How could hazardous waste landfills affect your Health?

A well-planned and constructed hazardous waste landfill poses little threat to human health. However, the human health risks that do exist are through exposure to contaminated dust and unexpected leaks. In other words, if any dust or leachate containing hazardous waste escapes and is consumed, it could possibly harm the human body. Another impact to human health can arise from an accidental gaseous emission that disperses hazardous material.

How could hazardous waste landfills affect our environment?

A hazardous waste landfill is constructed to have minimal impact on the environment. Yet, its presence like that of any humanmade construction disturbs geohydrology, vegetation and animals living in and around the area. Animals and plants may be affected by exposure to dust or water that contains hazardous substances. In addition, if leachate leaks out of the landfills, it may affect the surface and groundwater quality.

Figure 1. Hazardous Materials Identification System

Numbers are placed in the blue, red and yellow regions showing the severity of the hazard for that category. Degrees range from 0 – 4, 4 = extreme hazard and 0 = no or minimal hazard. In the white region, a specific symbol or abbreviation would be used to describe hazard.

Want to Learn more about hazardous waste landfills?

Arizona Department of Enviromental Quality
www.azdeq.gov/environ/waste/hazwaste/index.html

US Environmental Protection Agency
www.epa.gov/epaoswer/osw/hazwaste.htm

Hazardous Waste Resource Center
www.etc.org/technologicalandenvironmentalissues/treatmenttechnologies/landfills/

Instituto Nacional de Ecología
www.ine.gob.mx/ueajei/publicaciones/libros/35/gobiernoslo.html

Texas Center for Policy Studies/Red Mexicana de Acción Frete al Libre Comercio/La Neta
http://www.ban.org/Library/residuos.pdfgobiernoslo.html

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The University of Arizona College of Pharmacy

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Providing and supporting environmental science and toxicology training, research, and policy development.

Facilitating a binational dialogue between investigators and stakeholders concerning risk assessment and remediation problems.

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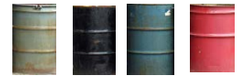
What is Hazardous Waste?



Waste that may be harmful to human health or the environment is called hazardous waste. It may be a solid, liquid, gas or a combination of these. Hazardous waste is usually produced by a variety of industrial and commercial sources.

The Resource Conservation and Recovery Act (RCRA) in the United States regulates the production, identification, management, treatment, tracking, and disposal of hazardous waste. According to RCRA, a substance is considered to be a hazardous waste if it has one or more of the specific characteristics listed below:

- **Ignitability** – ease by which a material catches on fire (e.g. oil or solvents)
- **Corrosivity** – capacity to chemically destroy material (e.g. strong acid or strong base)
- **Reactivity** – ability to cause emissions or toxic fumes (e.g. solvents)
- **Toxicity** – capacity to cause death or harm to plants, animals and humans (e.g. pesticides or metals)

In addition to these characteristics, a substance is also considered to be hazardous if it appears on one of four lists for different types of wastes or chemical products. There are also exclusions to the definition provided by RCRA which encompass household waste, domestic sewage, and irrigation return flows to name a few. For details on hazardous waste lists and exclusions see:

www.epa.gov/epaoswer/hazwaste/id/id.htm

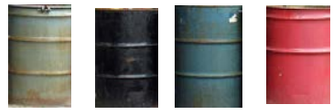
What are the U.S. governmental standards concerning hazardous landfills?

Hazardous waste landfills built in the U.S. follow very strict federal and state standards regarding construction and operation. These standards have been developed to protect human and environmental health. State standards by law cannot be less stringent than federal standards.

At the federal level, RCRA contains the guidelines regarding site, design, construction, management, and closure of hazardous waste landfills. Therefore, all landfills must obtain a permit that in turn ensures that they have incorporated standards set by RCRA. Also, U.S. EPA has designed regulations that provide standards regarding security, inspections and training.

Additional requirements for hazardous waste landfills are developed at the state level since landfill conditions can vary with local environmental and climatic conditions. These requirements are considered state specific and regulations do not apply beyond state lines. Specific Arizona hazardous waste landfill standards are the following:

- On-site state inspectors
- Additional groundwater monitoring wells
- Restrictions on specific waste (i.e. radioactive)
- Additional construction requirements



What is a hazardous waste Landfill?

A hazardous waste landfill is an underground site specially constructed to safely store hazardous waste for many decades. It contains special layers (known as "liners") that help prevent the leaking of hazardous materials into the soil. Hazardous landfills also contain separate cells (compartments) where different waste materials can be segregated depending on its chemistry, type and reactivity with other hazardous waste materials. Generally, hazardous waste sites contain other structures on site such as a wastewater treatment plant, monitoring wells, and water capture structures.

