



# **SEPUP: Groundwater Contamination: Trouble in Fruitvale**

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# SEPUP

**S = Science**

**E= Education**

**P= Public**

**U= Understanding**

**P= Program**

# Use of the 4 -2 -1 Model

- **4 students share set of materials**
- **2 students (each team) performs the investigation**
- **1 each student is expected to keep their own record**

# SEPUP Assessment

- **SEPUP variables, each of which identifies a major learning goal**
- **Embedded assessment tasks designed to track student progress towards mastery of the SEPUP variable**
- **Scoring Criteria with the associated Scoring Guides and Feedback Forms**

# Groundwater Contamination: Trouble in Fruitvale



What would you want to know  
about a groundwater  
contamination problem?

# The Challenges

1. Is something wrong with the water in Fruitvale?
2. How does water disappear into the earth and how can we get it back?
3. If you were traveling with a drop of water in Fruitvale, what would your trip be like?
4. What information do different types of maps provide that will help solve the mystery of Fruitvale's water?
5. How might a contaminant spread under different circumstances in Fruitvale?
6. What is a serial dilution and how do we measure contaminants in water?
7. What are the most likely locations for the pesticide to have entered the groundwater?

# The Challenges (cont.)

8. What is the extent and source of Fruitvale's contaminated groundwater?
9. How do you map contaminant plumes? How can you recognize a point and non-point source contaminant plume on an isomap?
10. What is the shape of the contaminant plume in Fruitvale? What does it reveal about the possible source(s) of contamination?
11. How fast is the pesticide spreading through Fruitvale's aquifer?
12. What should Fruitvale do about its contaminated aquifer?



# The Mystery of Fruitvale's Water



# Module at a Glance

- Activity 1: The Fruitvale Story, Part One

- Students introduced to the problem and examine a map of Fruitvale.



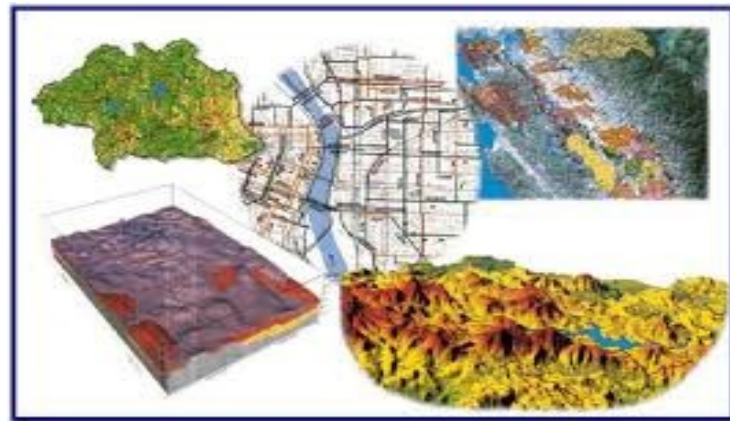
- Activity 2: Understanding Groundwater

- Investigate the ability of gravel, sand, and clay to both absorb and release water
- Learn about the earth's groundwater supply

# Module at a Glance

- Activity 3: Exploring the Water Cycle
  - Learn about the water cycle by playing a game that simulates traveling with a drop of water
  - Students write story that describes traveling through the water cycle

- Activity 4: Interpreting Maps
  - Learn information on a street map, topographic map, and geologic cross-section of Fruitvale

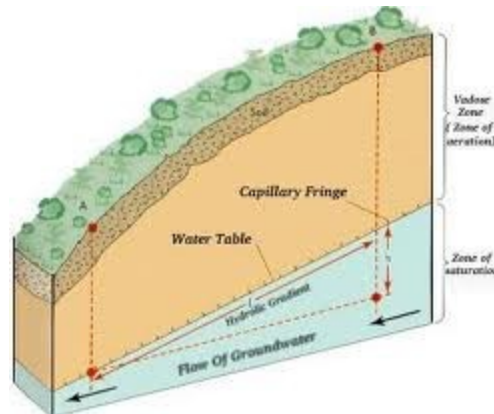


# Module at a Glance

- Activity 5: Modeling Groundwater Contamination
  - Model the spread of groundwater contamination in an aquifer
  - Students predict the extent of groundwater contamination from various sources using geologic cross-sections of Fruitvale
- Activity 6: Understanding Concentration
  - Simulate the process of diluting contaminated water by performing a serial dilution.
  - How to calculate the concentration of each successive, more dilute solution of the food coloring.

# Module at a Glance

- Activity 7: The Fruitvale Story: Part 2
  - More information about Fruitvale's water supply and predict the most probable locations for the source of the pesticide contamination
- Activity 8: Testing for Pesticide Concentrations
  - Students design and revise a well testing plan by collecting data from some of Fruitvale's wells



# Module at a Glance

- **Activity 9: Drawing Isomaps**
  - Learn about isomaps and how they show the extent of underground contamination
  - Draw isolines from a set of data and practice making isomaps
- **Activity 10: Making an Isoconcentration Map**
  - Students produce an isoconcentration map of the contamination in Fruitvale

# Module at a Glance

- **Activity 11: Damage Assessment**
  - Compare two isoconcentration maps of Fruitvale that were made six months apart
  - Estimate the spreading rate of the pesticide plume and assess the potential danger of the plume
- **Activity 12: Decision Making**
  - Students consider the options for cleaning up groundwater by participating in a role-playing simulation as members of the Fruitvale community

# Potential Cleanup Methods

- Pumping and treatment of all contaminated Water
- Excavation of earth materials from the plume area
- Bioremediation of the Plume area
- Leading Edge Water Treatment
- On-Demand Water Treatment
- Prohibition of All Pumping From the Contaminated Aquifer