Name _____ Date_____

Activity 2: Investigating Groundwater

Guiding Question: How does water interact with earth materials?

Key Words: ***aquifer, aquitard, groundwater,*** *nuclear waste,* ***sediment, sedimentary rock***

Get Started:

1. If nuclear waste is stored deep underground, why do you think most scientists think that it should be stored in areas with dry climates that receive little rainfall?

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2. Where do you think water goes when it falls to Earth?

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3. How does water 'disappear' into solid ground? Where does it go? Can we get it back once it has disappeared?

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4. Read the introduction and Guiding Question to Activity 2, "Investigating Groundwater," in your Student Book.

Do the Activity:

1. Read Procedure Steps 1-12 in your Student Book. Create the data table mentioned in Procedure Step 1 in the space provided on the next page.

Name _____ Date_____

Procedure Step 1: In the space provided, make a data table like the one shown in your Student Book. Make the space is big enough to include drawings of the earth materials.

Name _____ Date_____

2. *Watch the LABsent video (found here:* https://labaids.s3.us-east-2.amazonaws.com/labsent-videos/3e+Geological+Processes+2.mp4*) to see the experiment being done.* Each time the video says to record, you may want to pause the video to give you ample time to complete your observations.

Build Understanding:

1. Describe your observations of sand. Why do you think sand allowed water to flow through it? Why did clay *not* allow water to flow through it?

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2. Look at Visual Aid 2.1, "Comparing Clay and Sand," which is attached to this packet. The images show particle size magnified by a factor of 10 (10x indicates a magnification of 10 times the object's actual size). How do you think the size of the different particles in each material and the relative amount of space between them affects the ability of water to flow?

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Analysis:

1. **Sediments** are parts of rocks, shells, and dead organisms that have been worn down into small pieces, mostly by the effects of water. The earth materials you used in the activity—sand and clay—are sediments. Sediments settle on top of each other. The layers they form are pressed and glued together. Over long periods of time, these layers of hardened sediment form **sedimentary rock.**

    a. What do you think happens when water flows from Earth's surface into a shale rock layer, which is made of clay sediments?

    b. What do you think happens when water flows from Earth's surface into a sandstone rock layer, which is made of sand sediments?

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2. An **aquifer** is a rock layer that allows groundwater to flow through it. An **aquitard** is a rock layer that restricts the flow of groundwater.

a. Draw a diagram to show how you would use the materials from this activity (clay, sand, water, and a plastic tube) to build a model of an aquifer.
b. How would your placement of the earth materials in the tube allow water to flow and collect in an aquifer?
c. Which earth material would be considered an aquitard?

Before you answer this question, look at Visual Aid 2.2, "Groundwater Movement," which is attached to this packet, to see how groundwater moves through sedimentary rock layers under Earth's surface.

Diagram:

b:

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c.

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Name _____ Date_____

Build Understanding:

1. Look at Visual Aid 2.3, "Aquifers in the Contiguous U.S." which is attached to this packet. This map shows the major aquifers in the Contiguous United States. Each color on the map represents a different aquifer. Record your observations of the locations of the aquifers. Describe the patterns you notice.

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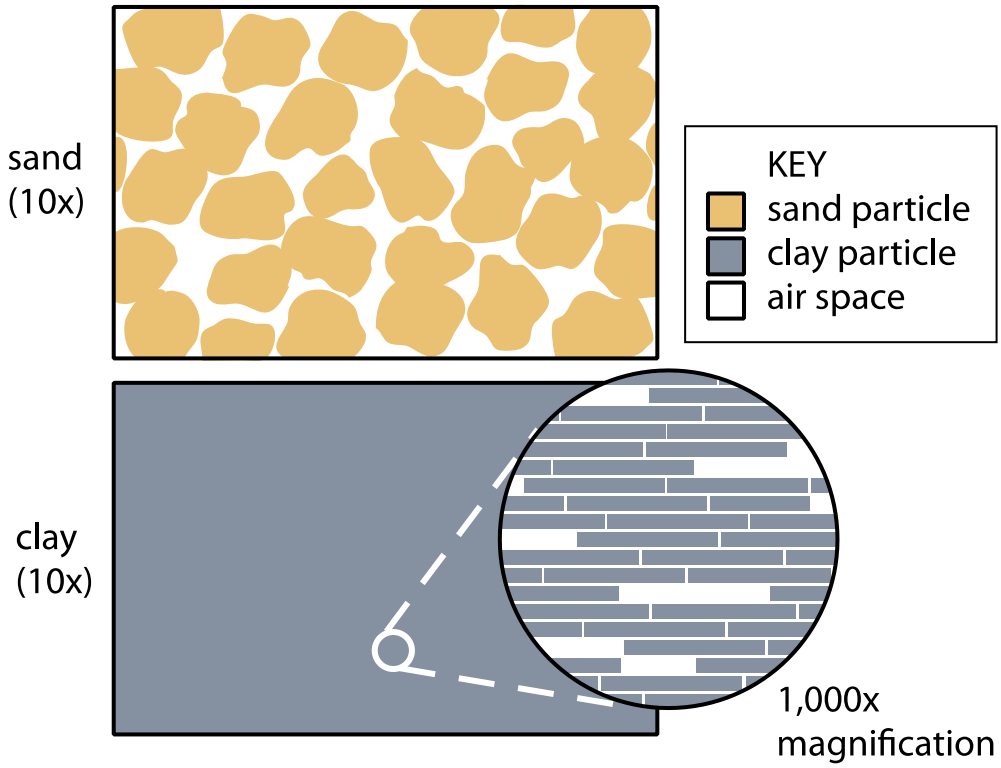
Analysis *continued*

