsible for having control of the hazardous waste. And that element of "control" can be accomplished in several ways as described below:

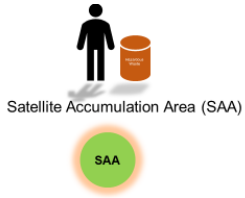


In addition, a key expectation is that the "operator" is knowledgeable and trained concerning the waste's safe handling. There can be more than one operator responsible for having control of the waste but there needs to be at least one individual so designated.

4.2 Waste Accumulation Areas

4.2.1 Satellite Accumulation Areas

A **Satellite Accumulation Area (SAA)** is a specifically designated area where the hazardous waste is allowed to be accumulated so long as it is under the control of the operator as described above, is at or near the point of generation and is managed within applicable volume restrictions as explained on the following page.



Important aspects of SAAs include:

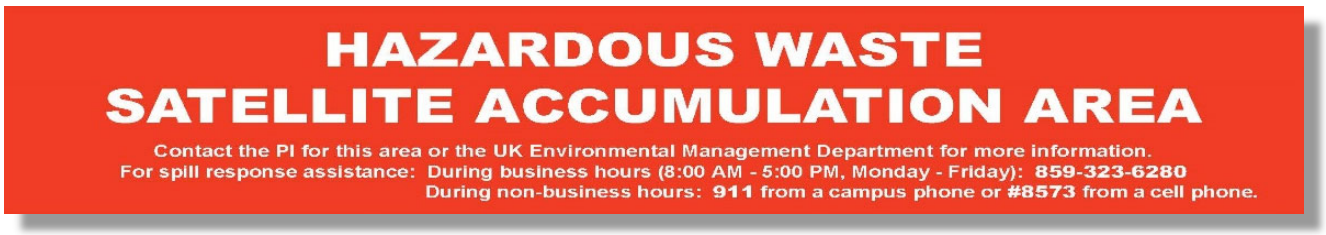
- The maximum volume of hazardous waste allowed to be accumulated in an SAA can not exceed 55 gallons or can not exceed one (1) quart of an acutely hazardous waste (otherwise known as a P-Listed waste, see Section 2.2.2).

- Full containers must be submitted in *E-Trax* for immediate pick-up.

- Hazardous waste must be under the control of the person generating the waste (i.e., an operator) at all times This means that it must not be accumulated in general public area, such as halls, or other areas with general public access. Access must be restricted to trained and authorized personnel.

- It is prohibited to move or relocate hazardous wastes from the SAA unless it is being moved to a Central Accumiulation Area by authorized personnel (see Section 4.2.2).

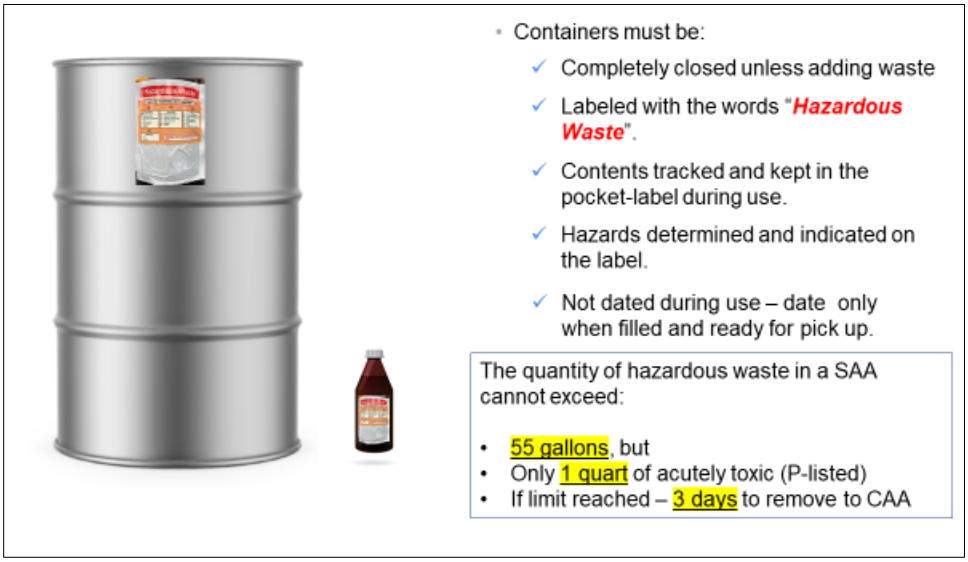
- To clearly identify the location of an SAA a plastic self-adhesive sign as shown below is required to be placed in such a way that clearly identifies the location of hazardous waste accumulation. A good example of an appropriate location for this sign includes the container spill trays. Other locations are also acceptable, however, and if there is a question about a particilar location EQM can be consulted for assistance.



Regardless of where hazardous waste containers are to be placed in an SAA, they must be segregated from other containers such as unused product containers to facilitate the identification and management of the hazardous waste. This can be done by placing the containers in a spill tray, placing the containers in a designated cabinet, or marking a designated area using laboratory tape.

EQM has prepared a guidance document titled *Requirements Specific to Satellite Accumulation Areas* (**Appendix 1**). This resource is intended to assist the operator in achieving compliance with the management requirements for hazardous waste as described in this section.

The following is a summary of the requirements associated with the management of hazardous waste containers at SAAs:



Containers holding hazardous waste must remain closed at all times other than those brief instances when waste is being added. Closed means the container's lid is secured in a tight-fitting condition. "Tight fitting" in this instance includes "hand-tightened" such that a spill would not occur if the container were knocked over and such that air emissions are reduced as much as possible (particularly considering volatile organic waste). Things that do not meet the definition of a "closed" container is Parafilm, tin foil, cork stoppers and other such improvised items. If a container is accumulating effluent from an instrument such as an HPLC, the cap must be drilled or a commercially available cap must be in place such that the tubing just fits through the hole(s). If the container becomes full or the tubing is removed, the cap must be changed to a tight fitting one"

As described in Section 3.0, all containers must be labeled with the words "Hazardous Waste" as soon as the first amount is added to the container. A special self-adhesive "envelope-style" label is available from the EQM and its use is recommended because of the extra utility of also being able to store a list of constituents or other notes with the container and for placment of the final *E-Trax* Waste Card (see Section 5.0). Additionally, hang tags are available which may be used on small containers instead of the envelopes.

The constituents in the container must be indicated. This practice is a UK requirement to help prevent the inadvertent mixing of incompatible wastes and to provide information in the event of any emergency. This list can be written on a folded sheet of paper or an index card and placed in the hazardous waste envelope.

As was noted in Section 3.2, the hazard warnings associated with the waste must be indicated. A menu of hazards is provided on the standard sleeves and hang-tags for the user's convenience and as a reminder to address this most important of labeling requirements.

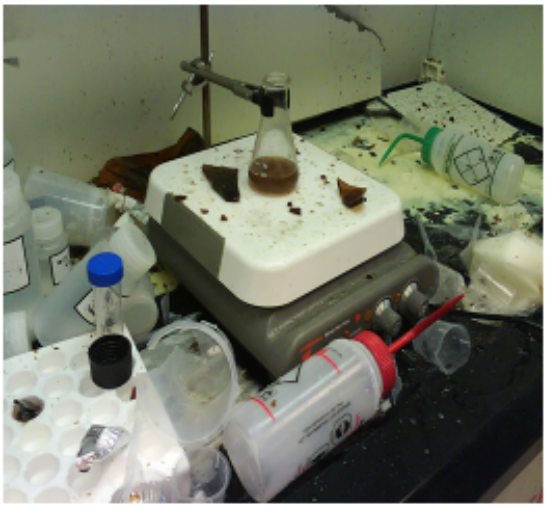
It is important that you DO NOT place a date on the container. Instead, simply attach an *E-Trax Waste Card* to the container as explained in Section 5.0 and that will provide the only required date information.

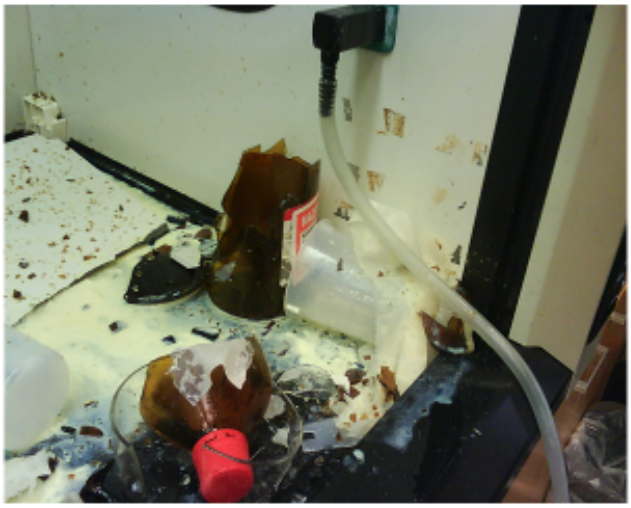
The quantities of waste that may be accumulated at any one time at an SAA is limited. Only 55 gallons of most types of hazardous waste can be accumulated at an SAA. However, only 1 quart of an acutely toxic waste as described in Section 2.2.2 can be accumulated. If any of these above thresholds are met, the waste must be picked up within three (3) calendar days and moved to a Central Accumulation Area (see Section 4.2.2).

Waste Compatibility

Wastes should be stored using proper segregation practices to avoid intermixing of incompatible materials. Compatibility, segregation and storage charts such as those and provided in **Appendix 2** should be consulted for guidance on how to properly store chemical containers. Lack of proper compatibility and segregation of some waste types could result in dangerous conditions producing serious injuries or worse. Provided below is the aftermath of one such dangerous condition at UK that resulted from the mixing of incompantible wastes together – fortunately, no one was injured in this case.

WASTE MUST BE COMPATIBLE WITH THE CONTAINER AND OTHER CONSTITUENTS!





CAUTION!

When incompatible wastes are placed in the same container violent reactions can occur!

4.2.2 Central Accumulation Areas

A **Central Accumulation Area (CAA)** is another type of specifically designated area where hazardous waste is allowed to be accumulated. There are only four CAAs operated at UK, two of which are located on the Lexington main campus and two of which are located off-campus:

On-Campus

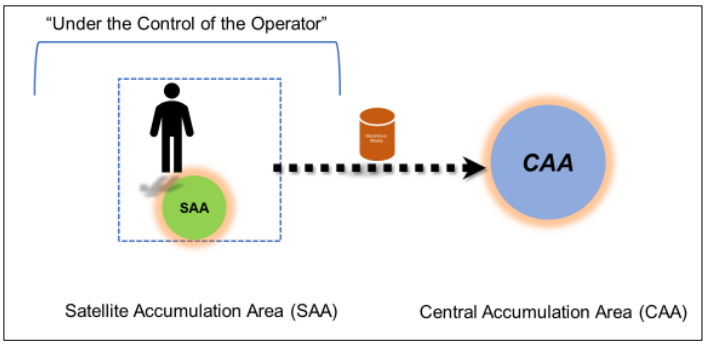
- Environmental Quality Management Center (EQMC)
- Jacobs Science Building

Off-Campus

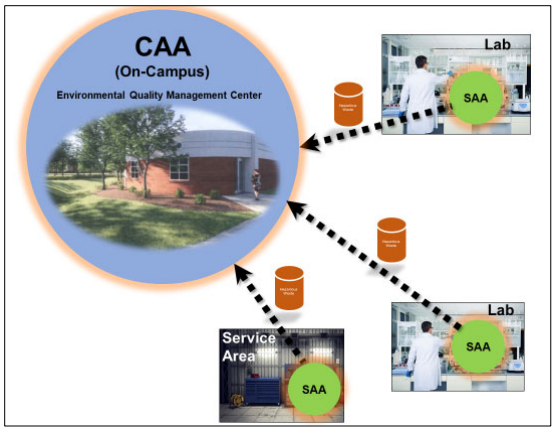
- Center for Applied Energy Research (CAER)
- Veternary Diagnostic Laboratory (VDL)

The primary CAA for UK is the EQMC while the other three are available to receive waste only generated at their particular location. For example, the CAA at the Jacob Science Building only receives hazardous waste originating in that building. And likewise for CAER and VDL, their CAAs are only available for hazardous waste originating from those facilities. CAAs are different from SAA's in several ways but two are noteworthy as explained below:

(1) CAAs do not have to be located at or near the point of generation of the waste.



