UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha

Department of Chemical and Process Engineering

Laboratory Chemical Waste Handling and Disposal Guidelines

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Background & Purpose

The University of Canterbury department of Chemical and Process Engineering (CAPE) operates 12 different laboratories which serve a variety of specialised purposes. Each of these laboratories generates differing types and amounts of chemical waste, some of which possess physical, health or environmental hazards.

Although the waste individually generated may seem small and insignificant, there may be other people using the shared facilities who are generating hazardous waste also. The combined effect of everyone disposing of their waste inappropriately, could be significant to both human health and the safety of the environment.

CAPE has created these guidelines to help educate people on, and encourage appropriate handling, storage, and disposal of chemical waste, and prevent the unwanted accumulation of such waste.

What is Hazardous Waste?

Hazardous waste includes waste materials (liquids, gases, or solids) that are explosive, flammable, corrosive, toxic, radioactive, or infectious, and it comes from many sources (for example, households, industry, small businesses, school laboratories, and hospitals).

New Zealand WorkSafe Guidelines for Working Safely with Hazardous Substances:

These regulations apply to the use, handling, and storage of hazardous waste. You do not need and SDS for chemical waste, however the following is needed:

1. **Hazardous waste must be included in your inventory of hazardous substances.** This includes the name of what best reflects the waste, the amount, it's location and any specific storage requirements.
2. **Hazardous waste in containers must be clearly labelled.** This includes labels in English, identifying the waste as closely as possible, relevant hazard pictograms and statements, and contact details of the producer/owner if known.
3. **You must provide workers with relevant information, training, instruction, and supervision before they carry out work with hazardous waste.**
4. **You need to store hazardous waste as you would store any other hazardous substance with the same hazards.**
5. **Your risk management for hazardous waste should be the same for any other hazardous substance.**

What Types of Hazardous Wastes Can CAPE Process and Dispose of?

Within the CAPE department, most chemical wastes are accepted, including:

- Unwanted Chemicals
- Organic Solvents Waste
- Halogenated Waste
- Waste Metals
- Flammable (Class 3) Waste
- Acutely Toxic (Class 6) Waste
- Corrosive (Class 8) Waste
- Toxic to Aquatic Life (Class 9) Waste
- Cyanide and Azide Species Waste
- Narcotics and Antibiotics
- Waste Containing Mercury
- Contaminated Equipment

CAPE cannot process the following wastes the following waste:

- Gas Cylinders
- Radioactive Waste or Class 7 Materials
- Explosive or Other Class 1 Waste
- Expired Human or Veterinary Medicines

Should you have any questions or require advice regarding acceptable forms of CAPE chemical waste, please contact the laboratory manager or the health and safety officer.

Disposing of Waste Correctly:

Depending on the type of chemical waste there are various method for waste disposal.

Common Liquid Waste Disposal:

If you are generating volumes of less than 500 mL per week of liquid chemical waste, you may use the common liquid waste disposal bottles located in the fume cupboards and secondary containment in the prep area of 205.

This communal waste is separated into:

1. **Mixed Class 3:** Mixed flammable liquids
2. **Mixed Class 6:** Mixed toxic liquids.
3. **Mixed Class 8 Strong Bases:** Mixed strong base liquids.
4. **Mixed Class 8 Acids:** Mixed acids liquids.
5. **Mixed Class 9:** Mixed Ecotoxic liquids.

The communal waste is located in the fume hood in communal areas:

- Prep Area – Lab 205
- Lab 174 – Special Purposes Lab
- Lab 182 – Special Purposes Lab

It should be ensured that these vessels are not overfilled, and that they are labelled correctly with the contents inside.

Please alert a lab manager once these vessels are full or if assistance is required with labelling.

Note: When disposing of bases, please seal and move the acid waste container to the secondary containment outside the fumehood. When finished with the base bottle please replace it in the secondary containment outside the fumehood and return the acid bottle to the fumehood.

Acid Waste Disposal:

If you are uncomfortable or unsure of how to do any of this safely, please speak with a lab manager before proceeding.

Similar to other liquid waste disposal, a common waste bottle is provided for liquid acid waste.

All solutions **above 5M acid** must first **be added to** an equal volume of water in a container 3 or more times the volume of the liquid and in the fume hood. Be aware of heat generated as a result of mixing and slow down mixing to prevent over-heating. **Note: Ensure you always add acid to water. Adding water to acid can result in violent reactions due to excessive heating.** Once these acids are diluted, they will be pH adjusted to pH 6 by the lab manager prior to decanting or disposal.

If generating greater than 500 mL of acid waste per week, you will be required to use a personal waste container. Be sure when labelling personal waste containers the concentration and identity of the acid waste is clear and legible.