It is important to mention that such landfills produce liquid waste streams known as leachate. Leachate contains dissolved and/or suspended materials. It is produced by two methods: a) the introduction of water via precipitation (i.e. rain or snow melt) and b) the decay of organic material (i.e. organic acids).

What are the general characteristics of a hazardous waste landfill?

The site selection of a hazardous waste landfill depends on the topography (characteristics of the land) and geohydrology (characteristics of the groundwater in the soil and rocks). Other considerations may include: a) proximity to waste producers; b) land uses; and c) environmental conditions.

Inside the facility, hazardous waste is sorted into compatible types and stored in cells. These cells are between 5 - 6 meters in height. Waste placed within these cells is commonly stored in 55 gallon drums. A 0.3 meter layer of compacted soil is placed on top of the landfill daily in order to decrease dust and gaseous emissions of hazardous substances.

All hazardous waste shipments to the landfill are inventoried to verify the material that is entering the facility. This information determines what treatment methods should be applied and how the material should be stored properly.

The soil that makes up the bottom layer of a hazardous waste landfill site is typically clay. Clay is considered a natural barrier that slows down and prevents the leaking of leachate. Along with the clay barrier, a double geomembrane liner made out of various plastic materials is also used as protection. A drainage system is placed above each of the liners to capture the leachate. The on site treatment plant cleans-up the collected leachate to prevent the release of hazardous substances.

Hazardous waste landfills have an impermeable top or capping layer to minimize exposure on the surface of the facility, prevent waste movement and restrict surface water infiltration into the landfill. The capping layer also serves as a land surface that can support vegetation and/or be used for other purposes. These caps generally consist of an upper topsoil layer; a drainage layer; and a low permeability layer made of a synthetic material covering 2 feet of compacted clay.

Symbols for Figures 2 and 3

= active disposal area

= separate cells (compartments) 5 - 6 meters in height

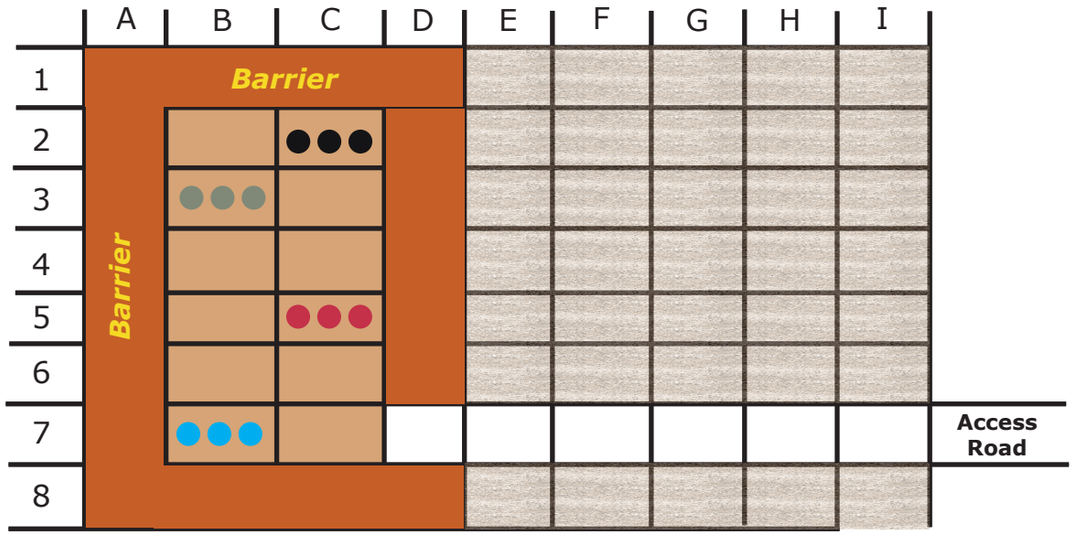
= Bases, pH greater than 7 — Corrosive

= Acids, pH less than 7 — Corrosive

= Solvents — Reactive

= Ignitables

Figure 2. Bird's eye view showing a typical grid system of a hazardous waste landfill



Hazardous waste landfills contain separate cells (compartments) where different waste materials can be segregated depending on its chemistry, type and reactivity with other hazardous waste materials.

Figure 3. Worm's eye view (cross section) of a hazardous waste landill with an enlarged view of the cover and liner