(2) CAAs can be used to accumulate hazardous waste from mulitple SAAs.



4.5 Management of Other Wastes During Accumulation

4.5.1 Universal Waste

There is another group of wastes that have been given a special regulatory designation called "Universal Waste". EPA's universal waste regulations streamline the hazardous waste management standards for certain categories of hazardous waste that are commonly generated by a wide variety of establishments. The streamlined regulations are designed to promote their collection and recycling, ease regulatory burdens and encourage the development of municipal and commercial programs to reduce the quantity of these wastes going to municipal solid waste landfills.

Universal waste regulations are found in 40 CFR 273 and apply to five types of waste:

- **Batteries**

  Universal waste batteries include nickel-cadmium (Ni-Cd), small sealed lead-acid batteries (i.e., wet-cell batteries) found in electronics, motor vehicles, heavy equipment and emergency backup lighting.

  Universal waste batteries do not include batteries that are not hazardous waste such as common alkaline batteries. These batteries instead can be managed through UK Recycling as an ordinary recyclable waste.

- **Pesticides**

  Universal waste pesticides include those pesticides that have been recalled if they are either stocks of a suspended and canceled pesticide that are part of a voluntary or regulatory mandated recall. Universal waste can also be used to manage stocks of other unused pesticide products that are collected and managed as part of a waste pesticide collection program.

- **Mercury-Containing Equipment**

  Mercury-containing equipment includes a device or part of a device (including thermostats, but excluding batteries and lamps) that contains elemental mercury integral to its function.

- **Lamps**

  Examples of universal waste lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

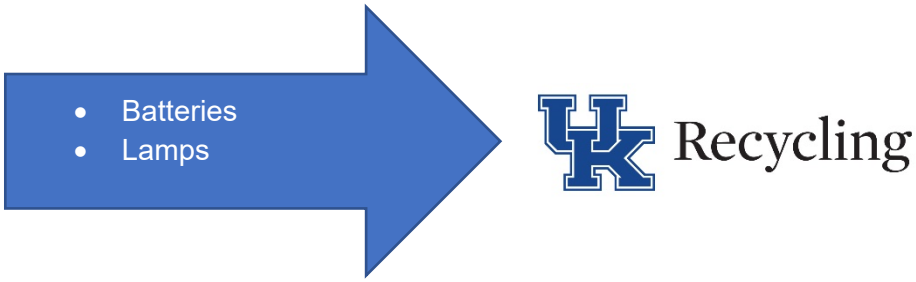
- **Aerosol Cans**

  The ruling on aerosol cans as being a universal waste is a relatively new one. A summary of the requirements for their management as a Universal Waste is available in **Appendix 3**.

There are minimal but important requirements related to universal waste including specific accumulation times, containerization and labeling. In general, materials managed as universal waste can be stored for a year and are not required to be shipped with a manifest or by a hazardous waste transporter. The other specific requirements within the accumulation area are:

- Unlike hazardous waste, containers accumulating Universal Waste must be dated as soon as the container is started.
- The container must be closed unless something is being added to it.
- The container must be labeled universal waste – as an example, *Universal Waste – Lamps*. Universal waste labels may be obtained from the EMD and UK Recycling.

Most common Universal Waste streams at UK consist of batteries and lamps and they are handled by UK Recycling instead of the EQM. If you generate these Universal Wastes, contact **UK Recycling** to request a pick-up.



If you generate mercury-containing equipment, pesticides or aerosol cans, please submit a E-trax (Section 5.0) to request for pick up from EQM.

4.5.2 Used Oil

EPA defines used oil as any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities. Simply put, used oil is exactly what its name implies—any petroleum-based or synthetic oil that has been used.

All waste containers must be stored with secondary containment and protected from the weather. Secondary containment must be kept clear of spills and debris.

Used Oil Container Management

- Do not add anything but used oil to your Used Oil containers.
- Label all used oil containers and drums with the words "USED OIL." Container must be securely closed.

- Use a container with a maximum capacity of 55-gallons or less.
- Keep your container clean and free from marks or drippings.
- Place containers away from drains and within a secondary containment device. Secondary containment must contain 110% of the volume of the largest container stored in the device/area.
- If a container must be stored outside, place the container away from storm sewers, street gutters, waterways, or any drain.
- Manage spills and releases as described below:
    - Consult UK's Petroleum *Spill Decision & Notification Chart* **(Appendix 4)** for general guidance.
    - Take steps to prevent leaks and spills. Keep machinery, equipment containers, and tanks in good working condition and be careful when transferring used oil. Have sorbent materials available on site.
    - If a spill or leak occurs, stop the oil from flowing at the source. If a leak from a container or tank can't be stopped, put the oil in another holding container or tank.

- Contain spilled oil. For example, containment can be accomplished by erecting sorbent berms or by spreading a sorbent over the oil.

- Clean up the oil and recycle the used oil as you would have before it was spilled. If recycling is not possible, you first must make sure the used oil is not contaminated with hazardous waste and dispose of it appropriately. All used cleanup materials, from rags to sorbent booms, that contain free-flowing used oil also must be handled according to the used oil management standards. Remember, all leaked and spilled oil collected during cleanup must be handled as used oil.

- Remove, repair, or replace the defective tank or container immediately.

- If your area has a *Spill Prevention, Control and Countermeasures Plan*, follow the notification and spill response steps in that document.

Used Oil Filters

Used oil filters, when removed from equipment, can contain up to 20 ounces of oil. All oil filters must be punctured on the dome end and hot drained for 24 hours, or crushed and dismantled. "Hot-drained" means that the filters are drained immediately after being taken off a hot engine. Label the outer container as “Used Oil Filters”.

- Metal parts from filters that are drained and/or crushed can be recycled as scrap metal.
- Place punctured or crushed filters in a container labeled as “Used Oil Filters”.

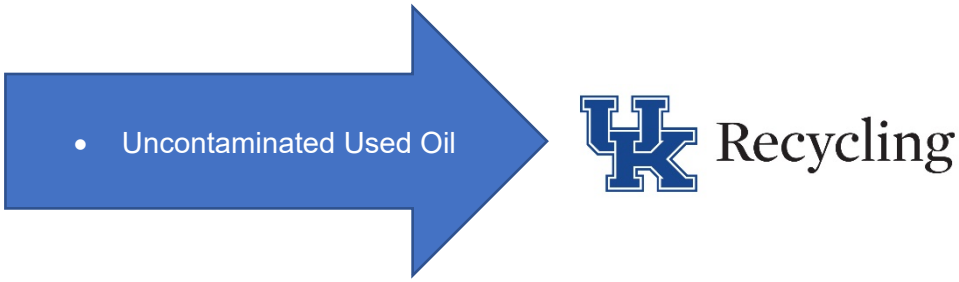
Recordkeeping

Disposal records must be kept for a minimum of three (3) years from the pickup date. It is recommended that a *Used Oil Manager* be designated for each accumulation area who will be responsible for the area.

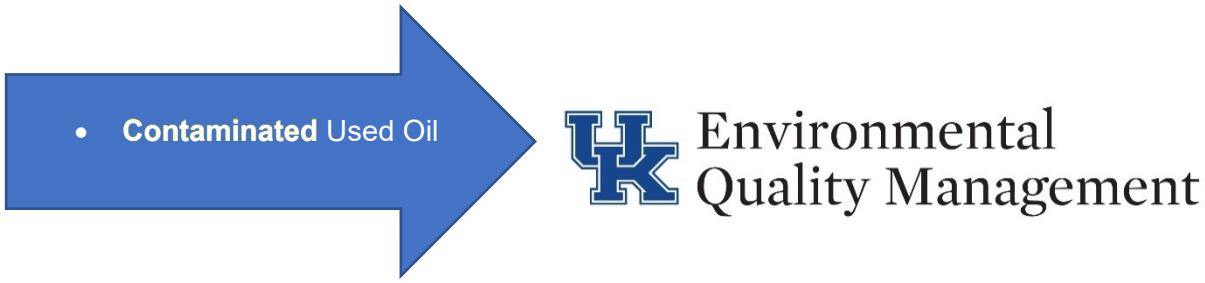
Recycling & Waste Management

Used oil generated from motor oil changes, oil filters pumps, small equipment, can be recycled if it is not contaminated with hazardous waste. This means keeping used oil separated from other types of waste is vital.

If you generate used oil free from contamination, contact **UK Recycling** to request a pick-up.



If you suspect that your used oil has been contaminated with chemicals or solvents, please request disposal through the *E-Trax* System. The EQM Team will test the used oil for final disposal determination.



4.5.3 Non-RCRA Regulated Wastes

There are some wastes that are not regulated because they do not meet any of the criteria classifying them as hazardous waste, universal waste or used oil. Nonetheless, some of these wastes may still pose a risk to human health or the environmental if managed inappropriately. Such waste demands cautious and prudent management consideration even if done so without any regulatory requirements.

These wastes are referred to as "Non-RCRA Regulated Waste" and it is UK's policy that such waste be labeled with the blue label as illustrated here to clearly identify the waste determination that had been made. These labels are available free of charge from EQM.

The three primary waste materials at UK meeting this criteria are ethidium bromide, formalin 10%, and silica gel. There are potentially many more, of course, but these are by far the most common. EQM can be contacted if there is any uncertainty over whether a waste should be managed as Non-RCRA Regulated Waste.