Personal Waste Containers:

Personal waste containers must be created for the following:

- >500 mL waste generated per week
- Waste Containing Oxidisers
- Waste Containing Tracked Substances

All waste must be correctly labelled with the contents, concentration (if known), the owner of the waste, and the appropriate hazard classes and associated pictograms.

Only amber coloured Winchester glass bottles should be used for liquid waste. It should be ensured that the existing label is completely removed from the bottle and all identifying markers of the previous contents are completely defaced.

Schott bottle should not be used for waste, as these are very expensive.

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Solid Waste Disposal:

Solid waste must be kept separate from liquid waste.

Each person generating solid waste should set up their own container and label it correctly. These containers can be stored in the general waste collection point on the labs, or a lab manager can be consulted if wanting to store elsewhere.

If solid waste contains metals, each individual metal should be stored in its own container (not mixed).

The following procedure and associated step-by-step instructions can help guide your chemical waste handling within the department.

Standard Procedure for Storage and Disposal of Hazardous Chemical Waste

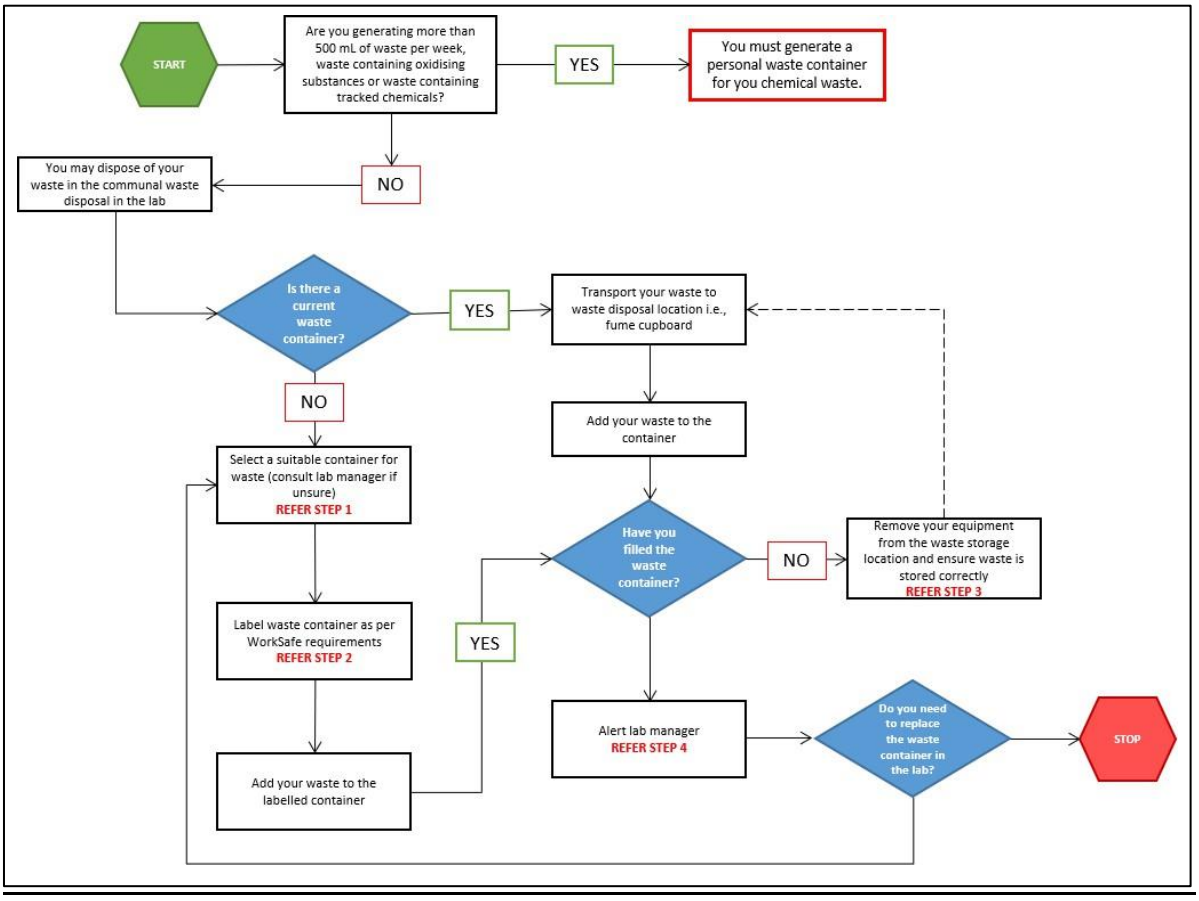

Figure 1 – Standard Procedure for Storage and Disposal of Hazardous Chemical Waste

