# Landfill in a Bottle

## Background Information:

When we throw trash in our garbage cans it goes to a landfill. But do you think a landfill is just a pile of trash? There's more to it than that! There are several layers and parts of a landfill that help make them safe and efficient. In this activity, by creating their own landfill in a bottle, students will understand the complex layers of landfills and the importance of keeping them regulated.

## Important Vocabulary:

**Compacted clay** – a type of soil that is nearly impermeable when compacted.

**Geotextile mat** – a mat that allows water to percolate through the leachate collection system, but not solids, and protects the plastic liner from tearing or puncturing.

**Gravel and drainage layer** – stones and rock that help filter leachate.

**Groundwater** – is fresh water (from rain or melting ice and snow) that soaks into the soil and is stored in the tiny spaces (pores) between rocks and particles of soil.

**Landfill** – a place to dispose of waste by burying it and covering it over with soil.

**Leachate** – formed when rain water filters through waste placed in a landfill. When this liquid comes in contact with buried waste, it leaches, or draws out, chemicals or constituents from the waste.

**Leachate collection pipe** – drains, collects, and transports leachate through the drainage layer of a collection sump where it is removed for treatment or disposal.

**Plastic liner** – a puncture-resistant plastic layer to keep unwanted materials from leaking into the groundwater.

**Soil** – the upper layer of earth in which plants grow.

**Waste** – eliminated or discarded as no longer useful or required. Also known as trash, garbage, refuse, and rubbish.

## Materials:

All items below are included in the *Don't Waste It!* Educator Check Out Program.

- Diagram of a landfill (included below; 7 laminated copies- one per group)
- Empty clear plastic container per group (1 per group)
- Set of materials to represent various layers of the landfill (enough for 7 groups and 1 for demonstration)
    - Groundwater- foam or Styrofoam
    - Compacted clay- brown paperboard
    - Plastic liner- film
    - Leachate collection pipe- straws
    - Geotextile mat- placemat

    - Soil- brown foam
    - Waste (trash)- chip or candy bag
    - Miscellaneous additional materials
- Vocabulary List (included below; 7 laminated copies- one per group)
- Worksheet (one per student, included below)

# Instructions:

1. Show students the diagram of a landfill and discuss the different layers, including their purpose and why they are important. Use the definitions and notes below to help explain each layer's purpose.
    a. Compacted clay- forms an additional barrier to prevent leachate from leaving the landfill and entering the environment. Also helps to prevent the escape of landfill gas.
    b. Plastic liner- typically constructed of high-density polyethylene (HDPE), which is tough, impermeable and extremely resistant to compounds found in leachate. Also helps to prevent the escape of landfill gas.
    c. Geotextile mat- helps to prevent clogging of the leachate pipe system.
    d. Gravel and drainage layer- collects leachate to drain by gravity to the leachate collection system.
    e. Soil- used as a base layer before putting waste onto the landfill. Also used to cover the waste daily to help keep it compacted and prevent vermin from getting to the waste.
2. Empty the materials from the plastic bags and lay out in a central location.
3. Give each group a bottle and tell them they will be using the materials to create their own landfill in a bottle.
4. Tell each group to choose which material will represent the various landfill layers. Let the students know there are additional items that will not be used. The students should use reasoning skills to select which one they think would work best for each layer.
    a. For younger children, you may want to pre-sort the materials and give them only the ones they need. You can describe the properties of the material meant to represent a layer (i.e. color, texture, shape, etc.) and then have them figure out which one to use.
5. Ask students to complete the Landfill in a Bottle Worksheet while making their landfill in a bottle.