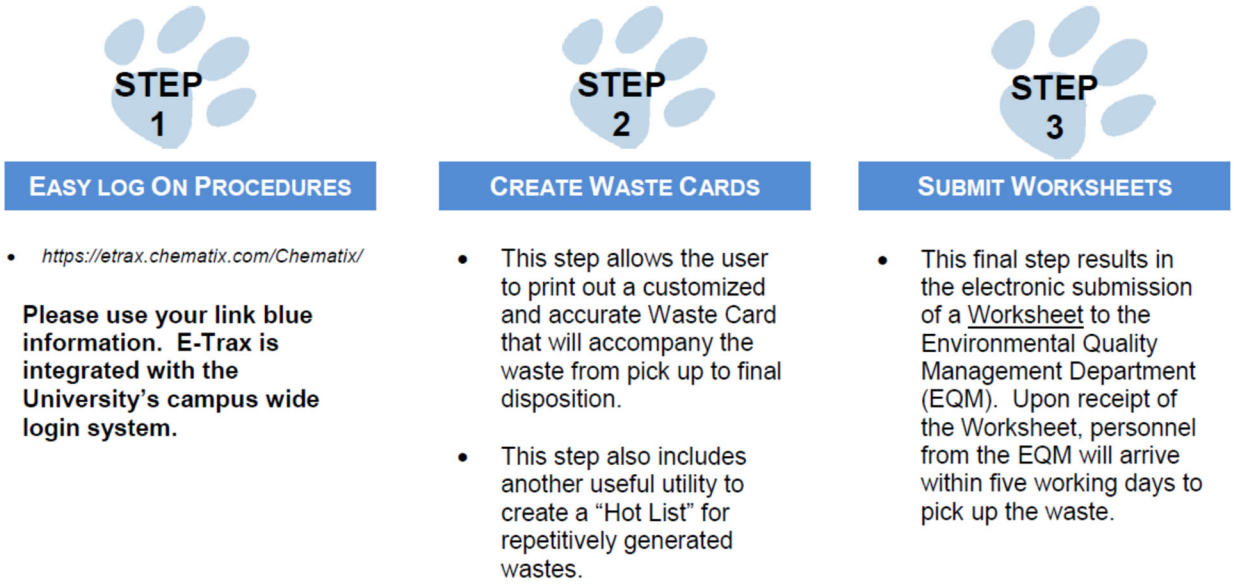
5.0 WASTE PICK-UP (E-TRAX)

E-Trax is a commercial web-based program that enables UK to systematically track and document all aspects of its hazardous and select non-regulated waste generation, management and disposal activities. Not only does *E-Trax* serve as a critical component of UK's regulatory compliance strategy it also provides an uncomplicated and proficient means for those who generate the waste to ensure its safe and timely pick-up by trained personnel from EQM.

The *E-Trax User Guide* is provided in **Appendix 5** provides all of the details of the use of *E-Trax* but in summary, the individual generator is responsible for creating *Waste Cards* for each container of waste. These cards are attached to each container normally by insertion into a special plastic sleeve provided by EQM or simply taped onto the container as described in Section 3.0). The type of information to be provided on the *Waste Card* includes:

- The exact location of the waste (i.e., building name and room number),
- The chemical constituents which are presented on the basis of percentage, volume or mass, the size of the container,
- The date on which the waste container is full and ready for pick-up, and
- The Principal Investigator's name.

The *Waste Cards* are submitted electronically within the *E-Trax* system to EQM by the generator idicating they are ready for a pick-up. Still within the *E-Trax* system, EQM transfers the information into a *Pick-Up Worksheet* (i.e., a log of all removal requests) that summarizes all of the outstanding Waste Cards that have yet to be picked-up by EQM.



Utilizing the *Pick-Up Worksheet*, EQM regularly schedules the pick-up of waste from the various waste-generating locations both on and off campus. Unless a special pick-up is requested, waste is picked up within five (5) working days of receipt of the submitted *Waste Card*. To meet this goal, however, it is imperative that EQM staff have access to the waste during normal business hours. EQM does not have independent access to labs and other locked spaces, therefore, those requesting the waste pick up service should be present. If access will be unavailable during specific times of the day, these dates/times should be noted on the *Waste Card*.

After verifying a match with the information on the *Pick-Up Worksheet* with that on the *Waste Cards* EQM staff picks up the waste containers and transports them to the on-campus CAA which as noted in Section 4.2.2 is the Environmental Quality Management Center. It is at this facility and using the information provided by the generator on the *Waste Card* that EQM staff prepare all waste for shipment to an off-site commercial permitted facility for final treatment or disposal location or for treatment within the EQMC.

6.0 EMERGENCY PLANNING

6.1 Contingency Plan

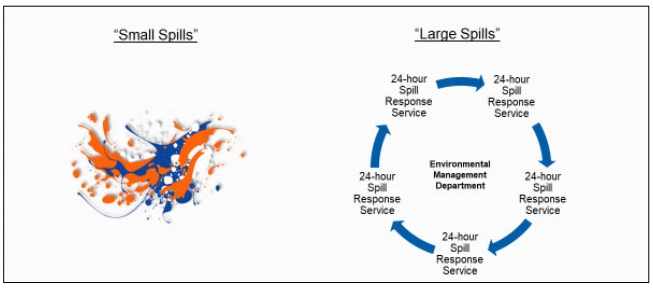
Each SAA must have available a document entitled *Contingency Plan Quick Reference Guide*. The intent of the Quick Reference Guide is to assist emergency responders to quickly identify the hazards they may encounter. This guide is provided in **Appendix 6** and should be maintained in your Chemical Hygiene Plan or some other readily accessible location.

The sections required to be part of the guide are:

- ✓ Types, names, and hazards for Hazardous Waste
- ✓ Estimated maximum amounts
- ✓ Map showing location of SAA's
- ✓ Map of surrounding areas and routes of access
- ✓ Location of water supply
- ✓ Identification of emergency equipment
- ✓ Names and telephone number of Emergency Coordinator

The *Contingency Plan Quick Reference Guide*, along with SAA signs (Section 4.2.1), the standard laboratory door signage, the *Building's Emergency Action Plan* which includes the building's evacuation routes and the area's chemical inventory will meet the requirements for having a contingency plan available in a quick reference format. Also forming the basis of the contingency plan are the available on-line campus maps and the University emergency notification systems.

6.2 Spill Clean up



If a spill does occur at an SAA, those responsible for hazardous waste management should be able to quickly respond to those instances in which relatively small quantities of waste have been spilled. It is difficult to place a precise volume on what constitutes a "small" spill and it may well vary from waste-to-waste and location-to-location. It includes an amount that the individual generator feels capable to

address and is prepared to handle in terms of experience, training and access to clean-up materials.

In those instances that the volume exceeds an amount that the SAA personnel are able to manage, then EQM staff are prepared to respond to assist on a 24-hour a day and 7 day a week basis. EQM may be contacted during regular business hours at its main line 323-6280 or after hours by dialing 911 from any on-campus phone or by contacting the UK Police at 257-UKPD (8573). EQM's desired response time is (1) one hour or less.

Lastly, there may be those instances in which the spill exceeds even the resources of EQM and in those cases the Lexington Fire Department's Haz Mat Unit will be contacted.

7.0 TRAINING

To promote a safe work environment and to comply with state and federal legal requirements all UK faculty, staff and students performing hazardous waste management tasks must complete initial and annual training. Access to the training and the associated training verification quiz is available online.

Initial Training

Training must be completed within six (6) months after the date of assignment to the position requiring management of hazardous waste. Work in unsupervised positions is not allowed until the successful completion of the training and subsequent verification as outlined below.

Annual Training

Annual hazardous waste management refresher training is required on successive years after the initial training. Annual training is required as long as assigned job responsibilities include the management of hazardous waste.

Successfully passing the hazardous waste on-line untimed quiz is necessary for all faculty, staff and students that have any role in the management of hazardous waste. Passing the quiz is automatically registered to EQM as proof of the required training and it allows access to UK's web-based waste pick-up request system *E-Trax* (Section 5.0).

8.0 Summary

ALL CONTAINERS OF HAZARDOUS WASTE MUST :

- ✓ Be labeled with the words "Hazardous Waste".
- ✓ Be labeled with hazard warning information.
- ✓ Be labeled with the waste's constituents.
- ✓ Be closed at all times, except when filling.
- ✓ Be located under the control of an operator.
- ✓ Be in a clearly identified and maintained Satellite Accumulation Area
- ✓ Not include incompatible wastes.
- ✓ Not include a date until it is filled and ready for pick-up.
- ✓ As much as possible, segregate wastes from non-waste chemicals.

WITHIN A SATELLITE ACCUMULATION AREA:

- No more than 55-gal. of hazardous waste (only 1 qt. of acutely toxic).

EVERYONE MANAGING HAZARDOUS WASTE MUST:

- Complete initial and annual Hazardous Waste training.

Appendix 1

Requirements Specific to Satellite Accumulation Areas

Environmental Management

Regulatory Compliance Guidance Paper

HAZARDOUS WASTE MANAGEMENT

REQUIREMENTS SPECIFIC TO SATELLITE ACCUMULATION AREAS (SAA'S)

Background

The EPA and the Kentucky Division of Waste Management (KDWM) have modified or clarified some of the regulations under the Resource Conservation and Recovery Act (RCRA). This document provides guidance for the specific requirements for managing waste in the SAA's where Hazardous Waste may be generated.

Under the Control of the Generator

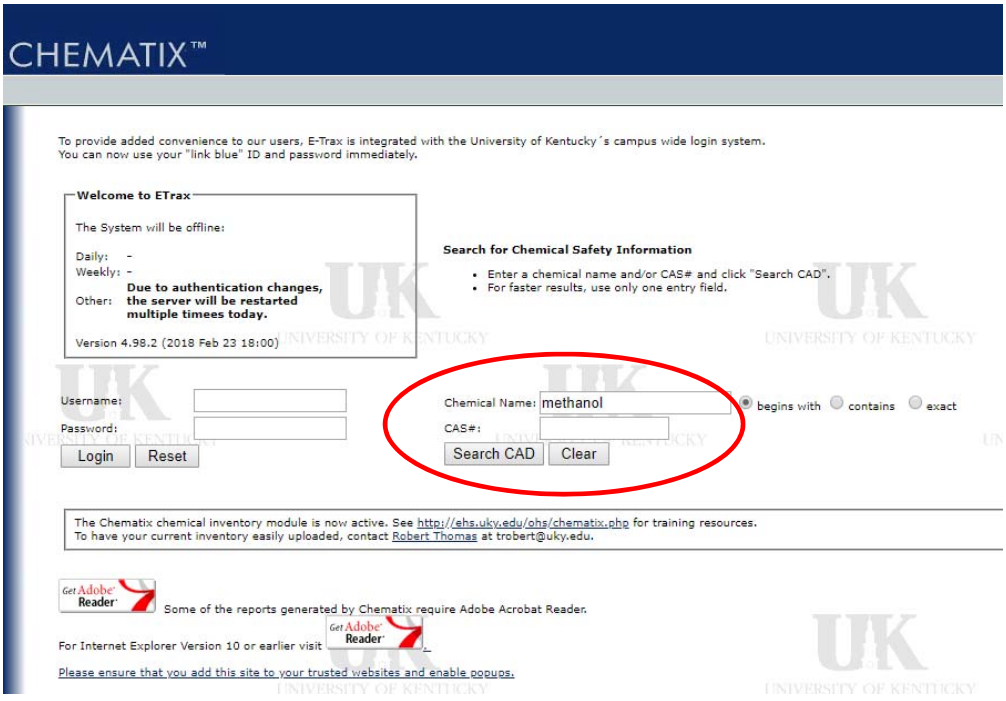
All Hazardous Waste must be under the control of the generator while it is being accumulated. The control may be accomplished by any one or combination of the methods listed:

- Access to the SAA must be controlled by access card, key, or lock box
- Waste is accumulated in a locked cabinet and access to the cabinet is controlled (even if access to the room is not controlled)
- The waste regularly in view of the generators in the SAA during the course of their job
- The generator is able to see if anyone enters or exits the SAA