Step 1: Selection of an Appropriate Waste Container

This section should be read in conjunction with section 2.12(2) of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

An appropriate waste container ***must*** be:

- In sound condition
- Will safely contain the hazardous substance –
    - Within the range of temperatures at which the container is likely to be used
    - For the duration for which the substance is likely to be contained

- Is made of material that is compatible with, and will not be adversely affected by, the hazardous substance. Section 13 of a substance's SDS will provide information for appropriate disposal considerations.
- Does not usually contain food or beverages and cannot be mistakenly identified as containing food or beverage
- If you are going to use a recycled chemical bottle, ALL existing labelling must be removed first. Simply crossing out existing labels is not acceptable.

Step 2: Labelling of a Container for Waste

This section should be read in conjunction with section 2.3 of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

A suitable label ***must*** contain:

- The material name of the waste or the nature of the waste as closely as possible
    - *NOTE: Labels such as "HPLC Waste" describe the source of the waste and not the nature of the waste. A more appropriate label would be "HPLC Waste containing 60% Acetonitrile and 40% Water".*
- The date
- Your personal name or the name or the lab manager where lab waste is communal
- Pictograms of relevant GHS classes.
- Sticky labels with space for chemical names/contents, name, date, and pre-printed pictograms should be available in the lab (or see the lab manager).
    - *NOTE: For communal waste containers where anyone may put small quantities into it, it is advisable that a log should be kept of the contents. This should be attached to the bottle, so that the chemical waste collection company can be assured of the specific chemicals they are handling. It also allows people to check if what they are adding to the waste container is compatible with the existing contents.*

Table 1 - GHS Pictograms

GHS01		Explosives, self-reactive substances, organic peroxides
GHS02		Flammable, pyrophoric, self-heating substances; water reactive
GHS03		Oxidising Substance
GHS04		Compressed liquified or dissolved gasses
GHS05		Corrosive, skin damage, eye damage
GHS06		Acute toxicity via oral, dermal or inhalation
GHS07		May cause immediate health effect – skin, eye, respiratory
GHS08		Aspiratory or respiratory hazard, carcinogenicity, mutagenicity
GHS09		Hazardous to the environment

Step 3: Storage of Waste Containers

ALL hazardous waste must be stored in the same way as hazardous substances of similar HSNO class are required to be i.e., flammable waste is to be stored in flammable waste containers

- *NOTE: long-term storage in fume cabinets is not acceptable*

Once a waste container is full, please contact a laboratory manager.

Step 4: Disposal of Waste Containers

When the waste container is almost full (80-90% of the containers volume), close the container with an appropriate lid so the container is ready for transport.

- For tracked substances, print off a copy of the SDS for the substance(s) and attach to the container.
- Collect a chemical carrier from the lab or the downstairs storage area and transfer the waste to the bulk storage location (ask a lab manager for more details).
  - Bulk hazardous waste should be stored in the outside DG storage facility.
- If required, create a new container for future waste (see steps 1 and 2) and return it to the normal storage location.
- **Never place incompatible substances in the same bin.**