3. **Revisit the issue:** The world's aquifers store much more freshwater underground than is stored in all the lakes and rivers on Earth's surface. Aquifers are sources of drinking water for many people. Add the consideration "location of aquifers" in a new row on Student Sheet 1.1, "Considering Where to Store Nuclear Waste." In the second column, write the recommended action you would take in regard to this consideration. Explain why you recommend taking this action when deciding where to store nuclear waste.

Name _____ Date_____

VISUAL AID 2.1

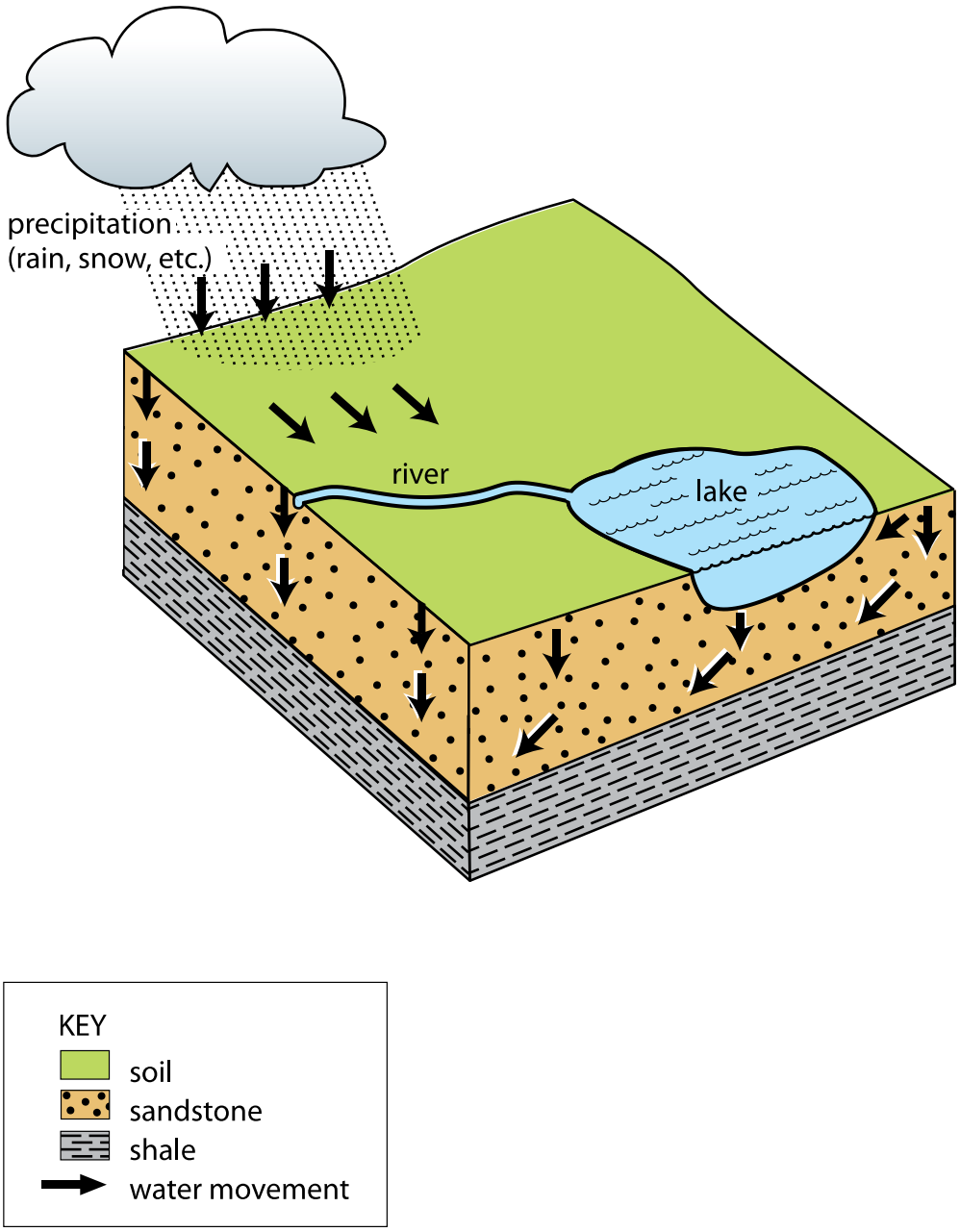
COMPARING CLAY AND SAND



Name _____ Date_____

VISUAL AID 2.2

GROUNDWATER MOVEMENT



Name _____ Date_____

Name _____ Date_____

VISUAL AID 2.3

AQUIFERS IN THE CONTIGUOUS U.S.

The different colors on this map represent different aquifers.