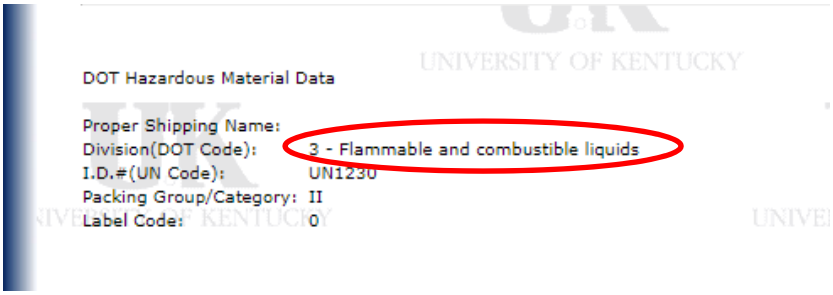
Waste Determination and Recordkeeping

Accurate waste determination MUST be made at the point of generation (within the SAA) This determination should be made:

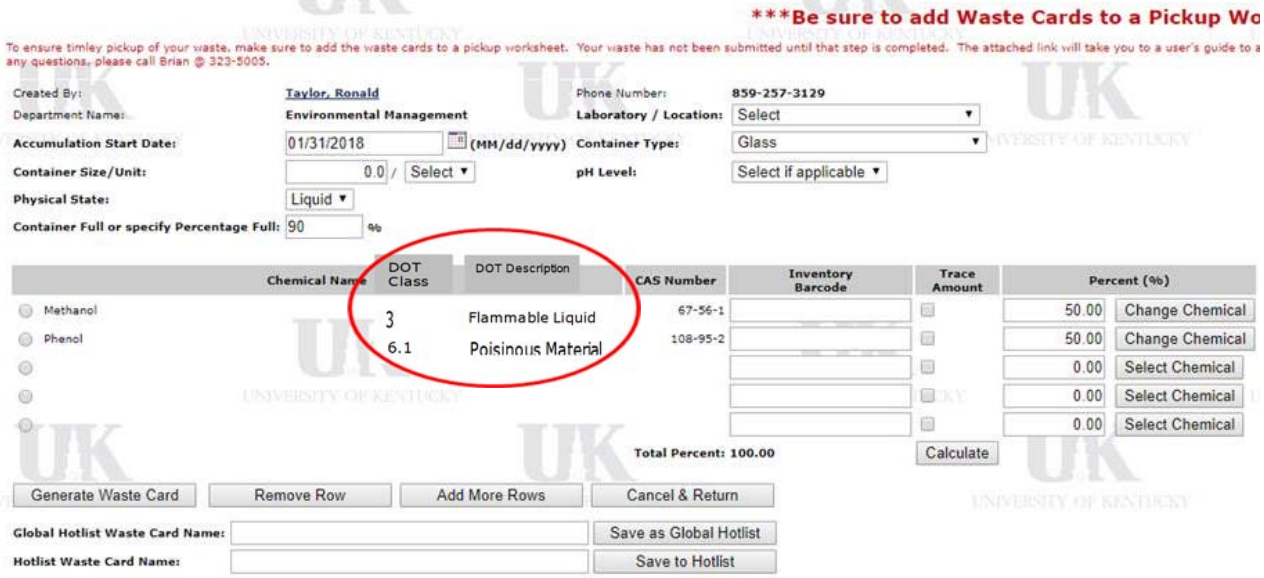
- Using the generator's knowledge of the material.
- Utilizing the E-Trax DOT description of the waste constituents. This may be done by entering the chemical name (s) or CAS number (s) on the opening page as shown and clicking "Search CAD":



Then click on the CAS number and the Chemical Abstract (CAD) will open. Scroll through the abstract and note the DOT description as shown:



- Alternatively, after signing in to E-Trax and navigating to the E-Trax waste card creation screen, select the chemical to be placed in the waste container and observe the DOT hazard classification information:

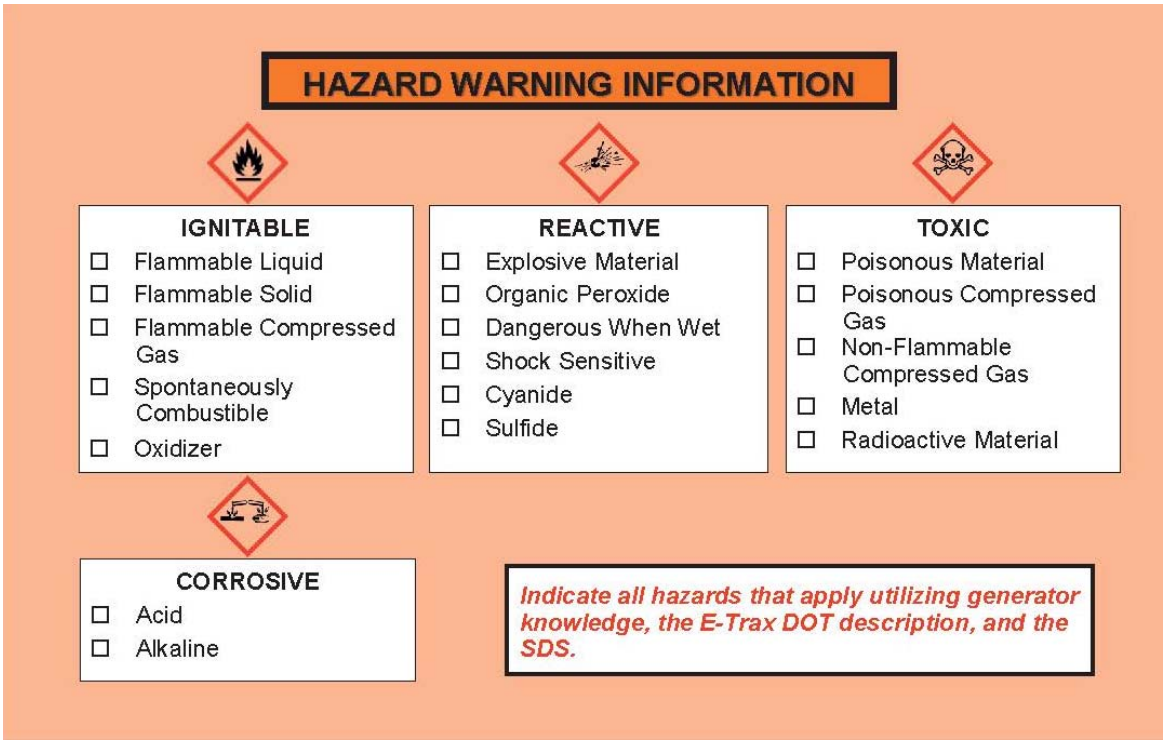


- The Safety Data Sheet (SDS) may also be used to determine the hazard classification by referencing section 14 of the SDS.
- Records of this waste determination must be kept at the generating locations for 3 years after the waste was last generated. These records are available in the E-Trax waste management system.

Labeling

Proper labeling of waste accumulation containers must occur at the time and the point where the waste is generated. Utilizing the information recorded as part of the waste determination process, each container must be:

- Labeled with the Hazardous Waste label or other appropriate label such as Non-RCRA Regulated Waste, Used Oil, or Universal Waste.
- Hazardous Waste containers must have hazard warning information indicated. Utilizing the *Hazard Warning Information* shown below and printed on the Hazardous Waste envelope or the hang tag card, check all warning boxes that apply. The primary source of this warning information will be as described above in waste determination utilizing generator knowledge, the E-Trax DOT description, or the SDS. This information must be indicated as soon as Hazardous Waste is introduced into the container and must be present and visible at all times.



- A date must not be placed on the container until it is filled and ready for pick up.
- University policy also requires that the container be labeled with the contents. This can be accomplished by writing the contents on the back of the hazard warning information card, or folded sheet of paper as they are added to the container. The card or paper may be placed in the Hazardous Waste envelope but the hazard warning information must be visible.

Container Management

Containers accumulating waste must be managed in a manner to prevent hazardous conditions. The requirements are:

- Containers accumulating wastes that are incompatible with other waste containers must be separated by any practical means. Some examples of separation are in separate cabinets or utilization of spill trays.
- Containers must be closed at all times unless waste is being added to them. However, a container may be open for temporary venting, proper operation of equipment, or to prevent dangerous situations. Once the temporary condition has passed, the container must be closed.
- Specific caps for containers collecting effluent from HPLC units should be purchased but if these are not available a cap may be drilled so that the tubing will fit into the hole or specific caps purchased. These caps must be changed prior to offering the waste for pick up.
- Once a Hazardous Waste container is ready for pick up, an *E-Trax* waste card must be printed, placed in the waste envelope on the container, and a waste pick up request submitted to the Environmental Management Department (EMD)

Contingency Plans

All SAA's must have a *Contingency Plan Quick Reference Guide* outlining the hazard information for the location and the appropriate emergency response information. Each SAA should use the Quick Reference Guide provided and insure that all occupants are familiar with the information and the requirements. This guide includes:

- Types and names of hazardous waste and associated hazards
- Estimated maximum amounts
- Any waste requiring special treatment
- Map showing generation and accumulation locations
- Map of facility and surroundings to include routes of access
- Location of water supply

- Identification of emergency equipment
- Telephone number and name of emergency coordinator

Additionally:

- The SAA location must be identified and labeled using the provided sign:

- The laboratory door signage must be maintained in accordance with the Lab Safety requirements.
- The evacuation maps identified as part of the Building Emergency Action Plan (BEAP) must be posted.

Appendix 2

Chemical Compatibility Charts

Fisher Scientific

CHEMICAL COMPATIBILITY CHART

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Inorganic Acids																								
2	Organic acids	●																							
3	Caustics	●	●																						
4	Amines & Alkanolamines	●	●																						
5	Halogenated Compounds	●		●	●																				
6	Alcohols, Glycols & Glycol Ethers	●																							
7	Aldehydes	●	●	●	●		●																		
8	Ketone	●		●	●			●																	
9	Saturated Hydrocarbons																								
10	Aromatic Hydrocarbons	●																							
11	Olefins	●				●																			
12	Petrolum Oils																								
13	Esters	●		●	●																				
14	Monomers & Polymerizable Esters	●	●	●	●	●	●																		
15	Phenols			●	●			●							●										
16	Alkylene Oxides	●	●	●	●		●	●							●	●									
17	Cyanohydrins	●	●	●	●	●		●									●								
18	Nitriles	●	●	●	●												●								
19	Ammonia	●	●					●	●					●	●	●	●	●							
20	Halogens			●			●	●	●	●	●	●	●	●	●	●				●					
21	Ethers	●													●						●				
22	Phosphorus, Elemental	●	●	●																	●				
23	Sulphur, Molten								●	●	●	●					●						●		
24	Acid Anhydrides	●		●	●		●	●							●		●	●	●	●					

● Represents Unsafe Combinations

Represents Safe Combinations

Group 1: Inorganic Acids

Chlorosulphonic acid
Hydrochloric acid (aqueous)
Hydrofluoric acid (aqueous)
Hydrogen chloride (anhydrous)
Hydrogen fluoride (anhydrous)
Nitric acid
Oleum
Phosphoric acid
Sulfuric acid

