

**CSI: Contamination Source Investigation****Scenario:**

You are a physician in a small community (about 1,000 residents). Yours is an old family in this area; your great-great-grandfather settled here in the 1800s and helped in the development of an embalming fluid that was widely used during the American Civil War. Several members of your family are buried in the local cemetery.

Over the past couple of years a few members of the community have described to you their puzzling physical symptoms. Recently, a patient presented you with similar but more serious complaints: weakness, tingling and numbness in his hands and feet, and dark warts on the palms of his hands and the soles of his feet.

You listen carefully as your patient responds to questions related to his medical history. He works in the small, local factory (*Private Well #6, on the Community Map*) that produces wood preservatives. He has lived in the area for about ten years. He and his wife of ten months have a private well at their home. His wife has not exhibited similar symptoms. He quit smoking three years ago and does not drink alcoholic beverages. He takes no medications, only vitamins.

You meet with members of the town council and express your suspicions- that the symptoms you have documented over the last few years are related to chronic arsenic poisoning from contaminated drinking water. Arsenic is a naturally occurring element, and is currently used primarily in the production of pesticides and wood preservatives. You advise them that the accepted level of arsenic in drinking water is 10 ppb. The town council votes to budget money for groundwater testing that will initially be limited to wells already in existence.

**Objective:**

- Analyze data to trace the flow of contaminants in ground water

**Prediction:**

- Based upon the scenario that you read, what is your initial thought as to the possible source of contamination?

**Setting up the Investigation:**

- The top right corner of the map is the point of highest elevation and the lowest elevation is the bottom left-hand corner.
- Indicate the direction groundwater will move on the map.
- Begin on the southern border of the map and plot contamination levels (using Data Set 1) from the bottom of the map to the top.

1. Based upon the plotted concentration levels of contaminants that you just plotted what do you believe is to blame for the contamination? Explain.
2. What do you believe the town should do with this information?

 **News Flash!** 

The lead groundwater researcher has important information regarding the contamination, but it can only be discussed after you reveal the evidence you have collected thus far!

- Follow the directions given to you on the "News Flash Memo" given to you by the lead groundwater researcher.

**Requested Coordinates:**

Coordinate							
Concentration of contaminant (ppb)							

**Report of Findings:**

1. Near what landmark were the highest concentrations of arsenic found on your map?
2. Where was the lowest arsenic concentrations found on your map?
3. What is the point source of the groundwater contamination? How did you reach your conclusion?
4. What should community members do now that the source of contamination has been identified?
5. Why didn't the patient's wife exhibit similar symptoms?
6. How did your initial prediction compare to your final conclusion? What would your initial prediction have impacted the community if you were unable to receive additional data?

### News Flash!

The factory owner was contacted by the mayor, and she has proven that her operation is not responsible for the arsenic contamination. All arsenic coming into and leaving the factory has been accounted for.

The city has budgeted additional funds and has commissioned a water quality-testing agency to locate the source. This agency drilled test wells to confirm that the factory is not the source; other sites need to be tested.

The city hasn't budgeted enough money for you to go to every single well site. You can only choose 7 well sites to test, of course you would like to not have to go to all 7 sites.

- Choose 7 coordinates to test and obtain the readings from the lead groundwater researcher (*i.e., request the data for plot H12, if you want the readings for private well 11,PW11.*).
- Record the coordinates in the data table on your handout.

**When you believe you have located the point source advise the lead researcher, don't let other members of the quality-testing agency know, as there could be a bonus to who finds the source first!**

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