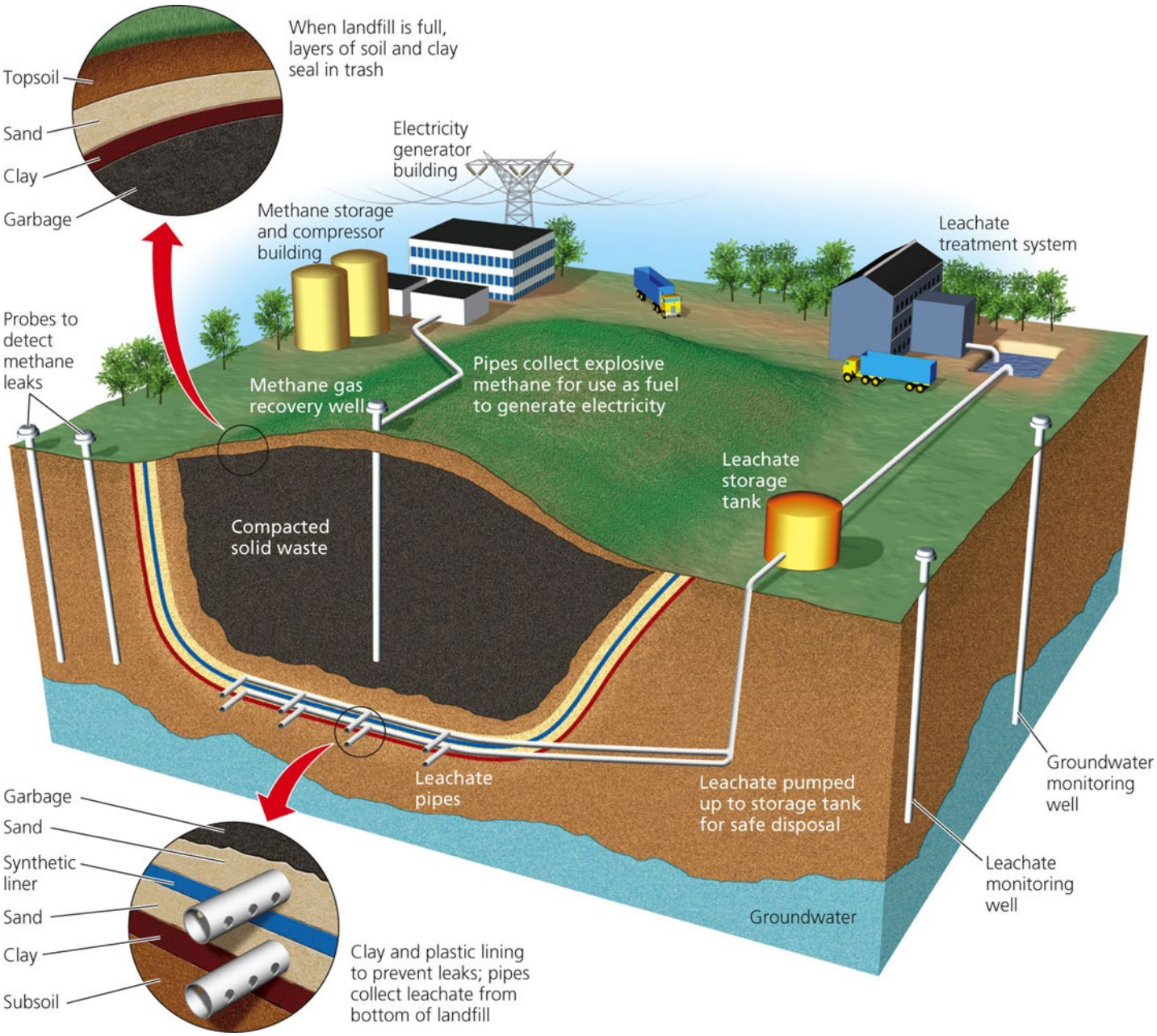
# Follow-Up Questions:

Once every group has finished, have groups share what material they picked for each layer and why. You can use the instructor set to create your landfill in a bottle as you go through each layer. Use the questions below to continue the discussion about landfills:

1. Which layer was the hardest to find something to represent it? Why?
2. Which layer of a landfill do you think is most important? Why?
3. Can a landfill be built anywhere? Why or why not?
4. Why do you think it's important for us to try and keep items out of a landfills?
5. What are ways to send fewer items to the landfill? (hint- reduce, reuse, recycle, compost)

# Sample Landfill in a Bottle:

# Landfill Diagram:




*Source: Living in the Environment: Concepts, Connections, and Solutions. International Student Edition.*

# Vocabulary List

| Landfill Layer | Definition |
|---|---|
| Groundwater | is fresh water (from rain or melting ice and snow) that soaks into the soil and is stored in the tiny spaces (pores) between rocks and particles of soil. |
| Compacted Clay | a type of soil that is nearly impermeable when compacted. |
| Plastic Liner | a puncture-resistant plastic layer to keep unwanted materials from leaking into the groundwater. |
| Leachate Collection Pipe | drains, collects, and transports leachate through the drainage layer of a collection sump where it is removed for treatment or disposal. |
| Geotextile Mat | a mat that allows water to percolate through the leachate collection system, but not solids, and protects the plastic liner from tearing or puncturing. |
| Gravel and Drainage | stones and rock that help filter leachate. |
| Soil | the upper layer of earth in which plants grow. |
| Trash | eliminated or discarded as no longer useful or required. Also known as trash, garbage, refuse, and rubbish. |

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# Landfill in a Bottle Worksheet

Name: _____

Date: _____

Find a piece of material to represent each layer of the landfill and explain below why you chose that material.

| Landfill Layer | Material Used | Why did you choose this material? |
|---|---|---|
| Groundwater | | |
| Compacted Clay | | |
| Plastic Liner | | |
| Leachate Collection Pipe | | |
| Geotextile Mat | | |
| Gravel and Drainage | | |
| Soil | | |
| Trash | | |