Group 2: Organic Acids

Acetic acid
Butyric acid (n-)
Formic acid
Propionic acid
Rosin Oil
Tall oil

Group 3: Caustics

Caustic potash solution
Caustic soda solution

Group 4: Amines and Alkanolamines

Aminoethylethanolamine
Aniline
Diethanolamine
Diethylenetriamine
Diisopropanolamine
Dimethylamine
Ethylenediamine
Hexamethylenediamine
2-Methyl-5-ethylpyridine
Monoethanolamine
Monoisopropanolamine
Morpholine
Pyridine
Triethanolamine
Triethlamine
Triethylenetetramine
Trimethylamine

Group 5: Halogenated Compounds

Allyl chloride
Carbon tetrachloride
Chlorobenzene
Chloroform
Chlorohydrines, crude
Dichlorobenzene (o-)
Dichlorobenzene (p-)
Dichlorodifluoromethane
Dichloroethyl ether
Dichloropropane
Dichloropropene
Ethyl chloride
Ethylene dibromide
Ethylene dichloride
Methyl bromide
Methyl chloride
Methylene chloride
Monochlorodifluoromethane
Perchloroethylene
Propylene dichloride
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
Trichloroethylene
Trichlorofluoromethane

Group 6: Alcohols, Glycols and Glycol Ethers

Allyl alcohol
Amyl alcohol
1,4-Butanediol
Butyl alcohol (iso, n, sec, tert)
Butylene glycol
Corn syrup
Cyclohexyl alcohol
Decyl alcohol (n, iso)
Dextrose solution
Diacetone alcohol
Diethylene glycol
Diethylene glycol dimethyl ether
Diethylene glycol monobutyl ether
Diethylene glycol monoethyl ether
Diethylene glycol monomethyl ether
Diisobutyl carbitol
Dipropylene glycol
Dodecanol
Ethoxylated dodecanol
Ethoxylated pentadecanol
Ethoxylated tetradecanol
Ethoxylated tridecanol
Ethoxytriglycol
Ethyl alcohol
Ethyl butanol
2-Ethylbutyl alcohol
2-Ethylhexyl alcohol
Ethylene glycol
Ethyleneglycol monobutyl ether
Ethylene glycol monoethyl ether
Ethylene glycol monomethyl ether
Furfuryl alcohol
Glycerine
Heptanol
Hexanol
Hexylene glycol
Isoamyl alcohol
Isooctyl alcohol
Methyoxytriglycol
Methyl alcohol
Methylamyl alcohol
Molasses, all
Nonanol
Octanol
Pentadecanol
Polypropylene glycol methyl ether
Propyl alcohols (n, iso)
Propylene glycol
Sorbitol
Tetradecanol
Tetraethylene glycol
Tridecyl alcohol
Triethylene glycol
Undecanol

Group 7: Aldehydes

Acetaldehyde
Acrolein (inhibited)
Butyraldehyde (n, iso)
Crotonaldehyde
Decaldehyde (n, iso)
2-Ethyl-3-propylacrolein
Formaldehyde solutions
Furfural
Hexamethylenetetramine
Isooctyl aldehyde
Methyl butyraldehyde
Methyl formal
Paraformaldehyde
Valeraldehyde

Group 8: Ketones

Acetone
Acetophenone
Camphor oil
Cyclohexanone
Diisobutyl ketone
Isophorone
Mesityl oxide
Methyl ethyl ketone
Methyl isobutyl ketone

Group 9: Saturated Hydrocarbons

Butane
Cyclohexane
Ethane
Heptane
Hexane
Iso-butane
Liquified natural gas
Liquified petroleum gas
Methane
Nonane
n- Paraffins
Pentane
Petrolatum
Petroleum ethers
Petroleum naphtha
Polybutene
Propane
Propylene butylene polymer

Group 10: Aromatic Hydrocarbons

Benzene
Cumene
p-Cymene
Coal tar oil
Diethylbenzene
Dodecyl benzene
Dowtherm
Ethylbenzene
Naphtha, coal tar
Naphthalene (includes molten)
Tetrahdyronaphthalene
Toluene
Triethyl benzene
Xylene (m-, o-, p-)

Group 11: Olefins

Butylene
1-Decene
Dicyclopentadiene
Diisobutylene
Dipentene
Dodecene
1-Dodecene
Ethylene
Liquified petroleum gas
1-Heptene
1-Hexane
Isobutylene
Nonene
1-Octene
1-Pentene
Polybutene
Propylene
Propylene butylene polymer
Propylene tetramer (dodecene)
1-Tetradecene
1-Tridecene
Turpentine
1-Undecene

Group 12: Petroleum Oils

Asphalt
Gasolines
- Casingead
- Automotive
- Aviation

Jet Fuels
JP-1 (kerosene)
JP-3
JP-4
JP-5 (kerosene, heavy)
Kerosene
Mineral spirits
Naphtha (non aromatic)
Naphtha
- Solvent
- Stoddard solvent
- VM&P

Oils
- Absorption oil
- Clarified oil
- Crude oil
- Diesel oil
- Fuel oil
  - No. 1 (kerosene)
  - No. 1-D
  - No. 2
  - No. 2-D
  - No. 4
  - No. 5
  - No. 6
- Lubricating oil
- Mineral oil
- Mineral seal oil
- Motor oil
- Penetration oil
- Range oil
- Road oil
- Spindle oil
- Spray oil
- Transformer oil
- Turbine oil

Group 13: Esters

Amyl acetate
Amyl tallate
Butyl acetates (n, iso, sec)
Butyl benzyl phthalate
Castor oil
Croton oil
Dibutyl phthalate
Diethyl carbonate
Dimethyl sulfate
Dioctyl adipate
Dioctyl phthalate
Epoxidized vegetable oils
Ethyl acetate
Ethyl diacetate
Ethylene glycol monoethyl ether acetate
Ethylhexyl tallate
Fish oil
Glycol diacetate
Methyl acetate
Methyl amyl acetate
Neatsfoot oil
Olive oil
Peanut oil
Propyl acetates (n, iso)
Resin oil
Soya bean oil
Sperm oil
Tallow
Tanner's oil
Vegetable oil
Wax, carnauba

Group 14: Monomers and Polymerizable esters

Acrylic acid (inhibited)
Acrylonitrile
Butadiene (inhibited)
Butyl acrylate (n, iso)
Ethyl acrylate (inhibited)
2-Ethylhexyl acrylate (inhibited)
Isodecyl acrylate (inhibited)
Isoprene (inhibited)
Methyl acrylate (inhibited)
Methyl methacrylate (inhibited)
o-Propiolactone
Styrene (inhibited)
Vinyl acetate (inhibited)
Vinyl chloride (inhibited)
Vinylidene chloride (inhibited)
Vinyl toluene

Group 15: Phenols

Carbolic oil
Creosote, coal tar
Cresols
Nonylphenol
Phenol

Group 16: Alkylene Oxides

Ethylene Oxide
Propylene Oxide

Group 17: Cyanohydrins

Acetone cyanohydrin
Ethylene cyanohydrin

Group 18: Nitriles

Acetonitrile
Adiponitrile

Group 19: Ammonia

Ammonium hydroxide

Group 20: Halogens

Bromine
Chlorine

Group 21: Ethers

Diethyl ether (ethyl ether)
1, 4-Dioxane
Isopropyl ether
Tetrahydrofuran

Group 22: Phosphorus, elemental

Group 23: Sulphur, molten

Group 24: Acid Anhydride

Acetic anhydride
Propionic anhydride

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CHEMICAL RESISTANCE OF PLASTICS

	Polypropylene		Polycarbonate		Polyethylene			
					LD		HD	
Chemical	**20°C**	**60°C**	**20°C**	**60°C**	**20°C**	**60°C**	**20°C**	**60°C**
Acetic acid solution <90%	R	R	R	R	R	R	R	R
Acetic acid, glacial	R	U	U	U	A	U	R	L
Acetone	R	R	U	U	E	U	R	R
Ammonia	R	R	U	U	R	R	R	R
Aniline	R	R	U	U	U	U	R	R
Benzene	A	U	U	U	U	U	U	U
Boric acid	R	R	R	R	R	R	R	R
Bromine	U	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	A	U
Chlorinated solvents	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U
Cresols	U	U	U	U	U	U	U	U
Diethyl ether	U	U	U	U	U	U	U	U
Diethylene glycol	R	R	R	U	R	R	R	E
Ethers	U	U	A	U	E	U	A	U
Ethyl acetate	A	A			A	U	A	U
Ethanol	R	R	R	R	R	U	R	R
Ethylene glycol	R	R	R	U	R	R	E	E
Formaldehyde solutions 40%	R	R	R	R	R	E	R	R
Formic acid	R	R	R	R	R	E	R	R
Hydrochloric acid conc.	E	E	L	U	R	R	SW	SW
Hydrofluoric acid 1-60%	E	E	20%	U	R	R	R	L
Hydrofluoric acid conc.	E	E	L	U	R	U	R	L
Hydrogen peroxide 30-90%	R	R	R	R	R	U	R	A
Hypochlorous acid	R	R			A	U	R	R
Magnesium hydroxide	R	R			R	R	R	R
Maleic acid	R	R			R	R	R	R
Mineral oil	R	R	R	R	A	U	R	E
Nitric acid <25%	R	R	R	U	R	R	R	R
Nitric acid 25-70%	R	E	U	U	A	U	L	U
Nitric acid >70	E	U	U	U	U	U	U	U
Oxalic acid	R	A	R	R	R	R	R	R
Paraffin	R	A	R	R	A	U		
Petroleum ether	A	U	R	R	U	U	U	U
Phosphoric acid <30%	R	R	R	R	R	R	R	R
Phosphoric acid 30-85%	R	R	R	R	R	A	R	R
Phosphoric acid >85%	R	R	R	R	A	U	R	A
Potasium hydroxide	50%	10%	U	U	R	R	R	30%
Salicylic acid	R	R	R	R	R	R	R	R
Sodium hydroxide solution	50%	10%	U	U	R	R	R	30%
Sulfuric acid <60%	R	R	R	R	R	R	R	R
Sulfuric acid 60-70%	R	U	R	R	R	A	R	A
Sulfuric acid >70%	E	U	U	U	A	U	A	L
Silicone oil	R	R	R	R	A	U	E	E
Stearic acid	R	R	R	R	R	R	R	R
Toluene	U	U	U	U	U	U	U	U
Trichloroethylene	U	U	U	U	U	U	V	U
Water	R	R	R	R	R	R	R	R

Key

R Resistant
V Vapour diffusion
U Unsuitable
SW Swelling occurs
L Limited resistance
% Max concentration
A Slowly attacked (not recommended for long term storage)
E Environmental stress cracking

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Appendix 3

Universal Waste – Aerosol Cans

Environmental Quality Management

Regulatory Compliance Guidance Paper

UNIVERSAL WASTE MANAGEMENT

AEROSOL CANS

Background

This policy establishes requirements for the management of aerosol cans as Universal Waste.

Scope

This policy applies to the disposal of certain hazardous wastes regulated by the U.S. Environmental Protection Agency (EPA) as Universal Waste. On December 9, 2019, EPA issued the final rule adding hazardous waste aerosol cans to the Universal Waste program in 40 CFR Part 273.

Aerosol cans may be generated by nearly every area on campus, from labs to arts studios and from the baseball fields to healthcare locations.

Aerosol cans often contain flammable propellants such as – propane or butane – so that they exhibit the hazardous waste characteristic of ignitability. An aerosol can may also contain other hazardous materials that exhibit hazardous waste characteristics or are listed hazardous waste.