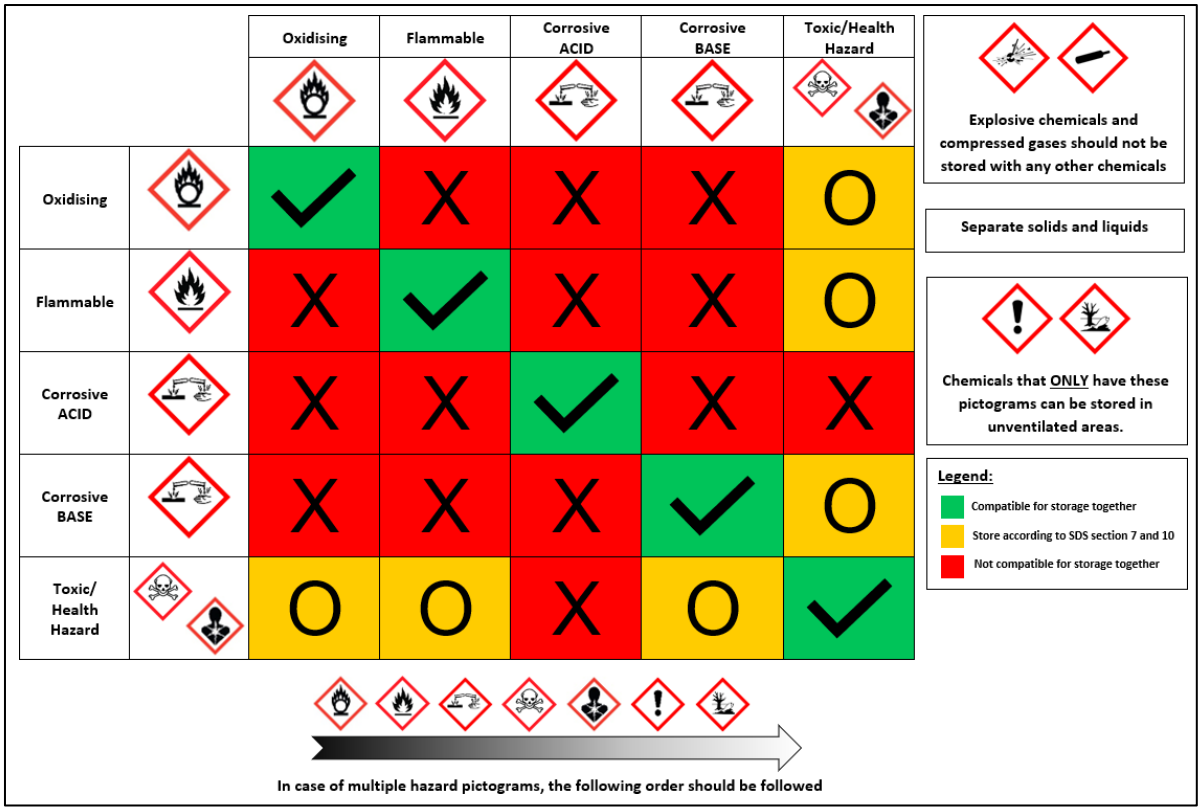

Figure 2- Chemical Storage Compatibility Chart

Trade Waste Disposal:

Laboratory drains are not designed to be used for chemical disposal, as waste entering these drains is not pre-treated prior to entering the Christchurch City Council wastewater system.

Disposing of inappropriate waste down drains can lead to numerous issues including:

- Damage to drains directly through corrosion
- Create risk to public health and safety
- Exposes maintenance personnel to hazardous chemicals when repair work is conducted on drains
- Local council has strict policies in place for monitoring wastewater. This is covered in the trade waste bylaw. The bylaw's purpose is to protect the environment, the Council's sewerage and stormwater infrastructure and the public's health. Specific characteristics are measured and monitored (e.g., pH and chemical contaminant concentration) under these local trade waste restrictions. Failure to comply with these regulations can result in fines or increases trade waste disposal charges for the University.

As a result of the above, only low hazard substances can be disposed of down the drains.

Table 2 – Trade Waste Disposal Suitability

Suitable for Trade Waste Disposal	Not Suitable for Trade Waste Disposal
- Water soluble, non-hazardous substances (e.g., D-glucose) - Dilute aqueous (water-based) reagents of low hazard (e.g., buffers) - Low volumes of low toxicity organic solvents (e.g., 10% ethanol solution in water) - Anions and Cations containing no heavy metals	- Corrosive solutions (pH <5.5 or >11) - Substances that are not soluble in water - Cyanide and Azide species - Heavy metals - Antibiotics/Narcotics/Anything with Biocidal Properties - Phenols, benzenes, or their derivatives - Halogenated organic solvents - Toxic organic solvents - Large volumes of flammable liquids (>100 mL) - Oxidisers

The below decision tree can be a useful tool to aid in the decision-making process of determining if waste can be disposed of down the drains.