- Only aerosol cans in good condition can be handled as Universal Waste. For example, a leaking aerosol can cannot be managed under this policy.
- The UK Environmental Quality Management Department (EQM) will supply 55- gallons drums to areas that generated large amounts of aerosol cans.

Managing & Labeling

- Generators of aerosol cans must label the containers "**Universal Waste-Aerosol Cans**".
- You **must mark on the label the date the first aerosol can** is placed in the container regardless of whether the cans are in a box or are individual cans.
- Remove the nozzle of the can but do not puncture the can.
- Do **NOT** place the aerosol cans inside of a Satellite Accumulation Area (SAA). The SAA is the accumulation area for hazardous waste.
- Contact the EQM to obtain labels.

Storage

If you are storing aerosol cans in containers, the container must be kept closed, except when adding aerosol cans to the container.

Disposal

- All Universal Waste must not be accumulated for longer than 12 months.
- You must schedule a pickup of the aerosol cans not later than **11 months after the date the first aerosol can is placed in the container**, regardless of whether the container is full or not.
- **Do Not** puncture any cans.
- Locations that generate or accumulate other types of waste such as biological or chemical wastes and use *E-Trax* for pick-up notification, can submit a request to have their aerosol cans picked up in the same way.

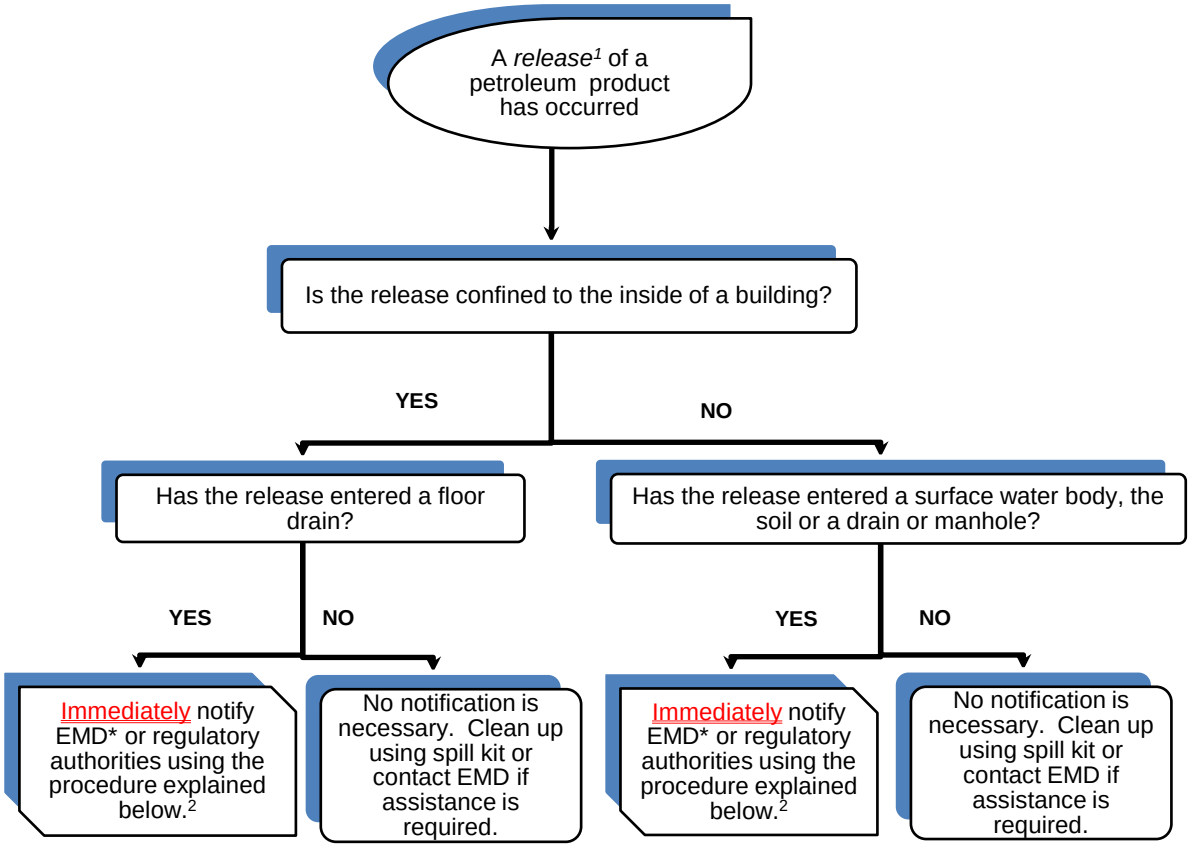
Leaking Cans

Clean up spills immediately. Place leaking aerosol cans into a **separat**e container from aerosol cans in good condition. Spill residues are also hazardous waste. Label containers with hazardous waste labels. For disposal, utilize *E-Trax* to notify EQM for a pick-up request.

Appendix 4

Petroleum Spill Decision & Notification Chart

PETROLEUM SPILL DECISION & NOTIFICATION CHART



1 – *Release* means any spilling, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing of petroleum into the environment.

2 – A release of petroleum meeting any of the criteria below must be reported to appropriate regulatory authorities within 15 minutes of knowledge of the release.

- Release of gasoline or other petroleum products such as oils in quantities greater than 25 gallons.
- Release of diesel in quantities greater than 75 gallons.
- Release that creates a visible sheen on surface waters.
- If a release enters a floor drain immediate determination must be made as to whether the material could enter the environment. If in doubt, assume it has for reporting purposes.

If a release occurs, EMD should be notified to provide assistance in notifying the proper regulatory agencies. If EMD cannot be contacted within approximately 10 minutes of knowledge of the release, then the operating unit should notify each of the regulatory authorities listed below:

CONTACT	NORMAL BUSINESS HOURS (8 AM – 5 PM; M – F)	AFTER HOURS AND WEEKENDS / HOLIDAYS
UK Environmental Management Department	323-6280	9-911 (from campus phone) or 257-8573 (UK Police Department)
LFUCG** Fire Department	9 – 911 (campus phone) 911 (mobile phone)	9 – 911 (campus phone) or 911 (mobile phone)
LFUCG** Emergency Management	258-3784	9 – 911 (campus phone) or 911 (mobile phone)
Kentucky Emergency Response Center	502-564-2380	800-928-2380
National Response Center	800-424-8802	800-424-8802

*EMD – UK Environmental Management Department ** LFUCG – Lexington Fayette Urban County Government

Appendix 5

E-Trax Users Guide

E-TRAX

The Complete Waste Tracking System.

What is *E-Trax*? ***E-Trax*** enables the University to systematically track and document all aspects of its hazardous (and other special) waste generation, management and disposal activities. Therefore, not only does ***E-Trax*** serve as a critical component of the University's regulatory compliance strategy it also provides an uncomplicated yet proficient means for those who generate the waste to ensure its safe and timely pick-up by trained personnel from the Environmental Management Department.

How does it work? Once training at http://ehs.uky.edu/env/hazardous_training.php is completed, there are only three easy steps to using the ***E-Trax*** system and they include:

STEP 1

EASY LOG ON PROCEDURES

- *https://etrax.chematix.com/Chematix/*

Please use your link blue information. E-Trax is integrated with the University's campus wide login system.

STEP 2

CREATE WASTE CARDS

- This step allows the user to print out a customized and accurate Waste Card that will accompany the waste from pick up to final disposition.
- This step also includes another useful utility to create a "Hot List" for repetitively generated wastes.

STEP 3

SUBMIT WORKSHEETS

- This final step results in the electronic submission of a Worksheet to the Environmental Quality Management Department (EQM). Upon receipt of the Worksheet, personnel from the EQM will arrive within five working days to pick up the waste.

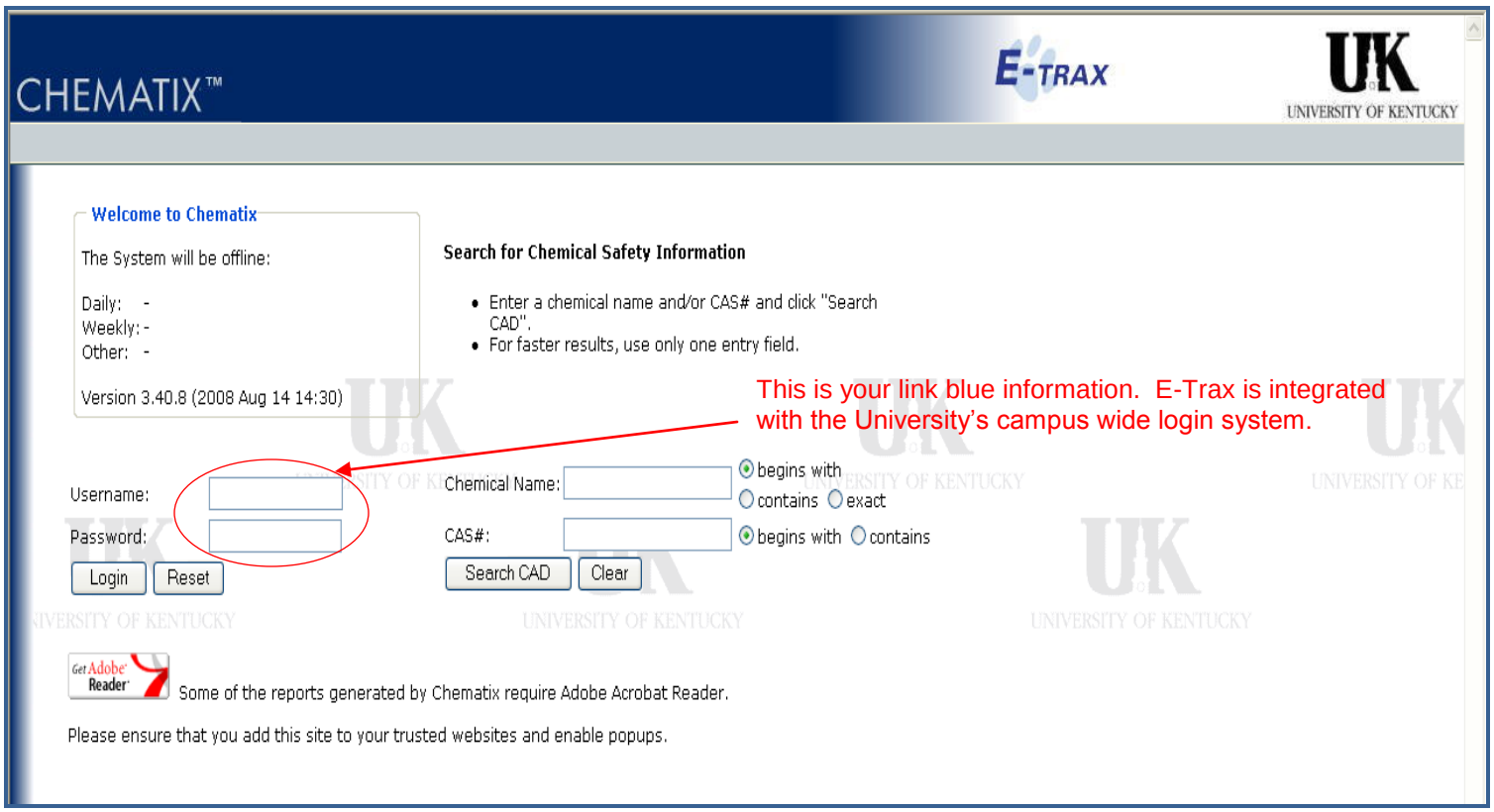
E-TRAX

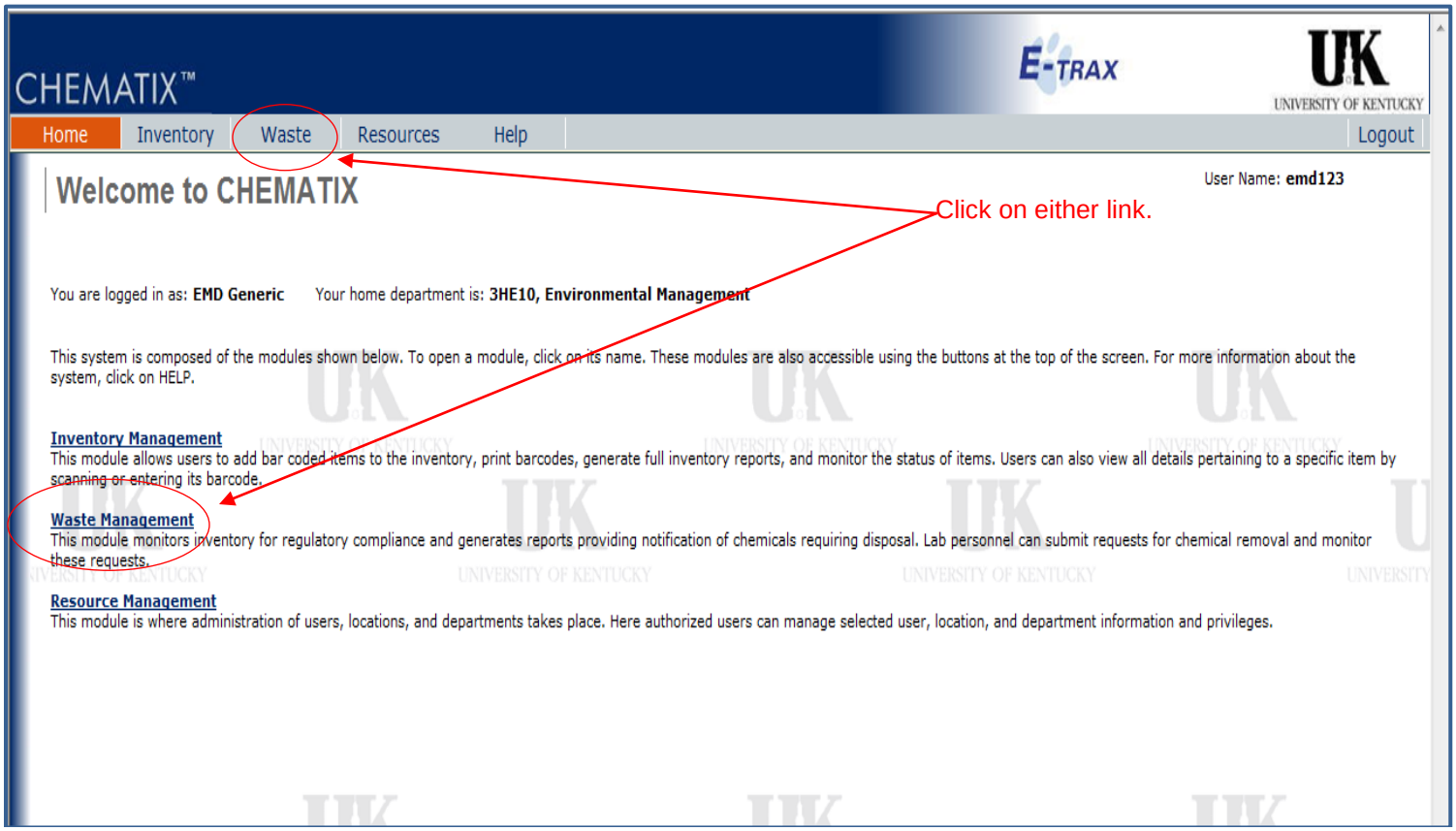
If you need assistance in accessing or using ***E-Trax***, please contact:

Brian Butler, Waste Management Systems Specialist
University of Kentucky
Environmental Quality Management Department
bbutl1@uky.edu
Office: 859-323-5005

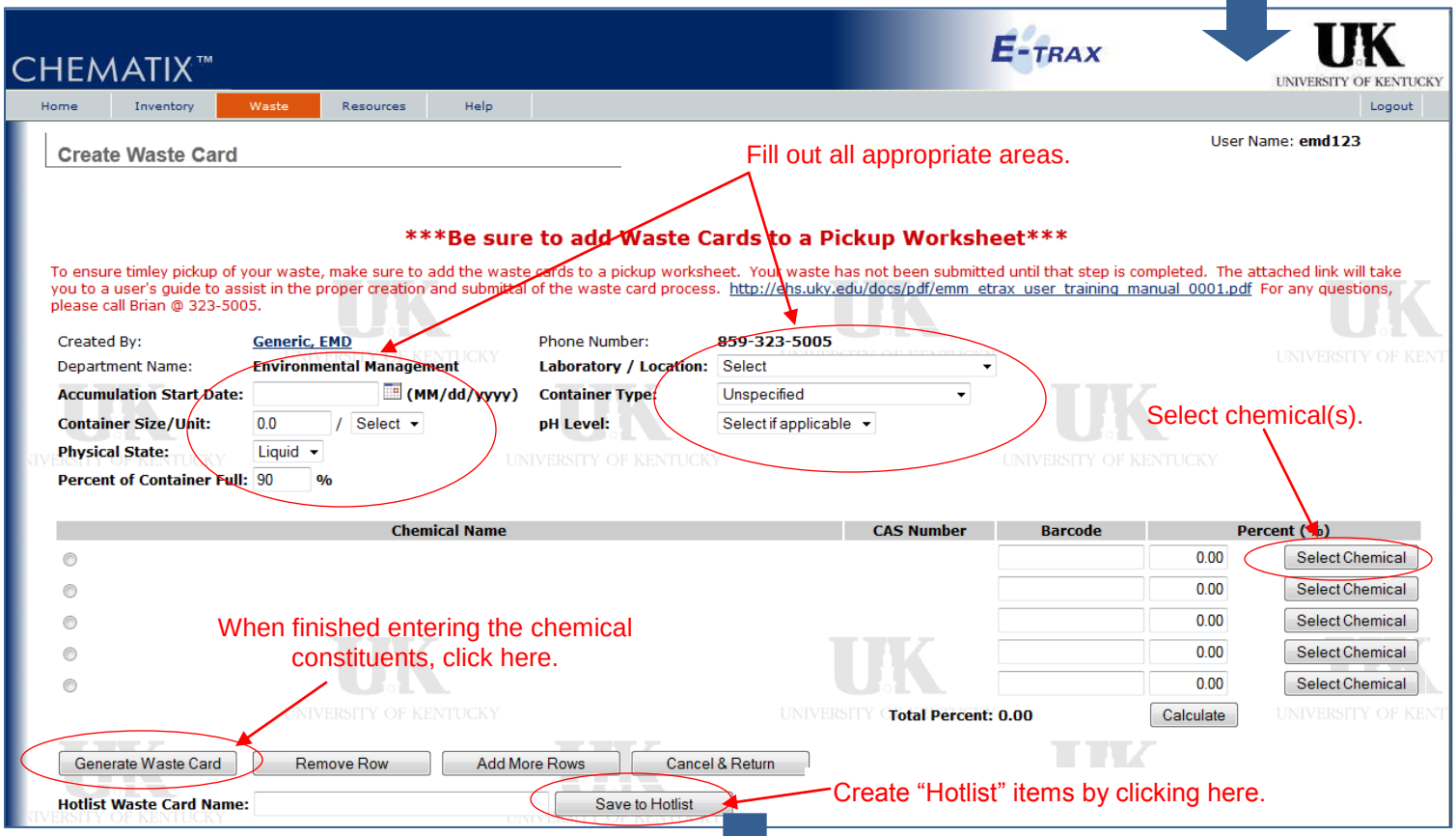
STEP 1 - EASY LOG ON PROCEDURES

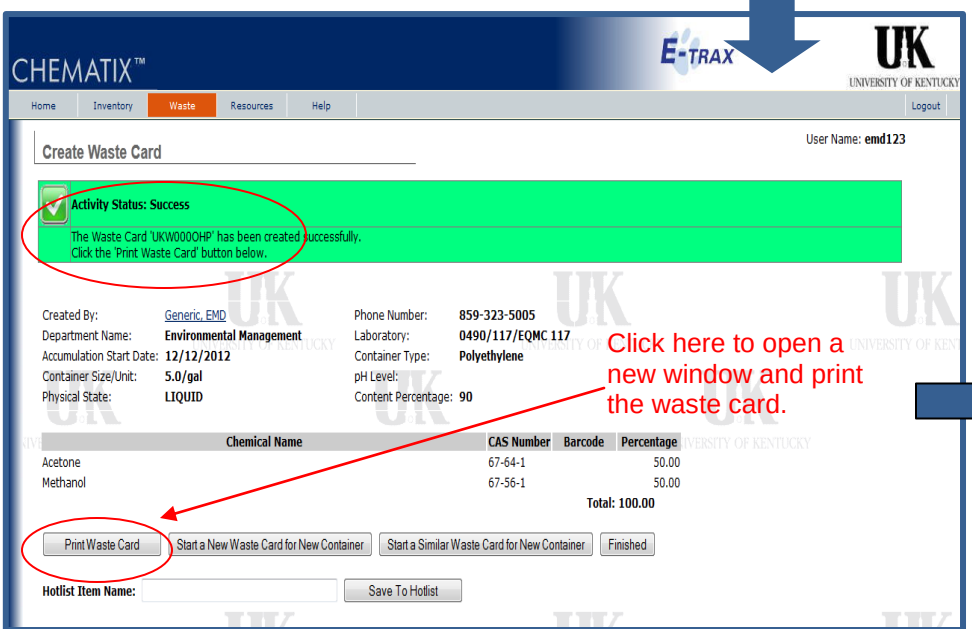
Access E-Trax Using - *https://etrax.chematix.com/Chematix/*



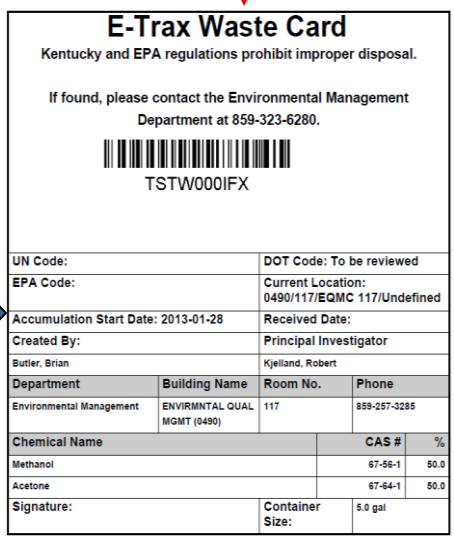


STEP 2 - CREATE WASTE CARDS





Print waste card and attach to waste container.



E-Trax Waste Card

Kentucky and EPA regulations prohibit improper disposal.

If found, please contact the Environmental Management Department at 859-323-6280.