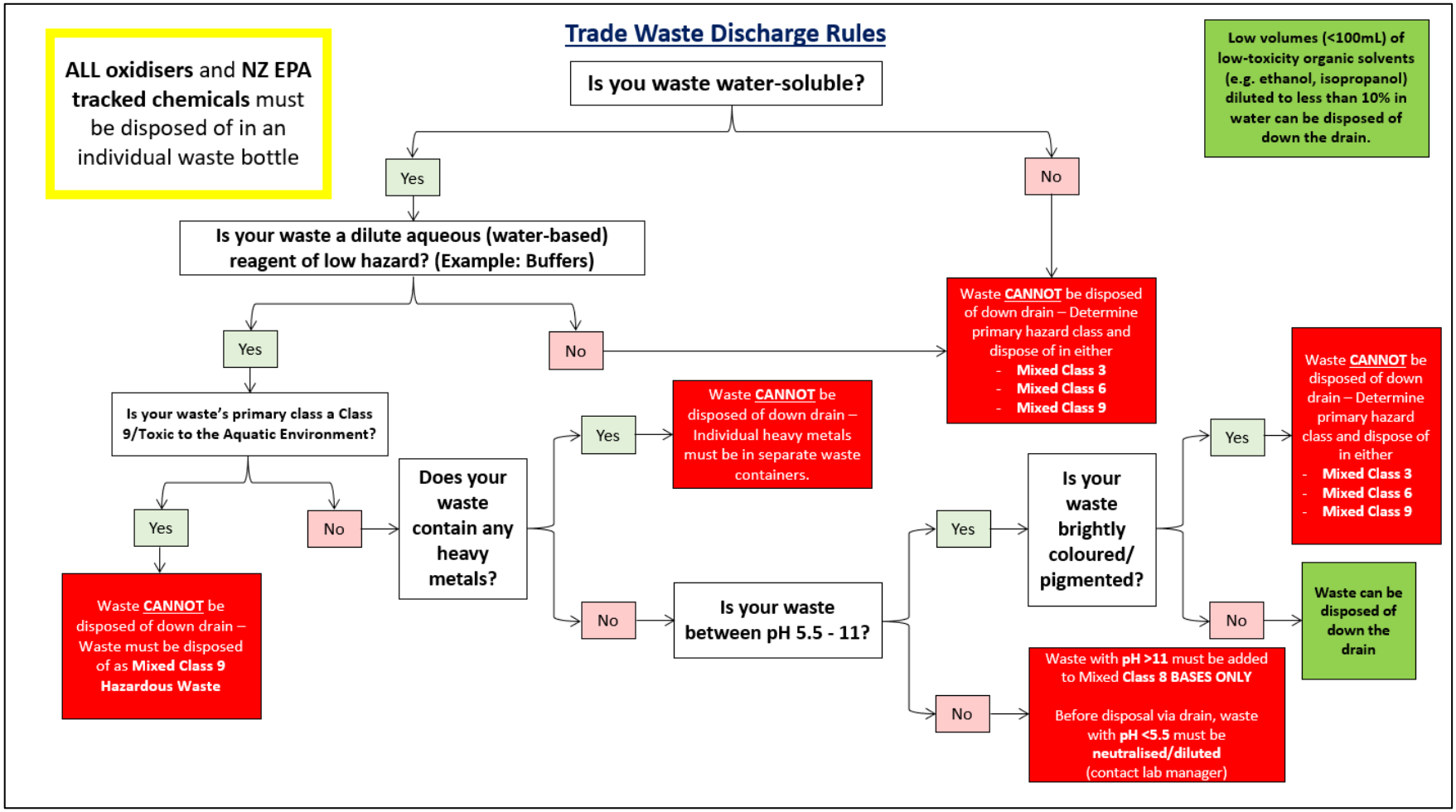

Figure 3 - Trade Waste Disposal Decision Tree

Disposal of Biohazard Waste:

Biohazard waste will be generated within the CAPE PC2 lab.

Biohazard waste should be disposed of in the yellow biohazard bags, as shown below.

Figure 4 – Biohazard Disposal Bags

Once ¾ full, the bag should be tied off with string, its contents labelled, and the lab manager will transfer the waste to a locked biohazard 240 L bin.

Once this bin is full, it will be transported over to the University of Canterbury Biology Department, where the bagged waste will be transferred to their storage facility.

The biohazard waste is disposed of by a third party, where it is steam treated to kill off all micro-organisms and shredded before being added to landfill. Although this process is very effective in destroying biohazard waste, however it will not destroy most chemical waste, which may pose a risk to the waste treatment personnel and natural environment.

Empty Containers:

When a chemical container is empty, it may be triple rinsed with water, and any labels removed or completely defaced. Following this, the container may be disposed of in the appropriate glass or plastic disposal bin inside the lab.

For containers where chemical residue remains after rinsing (e.g., for resins), or for chemical waste that is incompatible with water (HSNO class 4.3/HS260 and HS261), or where the container cannot be cleaned safely for other reasons, the entire container can be disposed of as hazardous waste. The contaminated container should be correctly labelled with the identification of the contamination present.

Unknown Substances:

If waste containers are unlabeled or contain illegal (not complaint with NZ WorkSafe labelling legislation), the lab manager should be alerted, and the following information should try to be provided:

- Physical state (solid or liquid)
- Colour
- pH
- Likely contents of container (e.g., organic solvent, unknown)

Incompatible Wastes:

The following lists wastes that are incompatible with each other:

- Do not mix reactive hazardous classification (class 4, 5.1.1 and 5.2) with flammable liquids (class 3) and corrosives (class 8).
- Keep acids well segregated from cyanides, azides, and hypochlorite solutions.
- Keep strong acids segregated form strong bases.

The safety data sheet for a substance should always be checked for detailed information on incompatibilities.