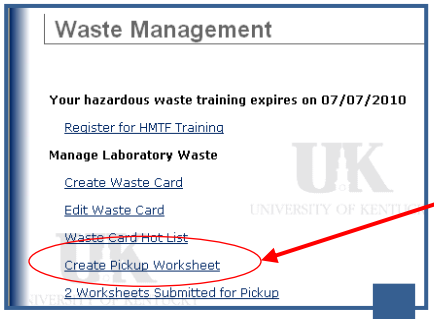
TSTW000IFX

UN Code:		DOT Code: To be reviewed	
EPA Code:		Current Location: 0490/117/EQMC 117/Undefined	
Accumulation Start Date: 2013-01-28		Received Date:	
Created By:		Principal Investigator	
Butler, Brian		Kjelland, Robert	
Department	Building Name	Room No.	Phone
Environmental Management	ENVIRMNTAL QUAL MGMT (0490)	117	859-257-3285

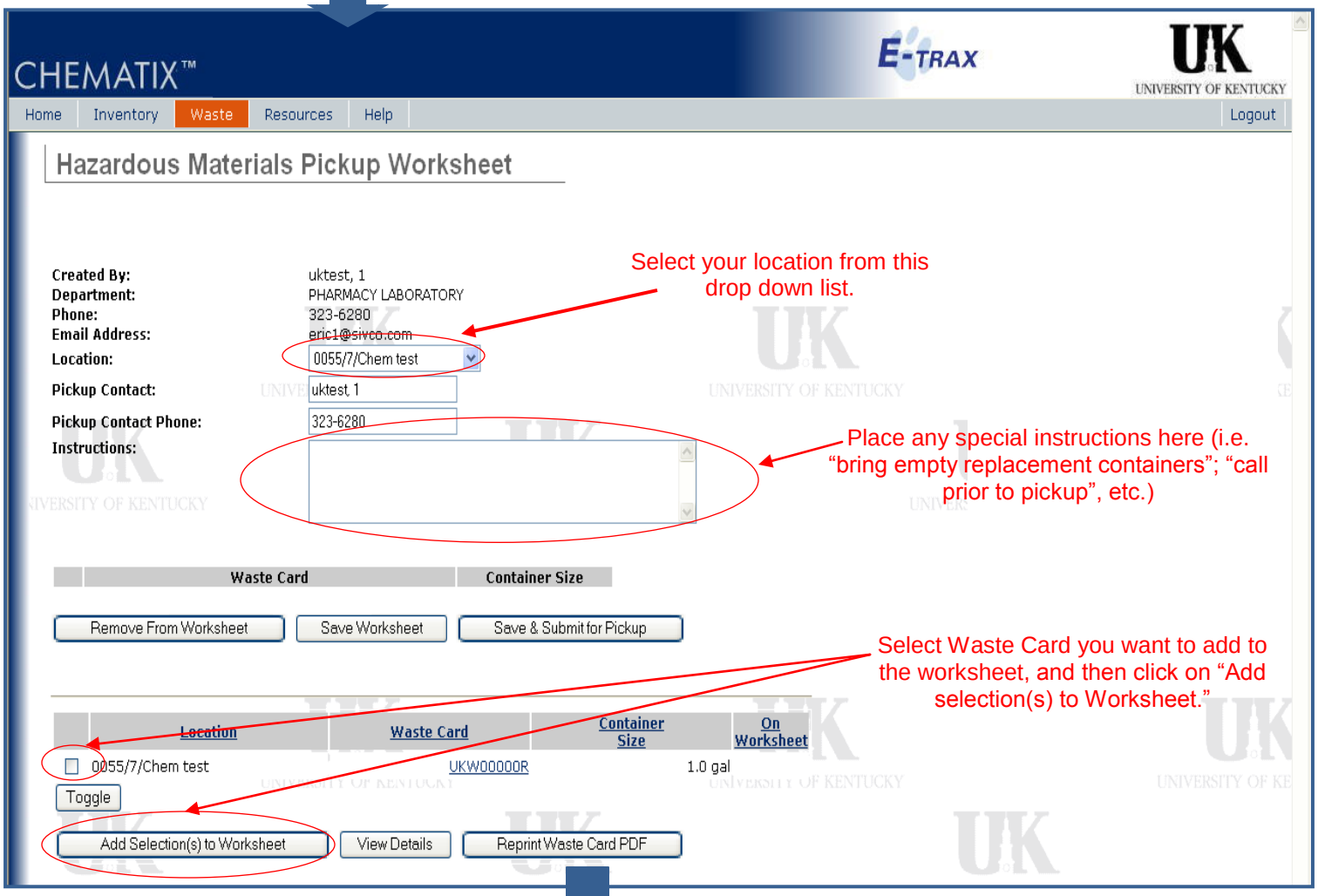
Chemical Name	CAS #	%
Methanol	67-56-1	50.0
Acetone	67-64-1	50.0

Signature:		Container Size:	5.0 gal

STEP 3 -SUBMIT WORKSHEETS



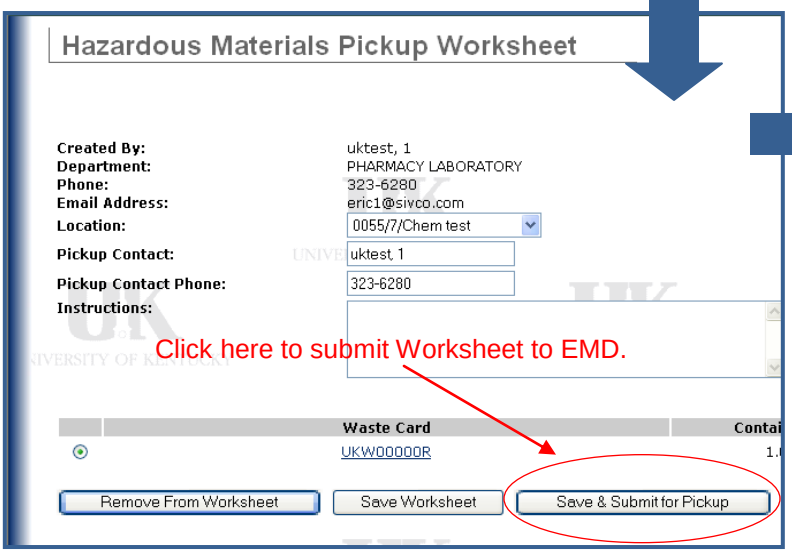
Click on "Create Pickup Worksheet."



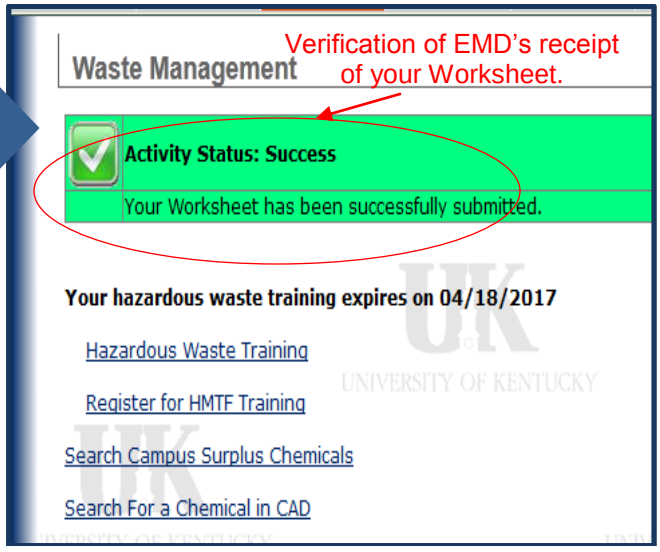
Select your location from this drop down list.

Place any special instructions here (i.e. "bring empty replacement containers"; "call prior to pickup", etc.)

Select Waste Card you want to add to the worksheet, and then click on "Add selection(s) to Worksheet."



Click here to submit Worksheet to EMD.



Verification of EMD's receipt of your Worksheet.

Appendix 6

Contingency Plan Quick Reference Guide

CONTINGENCY PLAN QUICK REFERENCE GUIDE
for
SATELLITE ACCUMULATION AREAS (SAA'S)

Hazardous waste on the University campus and at off-site facilities is accumulated in SAA's at or near the point of generation and remains under the control of the generator. In accordance with 401 KAR 39:080 and 40 CFR 262.262, the following is the Contingency Plan Quick Reference Guide for University SAA's. This Quick Reference Guide is a supporting document to the University's Hazardous Waste Contingency Plan. Should an emergency involving Hazardous Waste occur*, the Hazardous Waste Contingency Plan and conditions for implementation as outlined in that plan will define response and notification requirements.

Types of hazardous waste

The chemical inventory for each laboratory or other location is specific to that location. Emergency responders should expect that chemicals listed in the inventory for a specific location may also be present in the waste accumulated in the SAA.

Maximum amount of hazardous waste

SAA's will have less than 55 gallons of non-acute hazardous waste. Acute hazardous waste is rarely placed in a SAA and will be less than one quart or 1 kilogram if present.

Unique hazards

Any unique hazards presented within a location are identified on a sign posted at or near the entry point to the location where the SAA is located. These signs are updated annually. Additionally, the hazards associated with individual waste containers are indicated on the container and may also be accessed through the E-Trax waste management system.

Locations

All SAA's are identified with a SAA sign as illustrated:

A complete list of campus and off campus buildings and the spaces containing SAA's within the buildings is maintained in the Environmental Quality Management Center (EQMC). Drawings (by floor) of buildings is available on the University Physical Plant web site at https://www.ppd.uky.edu/Facilities/Floorplans/bldglist.asp.

Map/Evacuation routes

An interactive campus map illustrating buildings and their location in relation to surrounding areas may be accessed on the University's web site at https://maps.uky.edu/campusmap/. Location specific evacuation maps are posted in every building. The University Building Emergency Action Plans (BEAP) includes campus evacuation and notification procedures and would be implemented by UK Police (Crisis Management) if an incident involving a SAA required evacuation.

Water Supply

University buildings are equipped various sprinkler systems as well as fire hydrants in proximity to the buildings. The Lexington – Fayette Urban County Government Fire Department (LFD) maintains emergency plans for response to emergency incidents at the University. These plans include the locations of all stationary emergency equipment including fire hydrants, fire department connections (FDC) and post indicator valves (PIV) and are periodically reviewed in conjunction with University personnel.

On-site notification systems

The UK Police (Crisis Management) manages facility and campus emergency notification systems which include text messaging, speaker notification on campus telephones, area speakers and sirens across the campus, and web site notifications. These systems are activated as appropriate, depending on the level of the emergency.

Emergency Coordinator

The Director, Environmental Management is the Hazardous Materials Emergency Coordinator, and the Assistant Director, Environmental Management is the Alternate Hazardous Materials Emergency Coordinator. Each University building also has designated building contacts in the event of an emergency. The Hazardous Materials Emergency Coordinators may be reached at (859)323-6280 during normal business hours (8 AM – 5 PM). The UK Police Department maintains 24/7 emergency dispatch service which may be reached via 911 from any campus phone, (859)257-8573, or #8573 from a cell phone. Should the dispatcher determine that a Hazardous Material emergency has occurred they will contact the Emergency Coordinators.

**A release or spill of Hazardous Waste which presents an immediate danger or threat to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water or groundwater.*